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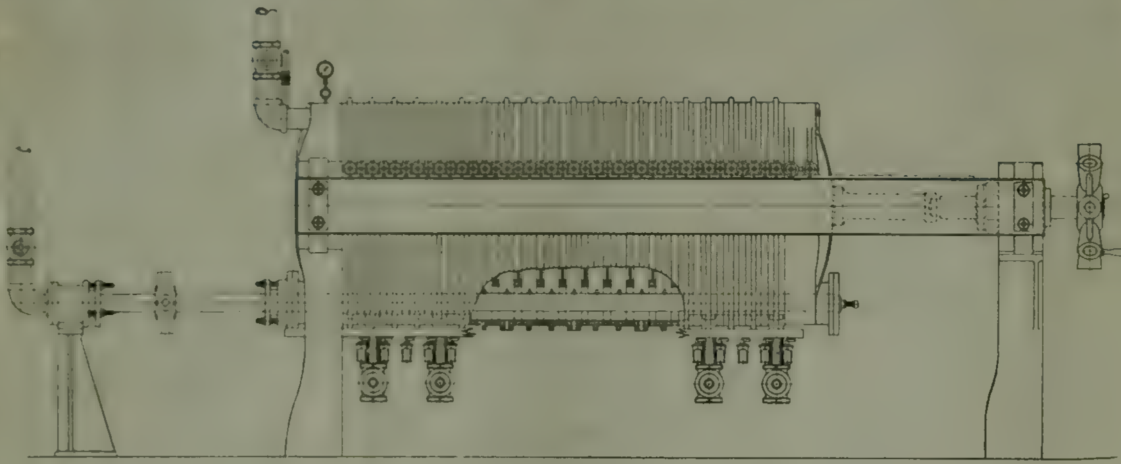

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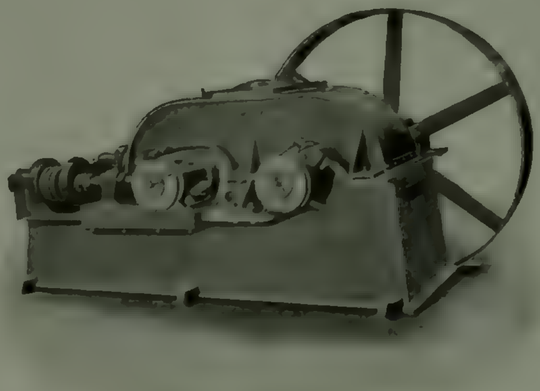

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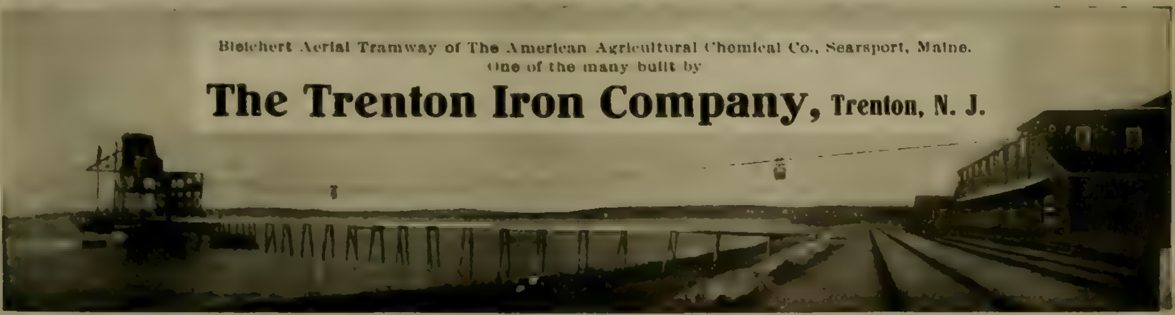

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EDITORIAL

THE American Institute of Electrical Engineers held its annual convention in Chicago last week and the session was most interesting.

EXPORTS of iron and steel for the year just ended show an encouraging increase, the estimate being $235,000,000, as compared with the former record of $184,000,000 in 1908.

IT is estimated that the poultry and egg production of the United States for the current year will have a value of $1,000,000,000. Why hunt for Porcupines when Plymouth Rocks are available!

MANY corporations have offered to compromise the claims for the Federal corporation tax of last year, and the ruling has been made by the Department that no offer of less than $10 in addition to the assessment will be accepted.

THE latest 'Trust' to be dissolved is the E. I. du Pont de Nemours Company, with its affiliated powder-manufacturing companies. The interlocutory decree fixes October 16 as the date for providing a plan of dissolution, so that the supply of powder for military purposes and the work of excavating the Panama Canal may not be interfered with.

AN interesting suggestion has been made by Mr. Horace V. Winchell to the effect that the attention of the President should be called to the desirability of appointing to the Supreme Court, whenever a vacancy shall occur, a judge familiar with mines and mining. It is to be hoped that such an appointment may be made, since many matters relating to mining come before this, our court of last resort.

PANAMA CANAL bonds showed unexpected market strength, the issue of last month selling at an average premium of 2.25, corresponding to an interest yield of 2.95 per cent. When this is compared with the 3.10 per cent of French *rentes*, and the 3.30 per cent of German Imperial threes, it would appear that the difference must be due to the market value of patriotism, for the security of the foreign issues is unchallenged.

FINAL DECISION has been rendered on the Cunningham coal lands in Alaska, the evidence clearly indicating that agreements had been entered into previous to making the entries. So the illegal segregation of public lands has been prevented. But this is merely a negative accomplishment: what is most needed is wise and energetic constructive legislation that will allow coal lands in Alaska to be developed promptly. The friends of Alaska have at times acted unwisely and frequently speak rashly, but their cause is just and a speedy remedy should be devised. Walter L. Fisher, Secretary of the Interior, has shown commendable insight in dealing with the situation so far, and an early solution of the Alaska coal problem will be anxiously awaited.

EUROPEAN methods of tunnel-driving, discussed by Mr. W. L. Saunders in a paper abstracted in this issue, have produced results superior to those in America. This is true despite the fact that in part the same machinery is used in both countries, and on some American work a number of experienced European workmen have been employed. Mr. Saunders attributes the result mainly to the greater discipline of the men, largely a result of the length of time that a particular crew work together in order to complete one of the great Alpine tunnels. Sending machines from the north to the south portal of the Loetschberg tunnel failed to affect the relative rate of progress. Bringing to the Cowenhoven at Aspen experienced foremen from the Arlberg, notably expedited matters. The man behind the drill is important, as is the drill. Any experienced engineer recognizes the importance of discipline in obtaining speed. How important this is was shown in the tunnel work on the Los Angeles aqueduct when, contrary to expectations, the cost per foot did not increase with progress into the mountain. The proficiency acquired by the men more than offset the increase in cost due to longer transportation of material. Careful training of men, keeping them interested and satisfied, so as to keep the same men at the same job, is the secret of success. Aside from that, however, the drill-carriage used at Loetschberg is worth imitating. Certainly remarkably speedy 'set-ups' were made possible by using it, and that in turn made it feasible to use short holes rather than the long ones standard in American practice. How far these methods may be adapted to advantage in America is not to be predicted offhand, but on any long tunnel when conditions approach those in the Alps, they should be given serious consideration, in spite of different labor conditions.

Local Sections of the American Institute of Mining Engineers

Officers of the American Institute of Mining Engineers recently have taken steps to secure the organization of sections wherever the membership and local interest seem to justify. This we believe to be an important move in the right direction. It is a waste of opportunity that the four thousand or more members of the Institute should have no means of increasing their mutual acquaintance other than semi-annual, none too well attended meetings, and no effective bond of union other than that of receiving the same technical literature. In San Francisco and its environs, there are about 120, and in California 300, members. These members had an opportunity, through the Institute, to meet in 1899, and will have another in 1911. The sessions held in the intervening years have necessarily been at a distance too great to afford any real or effective opportunity for California members to attend. The same situation, to only a little less striking degree, exists for members in Colorado, Montana, the Lake Superior district, and everywhere, in fact, except in and adjacent to New York City. Even there, there has not been that opportunity for frequent meeting, and for development of a real bond of union among members, that there must be if the Institute is to serve its highest purpose. A strong, healthy development of right ideals among mining men, can only flow from personal acquaintance and growth of mutual respect. The written or printed word, while reaching more people in less time, does not supplant entirely the influence of speech and personal contact. All of us, probably, have had the experience of misjudging a man known to us only from second-hand information. When we came to meet him, he proved to be quite a decent fellow after all, and ultimately we acquired a real confidence in his intentions and ability. It takes but a moment's consideration to perceive how greatly the effectiveness of an engineer is increased by the broadening of his acquaintance. To promote this is, in our opinion, one of the proper functions of a professional society.

It will be remembered that the disinclination of the officers of the Institute to organize local sections was one of the impelling causes of the formation of the Mining and Metallurgical Society, and no one who has attended a meeting of any of the sections of that society has failed to see the advantages of that form of organization. The Institute has a much larger list of members, and it includes, necessarily, a considerable number whose interest in mining is only secondary, but at the same time it does include practically all the active men in the profession, and in a large number of communities it affords splendid material for a local society. We present this week the rules under which sections may be formed. They are modeled after those of the American Institute of Electrical Engineers, which has been conspicuously successful in its solution of the problem of local sections. These rules provide for safeguarding the interests of the Institute in every proper manner and at the same time allow all proper latitude to the local organization. According to the constitution of the Institute, the latter can not "officially approve or disapprove any technical or scientific opinion or any proposed enterprise." This does not inhibit a local section, if it choose, from throwing its influence for or against legislation or other projects that may seem to it of sufficient concern. If the Section acts unwisely, or in such manner as to at any time compromise the Institute as a whole, the Council can at will withdraw its financial support and cancel the Section. This is as it should be. There has been entirely too much fear of taking a stand on public matters directly concerning mining and mining engineers, and it is desirable that in any instance the matter should be threshed out by those most intimately concerned. They, having a better acquaintance with the situation, are best qualified to act. The rule prohibiting the Institute itself from taking a stand is altogether wise, so long as the little interest in general meetings makes it necessary to provide that nine members shall constitute a quorum. A more lively concern with the work of the Institute is extremely desirable, and the Council has acted wisely in proposing to build it up on the broad basis of active interest, locally, among members.

Muntz Metal Plates

The valuable description of milling practice at the Komata Reefs mill which Mr. S. D. McMiken presents in this issue derives added interest from so closely following the description by Mr. C. A. Chase of the work at the Liberty Bell. Comparisons are always useful, and the divergent results obtained by the use of muntz metal plates at the two mills is an interesting minor matter. It may be urged that in the one mill crushing is carried on in cyanide solution, while water is used at the other; but there is no known reason why cyanide should have any such effect. Muntz metal is an intermetallic compound of copper and zinc. Both mercury and gold are soluble in copper, but neither is soluble in the copper-zinc compound; therefore, as Mr. McMiken observes, absorption of amalgam by the plates is very slight. Possibly the hardness of the plates, found objectionable at the Liberty Bell, is due to the fact that muntz metal can not hold so thick a film as a copper plate, an objection that is accentuated by the lack of absorption of gold into the plate. By far the best plate is one which is made of silvered copper, not scraped too closely during the clean-up. Muntz metal plates were first used in the Hauraki district because copper plates were not to be obtained locally, while muntz metal plates, intended for ship's sheathing, could be had in abundance. Though used successfully in New Zealand, they have found but little favor elsewhere. The cyanide process was first successfully applied at the nearby Crown Mines at Karangahake, and Mr. McMiken's description of the methods of work at the natal place of the Pachuca tank is full of interest.

Utah Copper and Its Critics

The conspicuous success of the Utah Copper Company in the development and exploitation of porphyry copper ore, makes the annual report of its affairs of more than ordinary interest. The magnitude and complexity of the financial as well as technical operations of the company have further attracted attention. One result has been an amount of criticism which, to our recollection, exceeds that heaped upon any other American mining company, and is only rivaled by the activities of the muckrakers in discussing Standard Oil or the 'Anthracite Trust'. As a result, it is difficult to get a fair estimate of the work now being done by the company and its officers. We present this week a rather long abstract from the annual report recently made public, and we regret that limitations of space prevent giving more detail. A perusal of this abstract, or better still a careful study of the original report, will, we believe, convince any competent and unbiased person that the affairs of the company are being well conducted, and that its officers have made an honest effort to present to stockholders and public the facts necessary for a correct appraisal of the property. If fault be found with the report it must be admitted that, as compared with the majority of those issued by American mining companies, it is conspicuously full and fair. It should be remembered that professional opinion as to what is desirable in a company report has been changing rapidly in recent years, and higher standards have been set. In the case of the present company, both its friends and its critics will agree that this is the fullest and most satisfactory report yet made public. In the face of the detail presented, only one with a bysmalithic prejudice will seem to discover a secret mass of corruption and persistent effort to deceive. Our fiery contemporary at Salt Lake City, is not, of course, satisfied; that is hardly to be expected, since with much energy, ability, and in general with good intentions, *Mines and Methods* has shown such prejudice toward the Utah Copper Company as to prevent its criticism being taken seriously. In commenting on the present report it has been attempted to show that approximately a half million tons has been milled but not accounted for. To our way of thinking, the laboriously discovered discrepancies in figures are the natural result of the fact that freight is paid on ore as mined, and mill recovery is figured on dry weights. Again, an elaborate argument is built up to prove that the company lost heavily by continuing underground mining, and then the use of steam-shovels is condemned. If this means anything, it logically follows that the company would have made the most money if it had not mined at all—a strange conclusion in view of the figures presented by the public accountants who had full access to the books of the company. Evidently our contemporary suffers a handicap in lacking data to prove its thesis; and just possibly the data do not exist. If *Mines and Methods* desires to do good work by drawing on esoteric information, we recommend an article or two on the re-location of phosphate claims by those who would maintain that a bed of oölite is a vein. For this friendly suggestion we expect to be roundly condemned, but, if so, we shall be members of a large and growing 'Ananias Club' that at least includes some interesting and respectable members.

Our New York contemporary, *The Engineering and Mining Journal*, which has acquired a part of the staff of *Mines and Methods*, if not of its prejudices, also criticizes the report. In part we agree. The company does not make any allowance for depreciation, despite the repeated recommendation of its accountants. Disregarding arguments that may be urged to the contrary, we believe it should do so. Here again, however, standards have been rapidly changing, and the management is not absolutely unreasonable in its contention that this provision can safely be made later. This does not rob the criticism of point, but this practice is too common a one to warrant any over-long sermon. The other criticism is directed toward the large increase in ore reserve reported as a result of additional development and recalculated within the year. As to this we have no information not available to others. We have never seen the drill records or the assay maps of the Utah Copper Company. We have, however, seen and studied those of the Chino Copper Company, which, as is well known, is under the same management and has a corps of engineers that has been largely recruited from the staff of the Utah Copper Company. Our impressions of the methods in use at Chino in calculating reserves are entirely favorable, and it is difficult to believe that the same men would adopt on another similar property methods open to serious criticism. As shown by Mr. Jackling's report, fairly complete data were available for making his estimates. The amount of driving and drilling done within the year, measured by the standards at any other mine, would be enormous, and when two formerly separate properties are consolidated it is usually possible with relatively little development to prove a large amount of intervening ground, because of the collating of information previously available only to the separate corps. The main element, however, is probably the lower percentage of copper required in ore as the scale of operations increases. Lowering a fraction of a per cent the grade that may be profitably worked, nearly always results in increasing the tonnage beyond all apparent proportion to the decrease in grade. This affords an easy explanation of the fact puzzling our contemporary, that the cross-section published in 1910 "should show so much greater depth of ore in certain drill-holes than the same holes showed in substantially the same section in 1909." This of course would not be true in estimating coal properties, with which *The Engineering and Mining Journal* is more familiar. To be specific, however, Mr. Jackling's report shows that the Utah Copper Company is now milling at a profit rock containing a percentage of copper below that which, when negotiations for consolidation of the Utah Copper Company and the Boston Consolidated were first undertaken, the consulting engineer would permit to be even discussed as probable ore. Conditions have changed materially in the last two years, and it is not surprising that some have difficulty in keeping up.

As every public speaker in California says of the Southern Pacific when he rises before an audience, 'We hold no brief' for the Utah Copper Company. We have frequently criticized it in the past, and will in the future when we see just cause; but we protest against an attitude on the part of technical journals that leads them into 'seeing things at night' whenever the name of a particular company is mentioned. The management of the Utah Copper Company has made mistakes. What engineer has not in rapidly building up a great enterprise? But large results have also been achieved, and Mr. D. C. Jackling, Mr. Robert C. Gemmel, and their associates, have pointed the way toward the utilization of enormous masses of rock formerly valueless. They are men having records of honorable achievement as engineers, and it is unwarranted to assume that possible stock-market manipulations of their business associates have led them into falsifying a plain statement of technical performance, and the criticism directed at the report means that, if it means anything.

Milling Practice at the Komata Reefs Mine

By S. D. McMiken

The Komata Reefs mine is situated on the Hauraki peninsula of the North island, New Zealand, shown on the accompanying map. When this mine was first worked, dry crushing with stamps, followed by cyanide treatment, was considered the correct method of treating the gold and silver ores of this field. Accordingly, a dry-crushing plant was built, but it was soon found that this method was not suited to the ore and was far too expensive to warrant its continuance. A change to wet crushing, with subsequent treatment of the pulp by cyanide, proved to be advantageous, and all the subsequent improvements in the milling and treatment of ore have been along the line of wet crushing. The extraction during the dry-crushing period was not high compared with the results obtained with the present method of treatment, although the ore milled during the dry-crushing period was worth more than the ore milled during the period covered by the present practice, the ore at that time being 'selected,' to cover the extra expense involved by the dry-crushing process.

SCREEN TESTS OF ORE

Percentage on	40 mesh.	60 mesh.	90 mesh.	200 mesh.	Through 200 mesh.
Ore from stamps..	38.7	12.0	16.5	14.8	18.0
Ore after mills....	nil	1.0	22.0	25.9	51.1
Sand in vats......	nil	1.3	23.6	35.0	40.1

EXTRACTION

	Value of tailing.		Percentage.		
	s.	d.	Gold.	Silver.	Value.
Amalgamation on plates..			42.0	5.6	38.0
Sand, by cyanidation....	2	2	94.2	85.6	93.0
Slime, by cyanidation....	0	8	96.5	91.9	95.6
Total, by amalgamation and cyanidation.......	1	5	97.1	89.2	96.4

The following definitions are given, for the sake of clearness: 'Slime' is that product, clayey in nature, but with some fine sand, all of which will pass a 200-mesh screen. 'Fine sand' will pass 100 mesh, but remain on 200 mesh. 'Medium sand' is finer than 60 mesh, remaining on 100 mesh. 'Fine' is all pulp, both sand and slime, ground fine enough for cyanide treatment. 'Middle' is sand which has passed through the tube-mills, but is not yet ground fine enough for cyanide treatment. 'Coarse' is the pulp as it issues from the stamp screens, crushed through a woven-wire screen, 4.5 meshes per linear inch. 'Sand residue' is the sand treated by percolation and sluiced into creek, containing a small amount of unrecovered dissolved metal. Cyanide strengths are in terms of potassium cyanide, although sodium cyanide, 130% KCN, is used in the plant. The short ton of 2000 lb. is used throughout. The assay value is based on gold at 84s. 9d. per ounce, and silver at 2 shillings.

Nearly all the ore now mined is unoxidized, being obtained from between the 400 and 700-ft. levels. The gold and silver occurs in a quartz gangue, mixed with calcite; in places associated with sulphides of iron and copper, and carrying a proportion of about 5 of silver to 1 of gold. In places, manganese silicate occurs, and native quicksilver has been found. The proportion of sulphides, however, is not great enough to warrant the use of concentration in the mill, and the process is accordingly simplified. The ore does not readily decompose; after six months exposure to the air, it shows only a faint acid reaction, and is in every way amenable to treatment by the cyanide process. The country rock, a highly silicified andesite, is much mixed with the vein material, and as a large quantity of this hard rock has to be crushed along with the softer ore, the duty per stamp is lessened considerably.

The ore from the mine is tipped over a grizzly placed on the main mine hopper. This grizzly is made of feather-edged steel bars, and is 15 ft. long by 3½ wide, the bars being placed 1½ in. apart. The main hopper is divided into two compartments, one for the material that passes through the grizzly, and the other for the coarse lumps of ore. The portion that passes through the bars is about 40% of the total. The two sizes are then trammed to the mill, a distance of three-fourths of a mile, in 4-ton cars. The coarse size is tipped into a hopper situated above the crushers and the small size is tipped directly into the main storage hopper of the battery, where it mixes with the material from the rock-breakers, of which there are two of the Blake type, 12 by 8 in., placed directly above the main storage hopper and crushing to 1½-in. ring.

One man looks after both machines, keeping them fed with ore, as well as attending to the friction hoist used for handling the four-ton cars up a small incline to the top of the mill. The ore is then fed by automatic feeders to four batteries of five stamps each, crushing in water through a steel woven-wire screen of 4½ holes to the linear inch. From the batteries, the coarse pulp flows to two tube-mills, thence to an elevator-wheel which raises the pulp to a separating-box where the fine overflows and passes to the amalgamating plates, and the middle is returned to the tube-mills for further grinding. From the plates, the fine passes to another elevator-wheel which raises the pulp to the spitzkasten, where the sand is separated from the slime. The sand is run into the percolation vats, which are furnished with radial distributors of special design, and after treatment by cyanide solution, is discharged into a creek near the plant, the gold-bearing solution being led to precipitation-boxes filled with zinc shavings, and then into the usual storage sumps. The slime from the spitzkasten is run into a settling vat provided with a continuous discharge at the bottom, limewater being added, and is there thickened to about 40% water, and then pumped into Brown & McMiken tanks (Pachuca), where cyanide solution is added, and agitation maintained until the gold and silver has practically all gone into solution. The slime is then pumped into another settling-vat, similar in design to the one already mentioned, and here another thickening takes place, reducing the percentage of moisture to about 45. The solution which is decanted off the settler is run into a vat provided with a sand filter-bottom, and thence to the precipitation boxes. The thickened slime is then pumped from the discharge of the settler to a Moore filter of special design, where the slime is formed into cakes and washed thoroughly, the residue being finally sluiced into the creek. The precipitate from the zinc-boxes is removed during the monthly clean-up, and is treated with sulphuric acid, washed, dried, and fluxed with borax glass in plumbago crucibles, heated in gasoline furnaces of patent design. The resulting bullion is shipped to London and sold at market rates. The amalgam from the plates is retorted, melted, and sold to the local bank in preference to shipping it.

KOMATA REEFS MILL.

TURN-OVER FILTER AT KOMATA REEFS.

ELEVATION OF B. & M. TANKS.

B. & M. TANKS AT KOMATA REEFS.

The crushing machinery consists of 20 stamps arranged in four batteries of five stamps each, ten stamps to each cam-shaft. The batteries are set on Kauri wood blocks of ample size, which rest on a concrete foundation, giving a firm and satisfactory crushing base. The frame is of the front-knee pattern, strongly braced, and giving little vibration. Each mortar-box weighs three tons and is of the single-discharge type, fitted with back and end liners of hard cast iron. The boxes are bolted down to the wooden blocks with eight 2-in. bolts, a single sheet of rubber packing ¼ in. thick being placed between the wood and the mortar. The weight of a stamp complete with new shoe is, stem 480 lb., head 320, tappet 130, shoe 170, total 1100 lb. The average working weight is about 1030 lb. A system of using the shoes and dies, when half worn out, has been in vogue for over eight years and has effected a great saving. No dies are ever bought, the half-worn shoe being turned upside down and the neck placed in a special casting in the bottom of the mortar-box. This allows the shoe to be worn down to within ½ in. of the neck, when it is pried out and another shoe inserted. Solid cast-iron guides are used, and have given no trouble for years. They are preferable to wooden, or babbitted guides. The tappets are of the 3-key type and seldom slip. Finger props are used to hang up the stamps when required. The usual drop is 6½ in., and the speed is 100 drops per minute, the ore being fed into the mortar by means of an improved Challenge feeder of the rotary table type, a special pawl motion being used in preference to the ordinary 'frying-pan' variety. Both cam-shafts are 6 in. diam. and each carry ten cams of the Blanton type. These cams are preferable to the old double-keyed kind, which give much trouble when they get loose on the shaft. The cam-pulley is also fitted with the Blanton wedge-piece, and never gets loose. Various kinds of screens have been tried, including punched and slotted screens; after exhaustive tests, the steel woven-wire screen has been found to give the best results as regards efficiency and cost. The kind now used is made to order in America, and is very good, a set of screens having lasted nine weeks. The ore is crushed through a woven-wire screen of 4½ holes to the linear inch, the thickness of the wire being 20-gauge. The discharge is kept about 4 in. above the dies, and about ten tons of water per ton of ore is used in crushing. The duty per stamp is five tons per day of 24 hours, and the horse-power used 48, including friction. Exhaustive trials of various makes of shoes, steel and iron, have been made, and the best, from a commercial point of view, is a shoe made of a special mixture of hard white iron manufactured by a local foundry. The consumption of iron, in shoes, per ton of ore crushed is 0.67 lb. The coarse pulp from the stamps is delivered into a steel launder running the full length of batteries, and immediately in front of the mortar-boxes. This launder is set with a grade of 1 in 12 in order to conduct the coarse product of the stamps to the tube-mills, at a lower level. This launder is divided into two sections just before reaching the tube-mills, so that each mill gets an equal quantity of pulp to grind (see grade of pulp in tables). The power used by the battery is furnished by a 6-ft. Pelton wheel, working under a head of 170 ft., and two single-cylinder condensing engines, supplied by two locomotive-type boilers, coal-fired. In winter, the water-power amounts to about 80 hp., but in summer the whole battery is run by steam. It requires about 140 hp. to run the whole plant.

Grinding is accomplished in two tube-mills, one of which is 16 ft. long by 4 ft. diam., and the other is 15 ft. long by 4 ft. 4 in. diam. The former was the first steel-shell tube-mill made in New Zealand for grinding battery pulp. It is furnished with spur gearing and runs on trunnions. The second mill was made out of a 'White' rotary dryer, cast-iron shell, running on trunnions. At first, this mill was run on friction rollers, but as these proved unsatisfactory, end trunnions were substituted, and there has been no trouble since. Both of these mills are lined with Brown's patent liner, which consists of a liner of hard cast iron, with ribs bolted over it; they last 22 months, grinding 28,500 tons of hard quartz, during the life of a set. The consumption of iron is 0.48 lb. per ton of ore ground to a finished product, 50% of which will pass a 200-mesh screen. This lining has been adopted by most of the mining companies in this field, in preference to all others, and will probably supersede all others in countries where fine-grinding in tube-mills is in vogue.

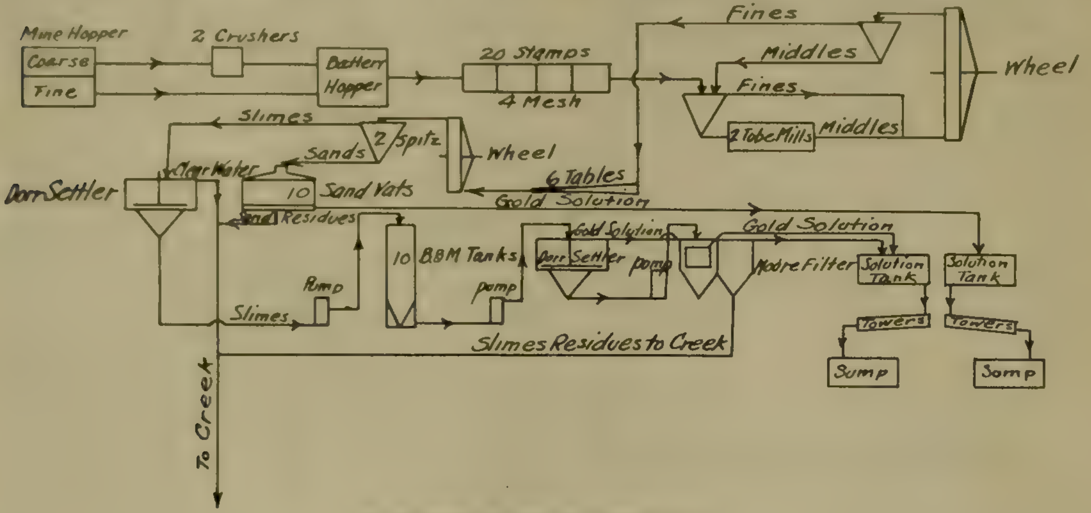
Each mill is fed from a pointed box, 3 ft. deep and 3 ft. square at top, by means of a pipe $1\frac{1}{2}$ in. diam. projecting into the trunnion of the mill. The size of this box is so adjusted that a large proportion of the water together with some slime is allowed to run off the top into a launder, so that the product issuing from the pipe is about $1\frac{1}{4}$ parts water to 1 part ore, by weight. It has been found that this proportion is the best for grinding our ore in tube-mills. The 16 by 4-ft. mill revolves at 29 revolutions per minute, and the 15 by 4 ft. 4 in. at 28 revolutions, according to the formula $R = \frac{200}{\sqrt{D}}$, where R equals revolutions per minute and D equals interior diameter of mill in inches. This speed has been found to give the best results, and the formula is recommended to users of tube-mills. The flints used are French flints about the size of a hen's egg. Larger and smaller flints have been tried, but this size gives the best results. Selected pieces of hard quartz were also tried but proved unsuitable. The charge used in the mills is such that the level of the pebbles is just even with the lower edge of the discharge orifice, which in this case is 8 in. diam. and is furnished with a screen of three holes per linear inch, in order to prevent the flints from escaping with the ground material. The wear of flints per ton crushed through stamps is 2.2 lb. Each mill takes 25 hp. when running at the above speed, and there are practically no repairs, other than renewing the lining and replenishing the supply of flints. Each mill is furnished with a Heywood & Bridge friction clutch, which is much better than fast-and-loose pulleys. At this battery, these two mills have been running for years, and the trunnion bearings are as good as when first put in, the original babbitt metal being still there. The whole of the floor under the tube-mills is finished in concrete, and a gutter leads into a small sump in order that any spilt sand may be picked up. From the discharge end of the tube-mills a steel-lined wooden launder conveys the middle, fine, and overflow from the tube-mill feed-boxes to an elevator-wheel, 18 ft. diam., which lifts the pulp to a pointed box furnished with a 3-in. discharge cock at the bottom, and an upward current of water. This box serves to separate the material that is ground fine enough for treatment, from the coarser product, which issues from the 3-in. discharge and is returned to the tube-mills for further grinding. The product which is too coarse for treatment is thus returned again and again to the mills until ground fine enough for treatment by the cyanide process. The elevator-wheel is built of wood and iron, the spokes and rim of wood, and the hub and buckets of iron. This wheel works well and has given no trouble since it was built, five years ago. (See grade of pulp after mills.)

From the overflow of the separating-box, the fine pulp flows in a wide launder to the amalgamating room. During its passage along this launder the pulp is automatically sampled in duplicate, and these samples taken daily for assay. The amalgamating room is situated some distance from the stamps and is built upon the solid ground, hence there is an entire absence of vibration. The floor is cemented throughout, and is given a fall to one side, 1 ft. in 15 ft. This allows all spilt material to run into the main pulp launder from the tables, the launder being situated underneath the edge of the floor. There are six amalgamating plates of muntz metal, 10 by 5 ft.; copper plates were tried years ago, but were afterward replaced by plates of muntz metal, which are more easily kept in order and save a higher percentage. There is practically no absorption of gold, and consequently very little value is locked up in the plates. A little dilute sulphuric acid is rubbed on the plates now and again; outside of this nothing is done to them beyond adding mercury as required. A device for turning the flow of pulp off the plates, one at a time, when cleaning up, is used, and the diverted pulp is returned to the elevator-wheel. There are two riffles at the bottom of each plate, as well as a mercury trap to each, and finally there is a large mercury trap in the main launder carrying the pulp away from the plates to the second elevator-wheel. The recovery by amalgamation is 38% of the total value. The plate room is under lock and key, and is only entered by the amalgamator when necessary.

The pulp from the tables is lifted by a wheel, similar to the one described, to a height of 16 ft., and delivered into a steel spitzkasten, furnished with an upward current of water, and a 2-in. discharge cock at the bottom. The spitzkasten is 4 ft. square and the sides slope at on angle of 60°; the overflow passes to a second one, 6 ft. square with similar sloping sides, also provided with a 2-in. discharge and upward current of water. This water supply is kept at a constant head of 40 ft. above the 'spitz.' This arrangement has been found to give the best results for separating the sand from the slime. The product issuing from the bottom of each 'spitz' is allowed to mix in a common launder and flow to the sand-treatment plant, while the overflow from the second 'spitz' goes to the slime-treatment plant.

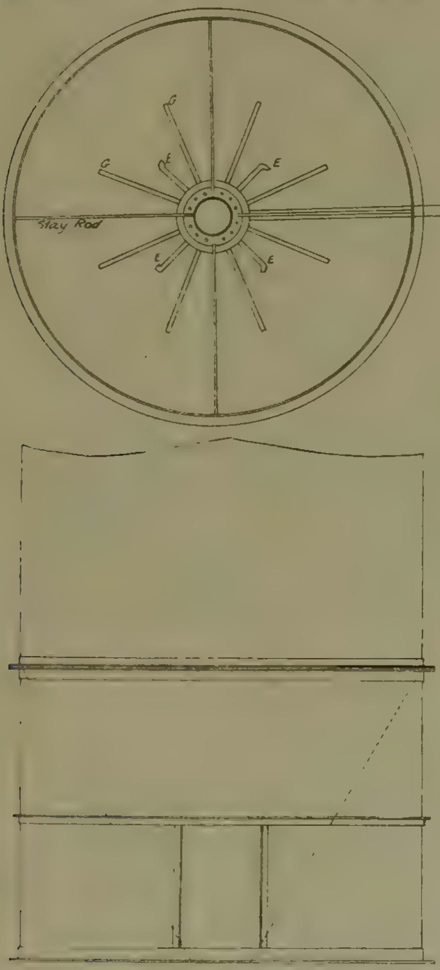
All the separated sand is conveyed to the sand vats, nine in number. These are built of steel, and are 22 ft. diam. by 8 ft. deep. Each of these vats is fitted with a filter-bottom, consisting of half-round slats of wood, 1 in. wide and 1 in. apart, supported on 4 by 1-in. wooden laths on their edge, and over the slats is stretched a filter-cloth of ordinary jute sacking. This cloth is firmly fixed all round the edge of the vat by means of $\frac{1}{2}$-in. diam. rope, caulked into a groove. These cloths last about three years, are very cheap, and easily put in place. Each vat is furnished with a distributor consisting of a wooden launder divided into four divisions, discharging at different peripheral points, the feed being at the centre, and the whole apparatus revolving on a central spindle by the force of the sand and water leaving the curved ends of the divisions. This distributor fills the vat evenly, little shoveling being required to level the top of the charge, previous to treatment by cyanide. The surplus water is taken away from the centre of the vat, and conveyed to a pointed box, 12 ft. square and 12 ft. deep, where lime-water is added, and the fine sand which has escaped from the vat is settled and pumped back to the launder which conveys the slime to the slime-treatment plant. The usual charge for a vat is 80 tons of sand, the grade of which is given in tables. The sand is allowed to drain as dry as possible, assisted by a small vacuum pump, if necessary, and is then sampled by boring holes with a special sampling auger, the holes being bored to a depth of 6 ft. This sample is taken in duplicate, and assayed in duplicate, and the result recorded. The amount of moisture left in the sand before treatment by cyanide is usually about 14 to 15 per cent.

A wash of 20 tons of cyanide solution of 0.05% KCN is then run on the top of the charge, and percolation started. This wash serves to pave the way for the strong solution, and it is percolated rapidly through the charge, passed through a zinc precipitating box, and into a weak sump, where the solution is sampled, and if the assays show no value, the solution is thrown away, as it is too weak to be of any further use. The first wash dissolves very little of the gold and silver, but is useful in reducing the consumption of cyanide when the strong solution is put on. The first wash is allowed to drain off, and then 20 tons of solution at 0.8% is run on the charge and percolation continued. As soon as the whole charge is saturated with the strong solution, and there is still about four inches of solution on top of the charge, percolation to the precipitation-boxes is stopped, and the solution is pumped back to the top of the charge by means of an adaption of the well known air-lift, one to each vat. The strong solution is thus kept circulating for eight days without leaving the vat, and is thoroughly aerated at the same time. Caustic soda is added to the strong solution, in order to provide sufficient protective alkalinity (Clennell's method of estimation being used), and a considerable saving in cyanide is effected by its use. The strong solution is then allowed to percolate from the vat into the strong-solution zinc-boxes, and thence into the strong-solution storage-sump. When the strong solution leaves the top of the charge dry, weak solution of 0.08% is pumped on, and about 200 tons of this weak wash is passed through the charge, the weak solution being passed to the weak-solution zinc-boxes, of which there are two, and thence into the weak-solution storage-sump. Finally, a water-wash of about 10 tons is put on the charge, and percolated through a separate wash-solution zinc-box, into a last wash-sump. The time taken by the washes is generally about 14 days, and after all the final wash has drained off, a door in the bottom of the vat is opened and the whole charge of sand is sluiced out, by water under a pressure of 65 lb. per square inch, into the creek. The cloth is swept clean with a coarse broom, the door put on again, and the vat filled with water ready for a fresh charge. It has been found beneficial to fill the vat with water, so that the overflow takes place as soon as filling starts. This prevents an undue settlement of fine material on the cloth, which, if allowed, would hinder the rate of percolation.



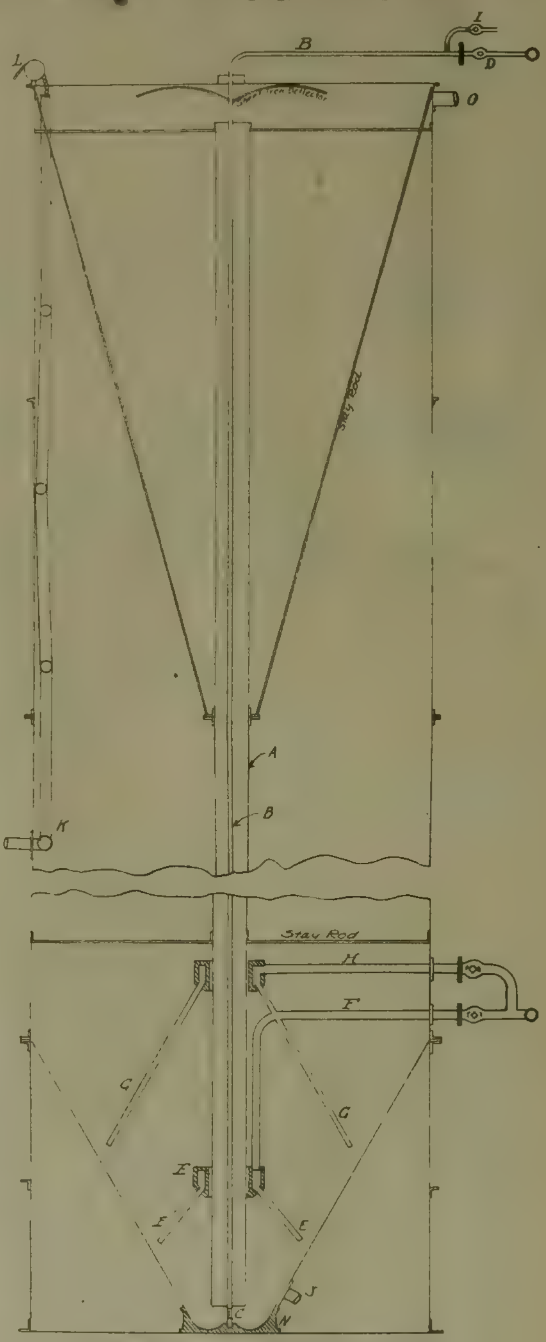
FLOW-SHEET OF KOMATA REEFS MILL.

The slime and fine sand passing 200 mesh, from the overflow of the second spitzkasten, is conveyed by launder to a mechanically operated settler provided with overflow launder at top. This settler consists of a steel vat 22 ft. diam. by 8 ft. deep, with conical bottom. Lime-water is added to the slime as it passes along the launder to this settler, and the slime settles very rapidly, the overflow being quite clear. The lime is fed automatically into a mixer at the average rate of 20 lb. per ton of dry slime, but there is a controlling device whereby from 1 to 50 lb. per ton can be fed as required. The thickened slime flows from the bottom discharge of the settler continuously, and contains an average moisture content of 40% water. This thick slime is piped a short distance to a double-plunger outside-packed pump, each plunger of which is 6 in. diam. by 15-in. stroke, geared, with cast iron mushroom valves. The wear and tear on valves and plunger is not great, the plungers being renewed every eight or nine months, and the valves every four or five months. By means of this pump the slime is elevated through a 3-in. pipe to the Brown & McMiken patent air-agitation tanks (Pachuca), of which there are ten, each 38 ft. high by 10 ft. diam., built of steel, with a cone of 55° pitch, and furnished with the usual air-lift and pipes. These agitators were first used at this (Komata Reefs) mill, but their use has extended all over the metallurgical world, as they are the most economical and efficient agitators yet invented. The cost of upkeep of these agitators is very low, as they only require a new 'nozzle' valve on the pipes now and then, and only 8 hp. is required for the whole ten, using compressed air at 22 lb. per square inch. No trouble is experienced in keeping the charge agitated while filling or emptying the tanks, and there is no accumulation of heavy material on the conical bottom. The slime is diluted by adding cyanide solution in such quantity that the total solution and moisture represents 65% of the whole. Each tank holds 40 tons of dry slime. The cyanide solution is put on at 0.1% strength, and agitation is kept up for seven or eight days, when all the metals are in solution. The slime is then pumped by another plunger pump to a second settler. Here the slime is thickened to 45% moisture, the cyanide solution continuously decanting into a sand filter. This sand filter is a steel vat, 22 ft. diam. by 4 ft. deep, furnished with a lath bottom supporting hessian cloth, which is covered with a layer of battery sand, about 4 in. deep. The solution percolates through this layer of sand, which clarifies it, and passes to the slime-solution zinc-boxes, of which there are two, and thence into the slime-solution sump. The thickened slime from the second settler is then pumped by means of a plunger-pump into the slime-tank of a modified type of Moore filter. This type, termed the turnover filter, was first used in this mill, being designed by me in 1906. It has proved to be economical in working cost as well as being cheap to install. The filter consists of ten cells, each 7 ft. square, formed by placing sheets of V-shaped corrugated iron inside a frame of 6 by 3-in. timbers, grooved on the inside to receive the edges and ends of the corrugated iron, the whole being covered with 8-oz. duck, fastened to the frame by means of slats nailed over the duck. A corner of each frame is bolted to a Y-shaped arm of cast iron, which is keyed to a shaft which forms the pivot on which the filter turns over.



BROWN & McMIKEN TANK (PACHUCA).

The inside of each cell is connected to a 2-in. header pipe by means of a flexible piece of suction hose and union joint, the 2 in. header pipe being in turn connected, by a piece of suction hose, to the pipe leading to the vacuum pump. The filter contains an area of 800 sq. ft. of filtering-surface, and is capable of treating efficiently 50 tons per day of 24 hours. The filter is lifted by a worm-geared hoist which allows the filter to be suspended in any position required, the discharging platform being lifted by a second drum on the same hoist. The washed slime-cakes are dropped into a mixer, where water is added and the whole mixed up into a slime again and run into the creek. In practice, a cake 1¼ in. thick is built up in about 30 min., under a vacuum of 24 to 26 in., produced by a Tangye belt-driven pump, 6 in. diam. by 12-in. stroke, which delivers the solution into another sand filter, similar to the one already described, and thence into the zinc-boxes. When the filter cells are immersed in the wash-tank, the solution is pumped direct to the wash-solution zinc-boxes, and flows back again to the wash-tank, thus maintaining an even quantity of solution in the wash-tank. This wash solution is generally about 0.03% strength. The cakes are dried as much as possible before being discharged, and they retain 25% moisture. The cycle of operations, namely, forming cake, washing, and discharging, takes 1¼ hours.

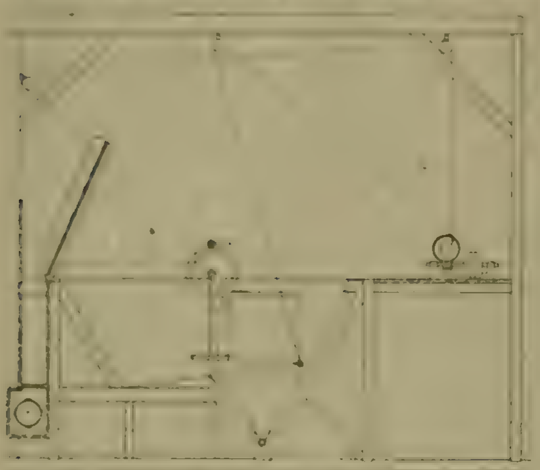


BROWN & McMIKEN TANK (PACHUCA).

The precipitation room is 42 ft. long by 22 ft. wide, and the windows are all securely barred; one wall is fitted with openings, so that the interior of the room is always under observation. The floor is concrete, finished with neat cement, and provided with gutters to convey any spilt material to a small sump. In one corner, a reinforced concrete strong-room contains a large Milner safe, for the safe-keeping of amalgam and bullion.

The zinc precipitation-boxes, nine in number, are all the same size, namely, 14 ft. long, divided into 10 compartments, 2 by 2 by 1½ ft., fitted with 4-mesh screen false bot tom, to allow the precipitate to accumulate between the screen and the bottom compartment. Each compartment is fitted with a 2-in. wooden plug, inserted in a hole in one corner to facilitate cleaning up, and each box has a launder running the full length of box, to convey the precipitate to a clean-up vat, 4 ft. square by 2 ft. deep. This vat is furnished with a filter cloth on the bottom, and the space beneath the cloth is connected by a pipe to a steel receiver 10 by 3 ft., which is again connected to a small vacuum pump, 6 in. diam. by 9 in. stroke. The solution from the sand and slime treatment is run through the zinc boxes, and into the various sumps, of which there are five, each capable of holding 10 tons of solution. The zinc shaving used is cut at a local foundry, and is dipped in a solution of acetate of lead before being placed in the boxes. Acetate of lead has been found to improve the precipitation when dealing with weak and foul solutions, and, as a rule, the solutions leaving the zinc boxes rarely assay more than 1d. per ton.

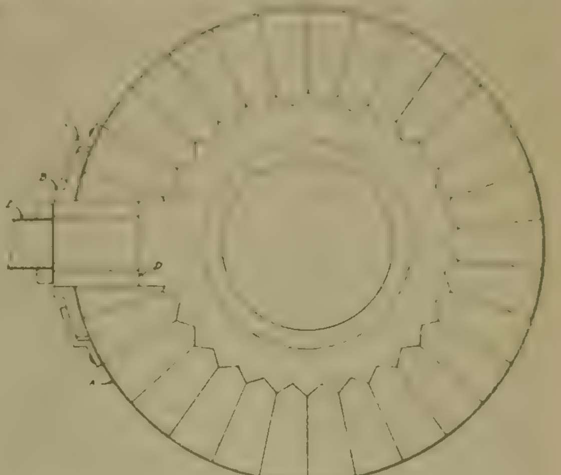
A clean-up is made every four weeks, and the method is as follows: The solution flowing through a box having been shut off, the coarse zinc is shaken and washed in the first, or top cell, and then taken out and placed on a tray. The plug in the bottom of the cell is then removed and the broken zinc, slime, and solution, are run into the clean-up vat, the cell is then sluiced out with a few quarts of solution from one of the other cells, and the plug replaced. The coarse zinc on the tray is replaced in the cell just emptied, and the coarse zinc in the next cell washed and placed with it. The same procedure is adopted with each of the cells in the box, and when all are replenished with zinc shaving, the solution is turned on again, and precipitation proceeds as before. All the time that the slime and short-zinc are running into the clean-up vat a vacuum-pump is taking away the solution and leaving the mixture of short-zinc and bullion slime on the filter-cloth. When fairly dry, a water-wash is put on the filter, and when again dry, the mixture is shoveled into a circular wooden vat, 6 ft. diam. by 2 ft. deep, furnished with stirring gear. A weak solution of sulphuric acid, 10 parts water to 1 part acid, is run on the slime, and the whole stirred until all the short-zinc is dissolved. The whole of the content of the acid vat is then transferred to a second vacuum-filter box, where several water-washes are added, and all the zinc sulphate washed out of the precipitate. The slime is then placed on thin iron trays, 3 ft. square, and taken to the melting-room.



TURN-OVER VACUUM FILTER, KOMATA REEFS.

The melting-room is detached from the main mill building, as the insurance companies do not permit the use of gasoline as a fuel inside insured premises. It is a room 30 by 20 ft., built of iron and wood, with a concrete floor, and ample provision is made for carrying off the gases. The trays of precipitate from the vacuum filter are placed in a drying-furnace made of sheet iron. This furnace is 6 ft. high by 3½ ft. square, and has three openings or shelves for receiving the trays of precipitate; the fire is placed on a grate near the bottom of the furnace, and the flame travels in a zig-zag manner under and over the shelves and escapes into a flue at the top of the furnace. This furnace will dry over 800 lb. of precipitate in 8 hours, wood being used as fuel.

The dried slime is then transferred to a rotary tubular screen, half filled with flints, and there reduced to a fine powder and mixed with borax glass in the proportion of 5 parts slime to 1 part borax glass. The mixture is melted down in plumbago crucibles (Morgan's No. 70), the pots being placed in specially designed furnaces, benzine being used as fuel. The benzine is stored in a tank of 50 cu. ft. capacity, placed on the hillside 70 ft. above the melting room, and conveyed to the melting room by means of ½ in. diam. galvanized pipe. Four furnaces of special shape, designed by me, are used for melting the slime and the resulting bullion is over 900 fine, the proportion of gold to silver being generally about 1 to 8. The bars of bullion are dipped in powdered nitre in order to clean the outside of the bars, and are then polished with a scratch-brush, sampled, and sent to the local bank for shipment. The slag is very clean and is crushed by a single stamp to recover any 'shots' of bullion that may be retained. The crushed slag is re-melted periodically, and the final slag rarely assays more than £4 per ton. The amalgam from the plates is retorted in a horizontal retort, fitted with trays, and the retorted metal is melted down and cast into bars of suitable size and sold to the local bank. The fineness of the bars is about 900, the gold fineness being 600 and the silver 300. The cost of melting is 1.34d. per ounce.



BULLION FURNACE, KOMATA REEFS.

The assay plant is situated a short distance from the mill; the building consists of a sampling room, furnace room, balance room, chemical laboratory, and store-room. The sampling room is furnished with the usual sampling and quartering apparatus, a drying oven is used for drying the samples and evaporating solutions, and there is a sample crusher and grinder driven by a small Pelton wheel. Gasoline furnaces are used, both for fluxing and cupelling. These are made on the premises, and are of better shape than the imported furnaces; they are made by mixing broken crucibles and fire-clay together and ramming into a thin iron frame. After being allowed to dry for some days, they are finally baked into a hard brick. Gasoline under a head of 70 ft., is used in 'Cary' burners; a 1½-in. burner is used for the fluxing furnace. The chemical room is fitted with all the appliances for analysis, testing of ores by cyanide, and other processes, electrolytic experiments, etc., and has in addition to these, a small tube-mill, and four air-agitation tanks, each 18 in. high by 5 in. diam. There is also a small filter in conjunction with this plant, and we are thus enabled to make tests on ore on exactly the same lines as in a working plant.

Oklahoma Metalliferous Minerals

By Charles N. Gould

Oklahoma is extremely rich in mineral products. The chief mineral wealth of the State consists, however, in its non-metalliferous minerals. Of these, the most important are the fuels, including coal, oil, and gas; structural materials including various kinds of building stone, as well as clays, shales, gypsum, and asphalt; and such minerals as salt and others of minor importance. The principal metalliferous minerals known to exist in profitable quantities in Oklahoma are lead, zinc, and iron. Copper, gold, and silver occur also, but, so far as known, not in quantities to justify development.

Lead and zinc occur in two widely separated regions in the State; namely, in the northeastern counties, and in the Arbuckle mountains. In northeastern Oklahoma these metals occur in the same rocks as in the Joplin region, this being the southwestern extension of the Ozark uplift. Small quantities of these metals have been found in Ottawa, Delaware, Adair, Cherokee, and Mayes counties. The chief development has been in the northeastern part of Ottawa county, where there are three well developed camps, known as the Miami, Peoria, and Quapaw. The first mining in this region was done about 1890. At the present time Miami is the most flourishing camp.

In the Miami region the geology is comparatively simple. The surface rock is a black, carbonaceous shale, belonging to the Cherokee formation, and is of Pennsylvanian age. Below this shale there are the sandstones, limestones, and shales of the Chester group. Beneath the Chester group is found the Boone chert. Throughout the productive lead and zinc area a large part of the limestone of the Chester has been removed, probably by underground solution, allowing the insoluble sandstone to settle down on the Boone. In this process of settling, the sandstone has been fractured and broken into angular fragments forming often a brecciated mass. The underground waters carrying the ores in solution have circulated freely in this breccia, and in so doing the ore has been deposited, filling the cracks and crevices and cementing the breccia into a solid mass. Most of the ore so far mined in the district occurs in this manner. There are two other modes of occurrence of the ore in the district; first, as an impregnation of the sandstone itself, and second, as a pure ore mass filling small solution cavities in the limestone. The latter mode of occurrence is relatively rare.

Among the minerals found associated with the orebodies the most important and troublesome to the miners is marcasite. This mineral, being nearly as heavy as the sphalerite, makes separation by jigging difficult, and therefore lowers the grade of the ore, there being a penalty of $1 per unit for iron. Much heavy oil, or bitumen, is found impregnating the rock and the crevices in the same manner as the ore. This oil is also a source of trouble to the miners, as it tends to agglomerate the crushed ore in the jigs, and prevents ready separation. Little or no calcite ('tiff') or dolomite ('spar'), which are so common in the Joplin region, are found with the Miami ores. The ores mined are practically all sphalerite and galena. There is but an insignificant amount of silica or carbonate ore.

The ores are easily mined, and only the most simple methods are employed in raising and separating them from the gangue minerals. The ore is broken by dynamite, and hoisted to the surface in buckets operated by donkey engines. This material is then crushed and the ore separated from the gangue minerals by the use of jigs. This separation is easily effected, owing to the wide difference in the specific gravity of galena and that of the gangue minerals. During the past two years, development has steadily increased, until now there are 25 mines in operation. The production for 1910 was approximately $700,000. The greater part of the zinc concentrate is smelted in Iola, Kansas, and Bartlesville, Oklahoma. Within the past few months there has been considerable prospecting outside the developed field, and there is little reason to doubt that more extensive deposits will eventually come to light.

For a number of years there has been much prospecting for lead and zinc in the Arbuckle mountains of southern Oklahoma, and much time and money has been spent in the attempt to find deposits of value. At the present time there is considerable activity in two localities, near Davis and Ravia, where lead and zinc are reported to occur. A number of carloads of ore have been shipped from Davis to the smelters at Bartlesville, and some of these shipments have proved profitable. Practically all the ore so far obtained in the Arbuckle mountains comes from within a few feet of the surface. A number of shafts, which have reached a depth of 50 ft. or more, have discovered little of value. It is unwise, at the present time, to predict what the future of this region will be.

There are three regions in Oklahoma where considerable deposits of iron ore have been reported, and which may possibly repay investigation; namely, the Wichita mountains, the Arbuckle mountains, and a locality near McAlester. Considerable deposits of high-grade iron ore, chiefly magnetite, occur in the Wichita mountains. Large boulders of this ore are scattered over the surface in several localities, particularly in a region 10 to 15 miles northeast of Mountain Park. No systematic surveys of these deposits have been made, and until this is done there is no way of arriving at an estimate of their value.

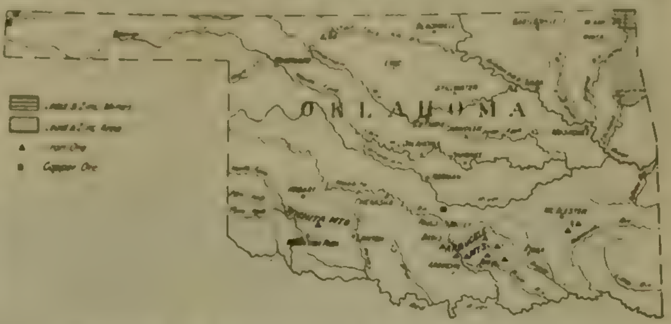
In the Arbuckle mountains there are extensive bodies of iron ore. All these deposits occurred originally in the form of pockets in the limestone. In some cases the ore is still imbedded in the rock, while in other localities the limestone, which is more soluble than the iron ore, has been removed, thus leaving the boulders of iron scattered over the surface. There are dozens of localities in the mountains where there are quantities of the massive black boulders, sometimes as much as ten feet in height. Cases of this kind occur near Davis, Roff, Bromide, Mill Creek, Hunton, Ravia, and Franks. This ore is usually of high grade, some of it being manganese-iron ore, which commands a high price. Shipments of the ore have been made from near Hunton and Mill Creek.

For several years there have been persistent rumors that large deposits of iron ore are to be found in the mountains south of McAlester. It has been stated, on what seems to be good authority, that mining engineers have examined these deposits in the interest of corporations and have made extremely favorable reports. Specimens which I have examined, said to have been obtained from these localities, appear to be rather low-grade iron ore. It is quite probable that the visible iron ore, scattered over the hills in widely separated areas in Oklahoma, aggregates several millions of tons. The greater part of it is in localities difficult of access. With good transportation facilities and the increasing demand for iron ore, it should be a question of but a short time until the Oklahoma ores are developed. Fortunately, both fuel and limestone for flux are abundant near McAlester and the Arbuckle mountains. If iron ore proves to be present in quantities sufficient to justify development, there will be no lack of fuel with which to smelt it.

Copper is widely distributed among the rocks of Oklahoma. There is hardly a county from which it has not been reported. In practically every instance, however, it has been found in such small quantities that it is not of commercial importance. In most cases nothing has been found but the greenish copper stain, but in a number of instances, near Perry, Noble county, and Winnview, Blaine county, for example, small nuggets of native copper the size of a hazelnut occur, scattered through the reddish clay-shale. In some instances tunnels have been driven into the red clay banks for as much as fifty feet, and several gallons of these small copper nuggets have been secured. In no case, however, has the amount of mineral obtained justified the expenditure.

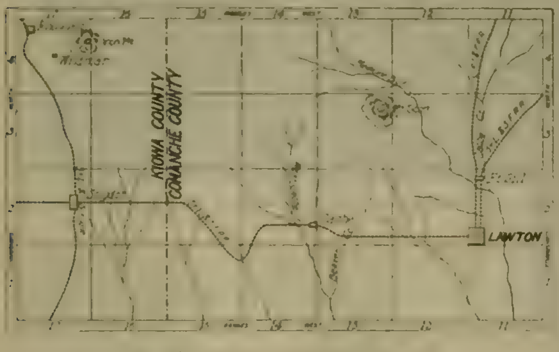
There is a region along the valley of Cimarron river and Carisso creek, near Kenton, in the extreme northwestern corner of the State, where copper was mined for a number of years. Several hundred shafts have been sunk in this region. The rocks, which are redbeds similar to those in central Oklahoma, are in many places vividly stained with copper. Some of the material obtained has been hauled to the railroad and shipped to smelters, but the venture did not prove profitable, and at the present time all of these workings have been abandoned. Copper mines were opened, a number of years ago, in the vicinity of Byars, McClain county, and operated by primitive methods for some time. But they, too, were not profitable, and nothing remains at the seat of operations but a few holes and old tunnels, and a part of an old improvised horse-power crusher, used for pulverizing the ore.

Copper has been reported from Kiamichi mountains, in the southeastern part of the State. There is a region not far from Hochatown, in east central McCurtain county, where small quartz dikes have cut sandstone and shales. Along the contact of these dikes the rock is stained with copper, but it has not been found in marketable quantities. Copper also occurs in small quantities in igneous rocks, in both the Arbuckle and Wichita mountains. A number of shafts have been sunk in each region and considerable amounts of ore taken out. One Government assay has been made which shows 10.81% of copper. It is possible that if a sufficiently large body of ore were developed, and improved methods employed, these mines might be made profitable.



LOCALITIES FOR METALLIFEROUS MINERALS IN OKLAHOMA.

There is a widespread notion that gold and silver occur in profitable quantities in Oklahoma. Much time, money, and effort have been wasted in the hope of finding these metals, but neither gold nor silver from Oklahoma have been placed on the market. There is perhaps not a county in the State in which the precious metals have not been sought. The greater part of the effort, however, has been put forth in the Wichita and Arbuckle mountains. Since the time of the Marcy expedition into this region, in 1852, prospectors and miners have been at work in the Wichitas.



MAP OF WICHITA MOUNTAIN REGION.

It is even claimed that the Spaniards sought gold there, and the sites of old Spanish mines are still pointed out. There is, however, no authentic record that the Spaniards, or anyone else, ever found anything of value.

At the time of the opening of the Kiowa and Comanche country to settlement in 1901, there was much activity in the Wichita mountains. It has been estimated that at one time there were more than 2000 miners at work in the region. The mountains were then bristling with claim notices and honeycombed with mining shafts. Scores of camps were scattered throughout the mountains. According to various estimates, all the way from half a million to a million and a quarter dollars has been spent in sinking shafts in the Wichita mountains. Some of the shafts reached a depth of 200 to 250 ft., although most of them were less than 25 ft. deep. Several small smelters were erected, and a number of carloads of ore were shipped to large smelters at Pueblo and Denver. Hundreds of assays have been published, many of them claiming results as high as several hundreds, or even thousands, of dollars per ton. Several reports have been published by Government and other officials on the occurrence of gold and silver in the Wichitas, the most important of which will be cited.

In 1904 E. G. Woodruff, then professor of mineralogy in the State University of Oklahoma, now a member of the U. S. Geological Survey, spent several weeks in the Wichita mountains, visited practically all the camps then active, and wrote a paper entitled 'Present Status of the Mining Industry in the Wichita Mountains of Oklahoma'. He sums up his conclusions as follows:

"The mining industry of the Wichita mountains is still in the prospecting stage. A conservative estimate places the number of claims located at about two thousand five hundred. On many of these claims no work whatever has been done. It is probable that 500 openings are from 10 to 15 ft. deep. The number of shafts ranging from 20 to 25 ft. deep does not exceed 100. Possibly 50 are more than 30 ft. deep. A few have gone beyond 100 ft., and in one case the shaft was more than 200 ft. deep.

"Two cars of ore have been shipped, one from the Wildman district, and one from the Oreana district. In addition to these shipments, a number of sample shipments have been made. At this time no ore is leaving the region. In one district a small smelter is being constructed to separate the bullion from the gangue.

"A word should be added concerning the damage which unscrupulous assayers have inflicted upon the region. With premeditated purpose they have, in many cases, issued false certificates, thus buoying up hope where it already existed, and creating undue excitement. In many cases the unsuspecting miner has been led to continue his search for the metal in the most impossible places. No one thing has contributed more harm to the industry than have these unprincipled assayers.

"Development is now in a quiescent state. At the time this investigation was made, five prospects were actually sunk, two in the Meers district, two in the Cache district, and one in the Oreana district."

Edwin Debarr, professor of chemistry at the State University of Oklahoma, visited the region during the summer of 1904 and collected 197 samples, which were afterward assayed. Mr. Debarr's conclusions are as follows:

"All samples were assayed by fluxes and by the cyanide processes, and the heavy sulphides were assayed by the chlorination process, and all save No. 136 showed no trace of gold.

"No. 136 was obtained from washing placer material south of Brushy and Bald mountains and Gold Hill, in the creeks and in Deep Red, in which material there is a very small quantity of exceedingly fine gold in a limited area. The lack of water, and the black iron in which it is found, together with the limited amount of gold therein, renders it unprofitable for working.

"No. 94 showed 0.98 oz. of silver and 3.6% of lead. No. 20 contained 5%; No. 21, 3½%; No. 23, 8⅓%; No. 9, 5%; No. 10, 3%, and No. 11, 3½% of copper.

"In collecting and sampling the above ores, the greatest care was taken to secure a good sample free from contamination, and with a view to revealing the true condition of values from the supposed mineral-bearing material. Whenever possible the samples were taken from the shafts."

H. Foster Bain, then a member of the U. S. Geological Survey, visited the region in October 1904, and collected 95 samples, 71 of which were assayed by E. T. Allen, chemist to the Survey. Mr. Allen reported as follows:

"After the usual cupellation and parting, gold was looked for most carefully, but not a trace was found in any of the samples.

"Ten of the above samples were examined for silver, as prescribed for gold, but no silver was found except in No. 41 and 48, which showed 0.14 and 0.92 oz. per ton, respectively.

"No. 57 and 73 were also assayed for copper, and No. 38 for lead. No. 57 gave 0.35% copper; No. 73 gave 10.81% copper; No. 48 yielded 3.63% lead."

Mr. Bain's conclusions are as follows:

"In view of the precaution taken in collecting the samples and the great care with which they were assayed, the absolutely uniform absence of even a trace of gold, and only the occasional presence of a small quantity of silver, copper, or lead, allows but one conclusion to be drawn, namely, that none of the prospects examined show any ore in the proper sense of the term, nor does any one of them have any present or probable future value.

"Whether future prospecting may reveal other occurrences which do have value, cannot, it is true, be stated. It is believed, however, that the prospects examined were fully representative, and have, in many cases at least, been developed enough to allow a proper judgment as to their value to be made, and in no case do they offer any encouragement whatever for additional prospecting."

Very little work has been done in the Wichita mountains during the past six years, and at the present time the greater number of the shafts are filled with water. A few persistent prospectors are still at work, and stock in mining companies is being offered for sale, but there seems to be little promise of renewed activity.

Prospecting in the Arbuckle mountains never reached the stage attained in the Wichitas. The structure of the rocks in the two ranges is practically the same, and there is as much reason to suspect the presence of gold in one as in the other. A number of shafts have been sunk in the Arbuckles. The greater part of them are in the West Timbered Hills, south of old Fort Arbuckle, but so far as is known nothing of value has ever been found. Joseph A. Taff, formerly a member of the U. S. Geological Survey, has studied the problem more carefully than anyone else. In a published report, after reviewing the structure of the region, he concluded:

"All the fault contacts between the igneous and stratified rocks have been carefully traced, but no indication of the mineralization of the rocks or the occurrence of ore deposits of any consequence along them have been noted.

"Many of the dikes, chiefly those of diabase, cutting the granite have been prospected at various times for the precious metals without any show of profit, and the sum of all information obtained gives no assurance that ore or metal deposits of any value can be found in the region."

Local Sections of the A. I. M. E.

The committee of the American Institute of Mining Engineers appointed to consider the advisability of organizing local sections of the Institute, have reported favorably on the project and have formulated the following rules which have been duly adopted. Steps have been taken already to organize sections in New York and San Francisco.

1. A local section of the Institute may be authorized by the council at the written request of ten members residing within an appropriate distance of a central point.

2. Only one section shall be authorized in one locality or district.

3. The council shall define the territory of a section.

4. A section must consist of 25 or more members; when its membership falls below 25 in number the council may annul the section.

5. Only members of the Institute shall be members of its local sections.

6. All members of the Institute, of all grades, residing within the territory of a section shall *ipso facto* constitute the membership of such section.

7. The officers of a section shall be elected after the formation of the section has been duly authorized, at a meeting of the members of the Institute within the territory of said section, called by the sponsors of the section, notice of said meeting and its object being given to said members at least thirty days in advance. Officers shall be elected for a term not longer than one year.

8. The officers of a local section shall be a chairman, vice-chairman, secretary, treasurer (or secretary-treasurer), and such others as the section may desire.

9. Whenever the Institute is financially able to do so, it shall be the policy of its board of directors to contribute from its funds for the legitimate running expenses of each local section an amount not exceeding, in each year, 25% of the dues received from the members of said section in said year. Requests for such appropriations shall be signed by the chairman, secretary, and treasurer of the section.

10. If the expenses of a section exceed the appropriation made it by the Institute, the difference must be made up by voluntary contributions, but not by assessment upon the members of said section. The Institute shall not be responsible for the debts of its sections.

11. The Institute reserves the right to cancel a section, or re-adjust its territory.

12. Papers presented at local sections, and discussions thereon, if reported, are the property of the Institute. They shall be submitted to the publication committee and published in the *Bulletin* or *Transactions*, or both, if approved. Such papers shall not be published elsewhere without permission of the council. The reading of a paper before a local section shall not carry with it the right of publication in the *Bulletin* or *Transactions* of the Institute.

13. Neither the author of a paper presented to a local section nor the local section shall have the right to reprint a paper or publish it in advance of the meeting without obtaining permission of the publication committee of the Institute, which shall determine the details of such permission. Nothing herein shall forbid the abstracting of a paper by the press after its presentation before the local section.

14. The Institute shall print advance copies of papers offered to local sections, in order to facilitate discussion thereon, provided that such papers are approved for such advance publication by the chairman or secretary of the local section and by the publication committee of the Institute.

15. Papers read before a local section may also be offered for reading or discussion at general meetings of the Institute, and shall be given equal standing with the other papers on the program of said meeting, when approved by the publication committee.

16. Each local section shall transmit promptly to the secretary of the Institute full announcement of its proposed meetings, and an abstract of its proceedings, including the names of authors and titles of all papers read before it, for the purpose of preparing a report thereon to be published in the *Bulletin* of the Institute, and for the purpose of enabling the council of the Institute to comply with articles 17 and 19 of these regulations.

17. The by-laws and regulations of local sections shall be subject to the approval of the council.

18. The council reserves the right to amend, annul, or add to these regulations.

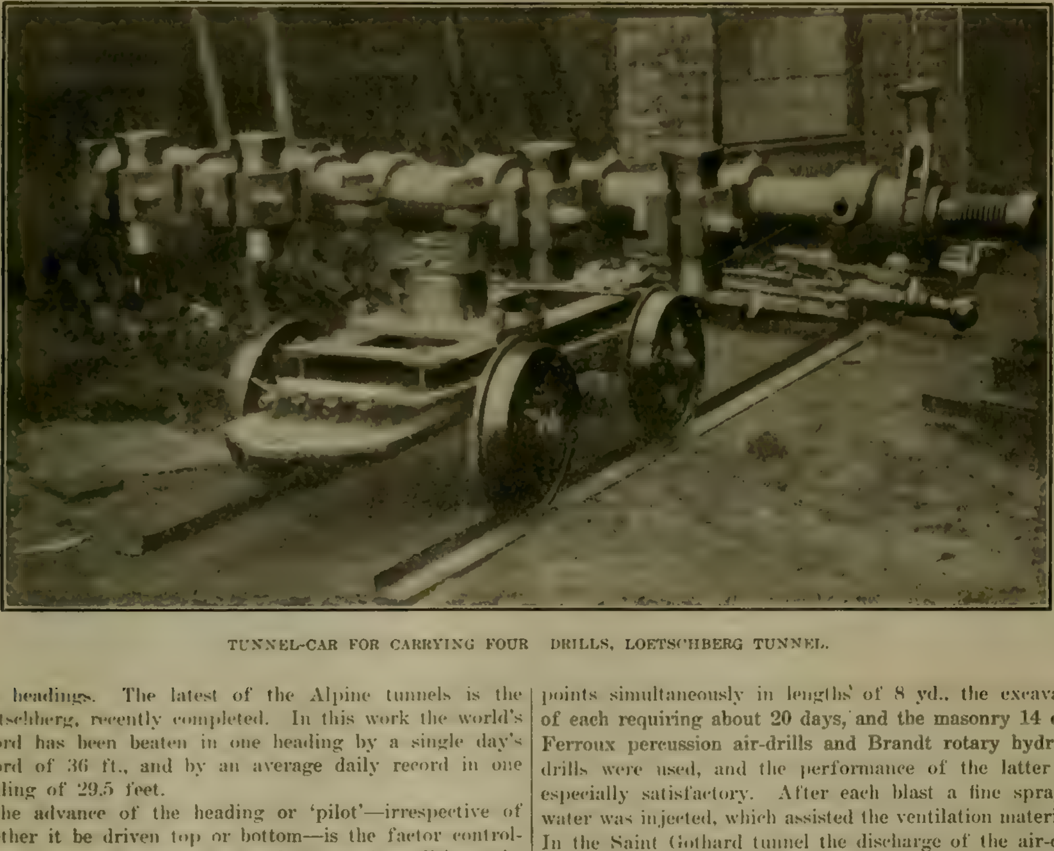
19. No action shall be taken by a section which shall contravene the constitution of this Institute.

It is thus seen that a paper may be presented before a local section, appear in abstract in the local press, and if accepted for publication, be printed in full in the *Bulletin*. This will allow many papers to be presented orally; a difficult proceeding at the regular Institute meetings as now conducted, and one which tends to limit discussion to the few members who are interested enough to write out their views.

Tunnel-Driving in the Alps

By W. L. Saunders

*It is now generally admitted by experts that, at least so far as rapid progress is concerned, the Alpine system of tunnel-driving is superior to any other. These great mountain chains cannot be treated in the ordinary way by shaft sinking and driving headings, thus multiplying the points of attack. The work must be done from the ends only, hence speed in driving is of the utmost importance, and the concentration of effort to make progress has resulted in an organization and in mechanical appliances that have produced results much in advance of the usual practice, even in America. The first Alpine tunnel was the Mount Cenis, length 7.5 miles, driven with a progress that averaged about 7.75 ft. per day. Next came the Saint Gothard, 9.5 miles long, 18 ft. per day; Arlberg, 6.5 miles long, 27.25 ft. per day; Simplon, 12.25 miles long, 36 ft. per day. The figures represent progress when driving from two headings. The latest of the Alpine tunnels is the Loetschberg, recently completed. In this work the world's record has been beaten in one heading by a single day's record of 36 ft., and by an average daily record in one heading of 29.5 feet.



TUNNEL-CAR FOR CARRYING FOUR DRILLS, LOETSCHBERG TUNNEL.

The advance of the heading or 'pilot'—irrespective of whether it be driven top or bottom—is the factor controlling the rate of advance, as, under normal conditions, the enlargement to full size, timbering, and lining, readily keep pace with the advance of the heading. The manner of removing débris in the headings, and the time required to do it, average about the same. The increased average gain in the rate of advance has been concurrent with the improvement in the machinery employed in the headings. Where a great thickness of rock overlies a tunnel, it is necessary to do the work wholly from the two ends, without intermediate shafts. The problem resolves itself into devising the most expeditious way of excavating and removing the rock.

In 1872 the Saint Gothard tunnel was commenced, and in 1881 the first locomotive ran through it. Mechanical drills were used from the commencement. Tunneling was carried on by driving in advance a top-heading about 8 ft. sq., then enlarging this sidewise, and finally sinking the excavation to invert level. Air for working the rock drills was compressed to 7 atmospheres by turbines of about 2000 hp. From 6 to 8 Ferroux drills, making about 180 blows per minute, were mounted on a carriage pushed to the point of attack. From 13 to 18 holes were drilled by the machine and its 16 attendants to depths of from 2 ft. 7 in. to 4 ft. 4 in. in from 3 to 5 hr., and the work of charging with dynamite, firing, and clearing away was then done by 22 men in from 3 to 4 hr. The charge per hole averaged 1.75 lb., and after firing, a strong current of compressed air was directed against the face of the excavation. Four sets of holes were, under favorable circumstances, drilled in 24 hr., which rendered attainable, in each heading, a progress of 13 ft. per day in such rock as gneiss.

The driving of the Arlberg tunnel was commenced in 1880, and the work completed in little more than three years. The main heading was driven along the bottom of the tunnel and shafts were opened up from 25 to 75 yd. apart, from which smaller headings were driven right and left. The tunnel was enlarged to its full section at different points simultaneously in lengths of 8 yd., the excavation of each requiring about 20 days, and the masonry 14 days. Ferroux percussion air-drills and Brandt rotary hydraulic drills were used, and the performance of the latter was especially satisfactory. After each blast a fine spray of water was injected, which assisted the ventilation materially. In the Saint Gothard tunnel the discharge of the air-drills was relied on for ventilation. In the Arlberg tunnel more than 8000 cu. ft. of air per minute was thrown in by ventilators. In long tunnels the quick transport of materials is of equal importance with rapid drilling and blasting. In the Arlberg, to keep pace with the miners, 900 tons of excavated material had to be removed, and 350 tons of masonry to be introduced, daily, at each end of the tunnels, which necessitated the passage of 450 cars. This traffic was carried on over a length of 3.5 miles on a single track of 27-in. gauge with two sidings. When the locomotives ran into the tunnel the fires were damped down, and as the pressure in the boiler was 15 atmospheres, the stored-up heat in the water furnished the necessary power. The cost per linear yard varied according to the thickness of masonry lining and the distance from the mouth of the tunnel. For the first 100 yd. from the entrance the prices per linear yard were £11 8s. for the lower heading; £7 12s. for the upper one; £30 10s. for the unlined tunnel; £45

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*Abstract of a paper read before the Wilkesbarre Meeting of the Amer. Inst. Min. Eng., and issued subject to revision.

for the tunnel with a thin lining of masonry; and £124 5s. with a lining 3 ft. thick at the arch, 4 ft. at the sides, and 2 ft. 8 in. at the invert.

In 1893 the Jura-Simplon Railway Co. contracted with Brandt, Brandau & Co., of Winterthur, Switzerland, for the construction of a tunnel from Brigue, on the north side, to Iselle, on the Italian side of the Simplon pass, and 12.4 miles in length. The contract time for construction was 5½ years. At the Swiss end the river Rhone was dammed. The power available here was about 2200 horsepower. At the Italian end the power was derived from the Diveria, about 2.5 miles above the works. There was also a supplementary steam-power plant of about 220 hp. The distribution of the power was proportioned about as follows: for high-pressure pumps, 700; for air-compressors, 400; for ventilation, 500; for illumination, 100; for machines in the shops, 100; making a total of 1800 horsepower.

The distance between portals is 12.4 miles, and except for a short curve at each end, the alignment is straight. The work consists of twin single-track tunnels exactly parallel in plan and profile, and lined throughout with masonry. A centre bottom drift was first driven by power drills, and then timbered and covered with a closely boarded roof. From this drift a shaft was driven upward to the roof line every 164 ft. (50 m.). The top heading was then excavated by working in both directions from each of these shafts. Next in order, the floor of the upper headings was removed, and then the two side cheeks of the bottom drift. The lower drift being timbered, no interruption of the traffic in it was caused by the removal of the rock above. The advance drift was the only part of the operation performed by power drills. The drills employed were Brandt rotary machines mounted in groups of two on a heavy thrust bar about 12 inches in diameter. This thrust bar was pivoted to a drill-carriage and was counterbalanced. The section at the heading was nominally 6.5 by 9.5 ft., or 61.75 sq. ft., and as the depth of each blast was roughly 4.5 ft., the material removed by each blast ranged from 265 to 275 cu. ft. The average daily advance was about 16 ft. at the Italian end and from 20 to 21 ft. at the Swiss end. This work was in gneiss. In rock of more friable nature, such as anhydrite or calcium sulphate, an advance of as much as 34 ft. in 24 hr. was made. After each blast, the time required to clean the heading, set the drills, complete the boring, and remove the drill-carriage, was more than an hour. The explosives used were dynamite at the Italian end, and blasting-gelatine at the Swiss end. The dynamite was put up in packages of about 1 lb. in weight; each hole was charged with six cartridges; each blast in the drift, therefore, used from 60 to 66 lb. of powder, or about 6.5 lb. to the cubic yard. Charges were fired by ordinary fuses, cut so as to give an interval between the firing of successive holes; about 15 min. was required after each blast to clear the fumes from the heading. This was accomplished by means of a ventilating pipe running close to the face and the use of a spray of water. The ventilating pipe exhausted about 35 cu. ft. of air per second, and the spray absorbed the sulphurous gases.

The spoil was cleared from the face by one gang while another gang loaded the collected rock into narrow-gauge cars hauled by horses. No machines were used, all the material being handled by manual labor. The work of clearing the heading was rushed to enable the drills to be put to work as soon as possible. To this end the clearing gangs were composed of men who had been previously rested by performing light work only, and only the most skilled and energetic laborers were employed. The majority of the workers were from southern Italy. There were 14 or 15 men at each heading, worked in three shifts daily. Each gang had two horses for each shift. Horses, which cost $1.60 per 8-hr. shift, died off rapidly and were paid for by the tunnel contractors. Other methods of transportation were tried but proved less economical than the use of horses in the advance headings. The horses took the cars to the compressed-air locomotives, and these in turn took them to the steam locomotives, as already described.

The Loetschberg tunnel, driven through the Bernese Alps, in Switzerland, is the last link of a railroad system connecting the city of Berne directly with the village of Brigue, which is situated at the north portal of the Simplon tunnel. The main tunnel is 47,678 ft. long, and was first planned to be on a tangent. After the cave-in of July 23, 1908, it was found necessary to insert a curve of 3600 ft. radius in the tunnel in order to drive through solid rock. The elevation of the north portal is 3940 ft.; of the south portal is 4000 ft.; and the maximum elevation of the tunnel is 14,081 ft. above sea-level. The maximum grade in the tunnel is 7%. Summarizing, the total length of the road is 45.8 miles, of which 36%, or 86,900 ft., is tunnels. Let it be added that, for construction purposes, a narrow-gauge railway had first to be built to reach both portals. On the south side of the tunnel the construction-railway necessitated 38 tunnels, aggregating 18,000 ft. Of the 38 tunnels, 11 only will be part of the permanent road. Beginning at the north portal, the materials penetrated have been calcareous for a distance of about 13,100 ft.; while on the south side, crystalline schist has been found on about 13,000 ft., and granite, forming the central part of the mountain, has been penetrated by both headings. But little water was encountered in the south heading, about 20 gal. per second; while in the north heading, 105 gal. per second necessitated the construction of quite a large-sized drainage ditch. On July 24, 1908, when the main heading had reached a point 1.6 miles from the portal, it struck a cleft filled with sand, gravel, and water. There was a sudden and violent inburst of these materials, which in a few moments filled up the tunnel for a length of 5900 ft., burying 25 workmen and all the drills and other installations beyond hope of recovery. It was then decided to deviate and cross the Gastern valley farther up stream. With 86% of tunnel completed, the maximum rock-temperature recorded has been 91° Fahrenheit.

Driving of the headings was begun on October 1, 1906, for a single-track tunnel, and continued until October 1, 1907, when it was decided to drive a double-track tunnel; 86% of the tunnel had been driven by October 31, 1910, and the 4000 ft. of heading which had been abandoned after the cave-in of 1908 had been regained.

The power-plant for the south heading is driven by electric power. Compressed air for the drills is furnished by three 2-stage Ingersoll-Rand compressors, each having a capacity of 1950 cu. ft. of free air per minute, and a compression of 145 lb. per square inch. They are driven by 400-hp. electric motors. Compressed air for the locomotives is furnished by two 4-stage Ingersoll-Rand compressors, having a capacity of 460 cu. ft. of free air per minute, and a compression of 1760 lb. per square inch. They are driven by 250-hp. electric motors. The power-plant for the north heading is situated in Kandersteg. Electric power is brought from Spiez. Compressed air for the drills is furnished by two units, each consisting of a 2-stage Meyer air-compressor, each having a capacity of 1770 cu. ft. of free air per minute, and a pressure of 117 lb. per square inch. They are belt-driven by 450-hp. electric motors. Compressed air for the locomotives is furnished by two units, each consisting of a 5-stage Meyer high-pressure compressor, with a capacity of 565 cu. ft. of free air per minute, and a pressure of 1760 lb. per square inch. They are belt-driven by a 250-hp. electric motor.

All trains in the tunnel are operated on a regular time schedule, changed from time to time according to the progress of driving. Steam locomotives are used outside, while compressed-air locomotives are run inside of the tunnel. A few mules are still in use in the south bottom-heading. The cars used for spoil are 6 ft. long, 2 ft. 8 in. wide, and 2 ft. deep, the upper edge being 3 ft. 7 in. above the top of the rail. The gauge for all tracks laid in the tunnel is 30 in.; the rails, of from 30 to 40 lb. per yard, being laid on wooden stringers, except in the last 100 ft. of the bottom heading, where portable rails with pressed-steel ties are used. Trains are run in the tunnel at a speed of from 8 to 10 miles per hour. Electric light is used only in that part of the tunnel already lined with masonry and partly completed. Portable acetylene lamps are used throughout the tunnel with a few exceptions only. They are sold to the men by the contractors for the sum of $1. Besides giving a very bright light, these lamps are clean, easily handled, and they do not give out fumes as do oil lamps.

The records made in driving the headings are due to the excellent organization, and to the methods of setting up and taking down the drills. A drill-carriage of simple but efficient design was devised by the contractors. Each carriage carries four or five drills mounted on a horizontal bar pivoted on a vertical arm, and easily swung into position, and jacked into place. The time required to change the machines from the position for transportation to that for drilling and to commence drilling is usually from 6 to 8 minutes. This fact alone shows the superiority of this system of carrying the drills for such work over any other method used up to the present time.

Three kinds of explosives are used. Dynamite, with about 83% nitroglycerine, is mostly used in the headings. Westphalite and cheddite, being more safely handled, are used for enlarging and for small blasts. Great stress is laid on the fact that a high grade explosive breaks the rock into small pieces, not larger than an orange, which enables the mucking to be done with shovels. Firing is done with ordinary fuses. The dynamite cartridges are wrapped with red paper in order to be easily detected in case of a misfire. Dynamite carriers and handlers are provided with red lanterns.

Italian labor is used throughout the work with the exception of some Macedonians lately imported. Mostly Italians from the northern provinces of Italy are employed. A bonus system of payment is used throughout the different kinds of operations. There are three 8-hr. shifts per day. The following wages are paid:

	Daily wages.	Average bonus.	Total.
Drill-foreman	$1.50	$1.10	$2.60
Drill-runners	1.00	0.70	1.70
Muckers	0.80	0.50	1.30
Nippers	0.70	0.30	1.00
Tracklayers	0.80	0.15	0.95
Masons	1.00	0.40	1.40

The width of the finished tunnel section is 28 ft. at the arch springing and 25 ft. at the base of the rail. The arch is semicircular, the crown being 20.7 ft. above the base of rail. A bottom heading of 6.5 by 10 ft. is first driven several hundred feet in advance of the enlargement. Upraises are then driven from 500 to 600 ft. apart, and a top heading started back and forth. The top heading is then enlarged. In the bottom heading the mining operations proceed as follows: The drill-carriage is run forward from its siding close to the face of the heading, passing over 5 by 5 ft. by $^3/_8$-in. steel plates laid on the floor of the heading for a length of about 30 ft. Each plate is provided with 1-in. holes at the corners for each in handling with a pick. The water and air pipes laid on one side of the heading to about 40 ft. from its face are connected with the drill-carriage, and the drilling begins with the top holes. Water sprinkling is frequently done, especially in starting the holes, in order to lay the dust. Without interfering with drilling, shoveling is going on just behind the drill-carriage, and the loaded cars are run back to a siding, where trains of from 20 to 30 cars are formed and hauled out by air locomotives. Drilling being completed in the heading, the drill-carriage is run back to its siding, and the steel plates laid on the floor are covered with a layer of rock about 4 in. thick to prevent deterioration. The bore-holes are then loaded and carefully tamped, and the last man to leave the heading, after firing the fuses, opens the air pipe valve, the escaping air thus creating a cushion of fresh air from the face of the heading back to a certain distance, so that, after blasting, the muckers are able to go to work without delay. A high-grade explosive only is used in the heading, which breaks the rock in small pieces and renders work with shovels easy. The bore-holes, having an average depth of about 4 ft., are started with a 3-in. drill and finished with a 2-in. drill. On account of giving better results, firing is done with fuses, about 4 ft. long, the centre holes being fired first.

Clearing the tunnel proceeds as follows: Two empty cars are run to the heading, the first one being immediately loaded by two or three men shoveling without interruption until the car is fully loaded. This operation is performed in 3 or 4 minutes, which means that 1 cu. yd. is loaded in from 2.5 to 3 minutes. Owing to the manner of drilling and blasting and to the shallow holes, the rock, instead of piling up in front of the face of the heading, is thrown back, and forms a layer over the floor, which enables the track to be cleared rapidly.

Getting rid of broken rock is a problem in tunnel-driving. At Loetschberg a cubic metre car (35.5 cu. ft.) is filled in 5 minutes, and it takes only 1 minute to get this car away and bring an empty car to the heading. In order to do this, small entries or chambers are excavated at intervals in the lateral wall of the main heading, which enable an empty car to be thrown from the track on the side, thus clearing the track and allowing the filled car to pass, whereupon the empty car is turned up on its wheels and rolled into the heading. Drilling is started not more than 5 min. after the removal of the last carload. This result, which at first sight seems impossible, is only obtained by absolute discipline. The rate of drilling is 15 to 16 holes in from 1.1 to 1.15 hours. An engineer who recently visited this work says:

"When I arrived at the heading it was 9:30 a.m. The holes were being prepared for blasting. The blast took place at 9:35 a.m.; 5 min. after the blast the men were in place removing débris, and at a little after 11 a.m. the drill-carriage was in place again and the rock-drills were working. It usually takes from 25 to 30 min. between the time at which the drilling is finished and the time at which the start is made to remove the débris; that is to say, 25 min. for taking away the drill-carriage, cleaning the holes, loading with explosives, and blasting. An additional 5 min. is consumed in getting the smoke away by means of the ventilator, and then the men get to work at the débris. In order to assist the men, a spray of water is discharged near the heading after the blast. This water is brought into the tunnel in a pipe placed within a larger pipe, which insulates it and keeps its temperature from being affected by the temperature of the tunnel."

At one time, when the north heading was making a daily progress in excess of the south heading, the contractors sent some of the drills from the north heading over to the south, thinking that perhaps the difference in progress was due to the drill, but the results were not changed. It seems plain that were it a question of machinery only, the machinery making the greater progress would be used throughout, but the difference appears to be one of natural conditions and of organization.

SHRINKAGE system stoping has many incidental advantages. As employed in the mines along the southern part of the Mother Lode in California, the system permits the accumulation of a large reserve of ore in the stopes, amounting roughly to two-thirds of the rock broken. This is of great advantage in a region such as this where labor supply and water fluctuate. In the summer months when both labor and water are scarce, the mine can be run with only a few men and the mill still kept going steadily. The reserve in the stopes thus regulates the price of labor.

BLUE-PRINTS to be carried into wet mines can be rendered water-proof by the following process. Immerse in melted paraffine until saturated, a number of pieces of an absorbent cloth a foot or more square. When withdrawn and cooled they are ready for use at any time. To apply to a blue-print, spread one of the saturated cloths on a smooth surface, place the dry print on it with a second waxed cloth on top, and iron with a moderately hot flatiron. The paper immediately absorbs paraffine until saturated, and becomes translucent and completely water-proof.

Recent Progress in Slime-Filtration Development

By C. S. Haley

The threatened revolution of the cyanide process from a chemical standpoint by the electrical regeneration of solutions has of late provoked a good deal of discussion, and justly. However, the revolution in the mechanical handling of pulp, solutions, and precipitate in the course of the last few years has perhaps not received that share of the attention of the metallurgical press which is its due; yet it has been no less far-reaching in its effects, although more gradual in its development. Of the different phases of this revolution, perhaps the most marked has been that of the change and development in the methods of handling and treating the more flocculent and troublesome portion of the crushed ore classified as slime. It has been my privilege to operate or assist at the installation of practically all the leading types of slime-filters at present on the market; and the results of an experience extending over ten years, not only in connection with the treatment of gold and silver ores, but also with the same type of work in manufacturing processes, has convinced me that there is still much to be done in connection with this line of work.

Ten years ago the present common types of vacuum-filters were practically unknown in the mining world. The necessity for a treatment of the more flocculent pulp different from the ordinary leaching methods applicable to the heavier sand, was early realized; but the treatment as first applied was cumbrous and unwieldy. The problem of securing agitation presented its difficulties, if the maximum extraction was to be obtained in the minimum of time. However, having expended so much time, power, and chemicals, on the solution of the gold, thereby increasing the amount of capital tied up in the mixed pulp and solution, a greater problem arose in the separation of the dissolved metal from the worthless pulp. It is this problem that I wish to discuss.

The first, and simplest, attempt at the solution of this problem was the ordinary decantation method. After agitation the slime was allowed to settle for as great a length of time as economy permitted, and the clear solution was drained off by decantation pipes or siphons. Various modifications of this process were made, and are still used today in more remote localities; but several grave difficulties arose. The first was the loss of time—a considerable factor. Next came the difficulties introduced in the refining of the product by the almost unavoidable introduction of a certain amount of fine silica into the zinc-boxes. Last, and most important, came the difficulty of giving a good wash to the pulp and the necessity of discharging good gold solution with the waste pulp at the end of the operation. After spending money to get gold into solution, any good engineer regards it as little short of criminal to deliberately throw any portion of that solution away. The decantation process, however, reigned supreme in this country for a considerable time. In Australia the method of separation by pressure was long ago in use; but the cumbrous methods required to clean the presses after filtration were a great drawback. The final introduction of this method into this country was signalized by a remarkably ingenious invention which did away with this objection very completely. This will be taken up later more at length.

In Colorado the introduction of filter-leaves into the slime-tanks was developed into a system of gravity filtration which had its drawbacks. Chief of these was the difficulty of giving a proper wash. A downward-percolating solution will not channel in ordinary sands; but in the case of slime it will not do anything else; and channeling is of course fatal to thorough washing. Further, the time element enters in to too great an extent. However, an ingenious mind conceived the idea of applying a vacuum-pump to these leaves and drawing the gold solution through them, leaving the pulp caked on the outside. Washing was accomplished by lifting the leaves, cake and all, bodily out of the original tank, and into another tank containing barren solution, which, on being drawn through the cake, displaced the gold solution and carried it to the precipitation boxes. A variation of this process, by means of which all the operations were carried on in the one tank, by the introduction of different solutions, brought with it improved vacuum machinery, and was soon made, and, as well as the older process, is now in wide use.

As this process is in general use, it may be well to give a brief résumé of its salient points. The pulp is introduced from the agitator, or stock tank, in a semi-liquid condition. Before the slime has a chance to settle in the filter-tank, a vacuum is applied on the filter-leaves, and gradually increased, its limits depending on the character of the ore and the method of treatment. A cake, varying in thickness from three-quarters of an inch to an inch and a half, is formed on the leaves. The surplus pulp is then returned to the stock tank, and the wash-water introduced. This wash-water is drawn through the cake, displacing the greater part of the dissolved metal which remains in the cake. The number of washes applied is of course also dependent upon local conditions. After the surplus wash-water is drawn off, the cake is discharged by the distending of the leaves from the inside by the introduction of water. The main difficulties left to be overcome by this method were still the time element, and, with the more difficult types of ores, the replacement of dissolved metals. While this type of filter is a vast improvement in both of these respects over its predecessors, it is still imperfect. Furthermore, the clogging of the filter pores by fine silica and lime renders frequent acid washing necessary, and renewal of the filter-leaves imperative. The presence of a chain-block for the repair of the slightest leak is imperative, and time is lost in the discovery and repair of leaks, especially as the filter grows older in use. About four or five years ago a filter was put on the market from Colorado which attempted to wash a mixture of sand and slime by upward percolation. This is merely mentioned to show the vanity of human endeavor.

The introduction into this country of the process of pressure filtration was greatly facilitated by the addition of the sluicing-bar, which did away with the principal objection to the filter-press, in that the cleaning of the press-chambers was automatic and speedy, though in dry countries the amount of water necessary for sluicing may be important. Pressure-filtration gained its greatest favor from the fact that, with its use, agitation, with all its use of power, is not necessary. Instead of bringing the particles of ore into contact with the solution, the solution was forced into close contact with the particles of pulp by means of pressure. The heavy and cumbrous presses, by reason of their cost and the difficulty of transportation, have been one great drawback to the use of this process in regions which are at all inaccessible. Its success where conditions admit of its use has been, on the whole, admirable.

Contemporaneously with the development of this form, a rather ingenious pressure-filter which is in no sense a filter-press, was a good thing which came out of Utah. It consists of a large cylinder resembling in outward appearance a compressed-air receiver mounted at an angle from the horizontal. Mounted on a track inside this cylinder is a set of filter-leaves running longitudinally and decreasing in height, of course, from the centre out. Under pressure of about thirty pounds the solution was forced through these leaves, and came out through nipples in the grate to which the filter-leaves were attached. The cake was rapidly formed on the leaves, and the excess pulp returned to the stock tank when a definite time had elapsed. Wash-water was then introduced, and run through the cake for a definite time. Pressure was held on the cake by means of air when the wash-water was returned, and it was thoroughly aerated, producing a very dry cake. When the cycle was completed (ordinarily in about an hour) the end-gate was opened, and the filter carriage let out on a track by gravity, which overhung the discharge chute. The idea was to discharge the cake by internal pressure of water, or steam, where available, but the cake formed is generally so dry that the operator loses much time in scraping and hosing it off. This filter has the advantages of giving an excellent wash and being simple in its operation, but weighed against this is the necessity of having a man constantly watching it and frequently needing a helper to discharge or re-seal the filter.

This amount of labor necessary in the operation of a filter, as well as the time lost in discharging the cakes, has resulted in many attempts to develop a continuous filter; one which would run by itself and be constantly discharging the pulp. Many solutions of this phase of the problem have been offered in the last few years, with varying success. One type which is coming into wide use on account of its convenience and practicability has recently been developed. This filter consists of a revolving drum, whose spokes are vacuum pipes or compressed air pipes, as occasion demands. This drum is immersed in the pulp nearly to its axle, and a gentle vacuum causes a comparatively thin cake to collect on the outside of the drum, whose canvas surface is protected by wire. The pulp is slightly agitated in the filter tank by means of compressed air, and as the cake forms on the surface of the drum it is lifted out of the tank by the revolution of the latter. As it rises and begins to harden, it passes under a dripping spray of wash-water, which is sucked through the drum surface and washes the thin cake. The cake is carried around until it comes within about three feet of a scraper, when, by an ingenious valve arrangement, the suction in that part of the drum is changed to a pressure. This loosens the cake, the wire protects the filter-cloth from the scraper, and before re-submergence that section of the drum is thoroughly cleaned and ready to take another charge. This filter has lately been imitated in Colorado. The valve action in the California patent is simple; the main difficulty arises in case of stoppage of the filter for any cause, when it is a trifle hard to start. The problem of washing seems to be well handled in this filter, the time element no longer enters, and the filter is automatic in its operation. The repair of leaks is accomplished by slipping a small piece of canvas under the wire. One difficulty, however, remains. In the case of a heavy sliming ore, such as a stephanite type, once the pulp is in a cake form it is next to impossible to give it a perfect wash, as a certain amount of channeling is bound to occur. If the cake could be broken up into its various particles of slime before being submitted to a wash, washed by compressed air, and then gathered together again, a practically perfect wash could be obtained. However, in the different filters that have attempted to handle this problem (most of them of the continuous type) the increased mechanical cost and difficulty have far outweighed the saving effected.

On the whole, the development of slime filtration during the past few years has merely exemplified the extreme quickness of metallurgists in adapting themselves to new conditions imposed upon them by the adoption of new processes of treatment.

Diamonds in Liberia

During the dry season of last year there was considerable work done in the recently discovered gold and diamond fields of Liberia; the result being that diamonds of good quality have been found in several places. The work has been carried on regularly; a number of mining engineers and prospectors have already been engaged and are directing their attention, not toward the alluvial gold-bearing strata, but to the more promising diamond winning. In a recent report it is stated that in the beds of the Jiblong river, and four of its tributary streams, 79 diamonds have been found. In view of the finds in German Southwest Africa this is significant, and it is not at all impossible that new diamond fields may be developed.

Placer Mining in Alaska

By L. H. Thomas

Draw a line from Good News bay on the coast of Bering Sea just south of the mouth of the Kuskokwim, northeast to Indian creek, in the Koyukuk basin, and it will pass through all the newly discovered placer fields of the Kuskokwim, the Iditarod, the older Innoko, Ruby, Gold Hill, Melozi, and the new fields of the Koyukuk country. This is a region more than 600 miles long and from 50 to 150 miles wide, in which pay gravels of great value have been opened at eight separate points.

Gold was found in the Iditarod in 1909, but until the summer of 1910 the region produced nothing but conflicting reports. In August last, however, the gold began to come out, and up to June 1, less than a year, the Seattle assay office credits the new camp with $1,112,316. As some gold from the Guggenheim properties, operated by H. L. Jaffe, went to the Selby smelter on San Francisco bay, and as some dust always comes out which never reaches the local office, and some remains in the camp of its origin, the total production of the Iditarod for the season is no doubt in excess of a million and a quarter. Estimates for this season's output exceed five million dollars.

Gold was found in the Innoko in 1906, on Ganes creek, and later on Little and Ophir creeks. In 1907 $13,100 was taken out, and in 1908 the total was $72,100. The next year, 1909, production jumped to $200,000, but nothing so good has been done since. Up to date all mining there has been done by crude methods, though Ganes creek has much gravel that would pay to mine even with steam scrapers, and there is ground which is adapted to the use of steam-shovels.

MAP OF ALASKA.

The Tuluksak discoveries should also be mentioned, where a handful of men mining with rockers took out several hundred ounces of coarse gold as early as 1908, and which has been producing since. The stream comes into the Kuskokwim a short distance above Bethel on the east side. It is easily reached, or will be now that regular transportation has been established on the Kuskokwim.

Gold Hill has been producing for several years, and so have Ruby and the Melozi and the Koyukuk, but last winter's discoveries in the latter region, Indian creek, gives the Koyukuk added importance as a future placer mining region of the North.

The report has come from Ruby of a stampede there, on June 1, near the mouth of Ruby creek, and the establishment of a new town, in which there were 300 tents and one log building. The cause of the stampede was the discovery of gold, as high as a dollar a foot and over, on bedrock just over the Ruby creek divide on branches of the Solatna. This divide is low and Ruby city on the Yukon is but a few miles distant from the new finds. Pay has been found over a distance of some miles, and in places it is a thousand feet wide. One report predicts that 3000 men will be in this new camp before the end of summer, as it is easily reached by steamer from either upper, middle, or lower Yukon points.

These new fields are no places for men lacking in money, physical prowess, and knowledge of mining conditions and mining methods. All such are doomed almost inevitably to failure at the outset, and would better remain away. To the adventure-loving, red-blooded, not-afraid, self-reliant kind of men, the field is inviting and the promise alluring; for the battle is in the open with the odds on the side of the man of courage and endurance.

Goldfield Consolidated Report

In his report for May, J. F. Thorn, general superintendent, gives the following figures: The total production for May was 29,450 tons, containing $962,110, or an average of $32.67 per ton, of which 29,410 tons were milled with an average extraction of 94.51%, and 40 tons were shipped, of an average value of $54.56 per ton; the net recovery from all ore being $30.89 per ton. The total net profit was $679,537, or $23.07 per ton. During the month of May 4585 ft. of development work was performed.

The total cost of mining, development, milling, office, and general expense was $7.82 per ton, distributed as follows:

Mining:		
Development	$1.17	
Stoping	2.17	
		$3.34
Transportation		9.08
Milling		2.26
Marketing		1.13
General expense		0.62
Bullion tax		0.39
Marketing ore shipped		0.01
Construction		0.04
Total cost per ton		$7.87
Miscellaneous earnings		0.05
Net cost per ton		$7.28

During the month the drift on the second level of the Combination mine was extended 50 ft. west through ore that averaged $60 per ton. This will connect with the 136-stope, making an orebody over 100 ft. long. The 354-sill floor in the Mohawk mine was considerably extended, and produced 1647 tons of ore that averaged $30 per ton.

In the Clermont mine the 413 intermediate drift, between the 600-ft. level and 700-ft. level, was advanced about 75 ft., and produced 682 tons of ore that averaged $125 per ton. The raise through the 604 orebody on the 1000-ft. level was connected with the 900-ft. level during the month, and a stope is being started on the 900-ft. level, which has produced 150 tons of $50 ore. The raise from the 1200-ft. level was connected with the winze from the 100-ft. level, the greater part of the winze being in ore of milling grade. The raise, however, encountered no ore of any value. Intermediate drifts are being driven from the bottom of the winze about 120 ft. on the incline from the 1000-ft. level.

Bingham and Garfield Railroad

The Utah Copper Co. has had so much delay and trouble over shipment of ore from its mines to the mills at Garfield that an entirely new railroad has been built exclusively for this traffic. The line runs high along the mountains and is arranged so that trains of 40 cars of 60 tons each may be hauled by one locomotive direct from mine to mill. In addition, the thirty miles or more of track in the company's mines has been turned over to the railway, a subsidiary corporation. The road will be ready for service in July. The following details regarding it are given in the annual report of the copper company.

The road, from a connection with the San Pedro, Los Angeles & Salt Lake railroad near the town of Garfield, to the Magna plant, is about 2½ miles long. The total length of line from the Garfield connection to the auxiliary yards at the Utah Copper Co.'s mines is 20.1 miles. The line between Garfield and the Magna plant is laid with 65-lb. steel, and the remainder of it with 90-lb. steel. The maximum gradient is 2½%, this grade prevailing for about 14 miles. The maximum curvature is 10 degrees, but there are only two curves of this character. There are four 8-degree curves, and the remainder of the curves are 6 degrees or less. The total length of tunneling on the line is 4795 ft., in four tunnels of the following lengths: 682, 754, 2079, and 1280 ft. There are three steel bridges on the upper end of the line, one across Carr Fork, adjacent to the main delivery yards of the Utah Copper Co., having a length of 690 ft., and a maximum height of 190 ft. The bridge across Markham gulch is 640 ft. long and 220 ft. high, and the Dry Fork bridge, about three miles from the upper end of the line, is 670 ft. long and 185 ft. high. The road will be operated, in so far as ore service is concerned, using the heaviest type of Mallet compound locomotives and steel ore-cars of a capacity of 120,000 pounds. This road is approximately ten miles shorter than the line over which the ores are now being delivered. It will do a general passenger and freight business, including the transportation of ores from the numerous mines at Bingham, to the smelters in Salt Lake valley.

Traction Haulage

Oil is used for fuel at the Kennedy and other mines at Jackson, California. It was formerly hauled from Ione, at the end of a Southern Pacific branch, to the various mines in tank wagons, of which one is illustrated below. These wagons were hauled by traction engines. The engine shown in the figure is connected with the boiler ahead and is used on hills where extra motive power was required. One tractor thus hauls 192 bbl. of oil over a mountain road with heavy grades. The rate per barrel was 50c., the distance being approximately twelve miles. Concentrate was taken on the return trip at $1 per ton. At these prices the contractor did so well that a railway was built from Ione to Martel, within a mile of the principal mines. From this point oil is now delivered to the Kennedy mine through a 6-in. pipe-line, 5000 ft. long. In summer the oil flows by gravity, but in winter must be pumped. For that purpose a pump is placed at the railway terminal, being driven by compressed air delivered through a 2-in. line from the mine plant. This saves 16c. per barrel on the old rate and the line has paid for itself several times over.

TRACTION HAULAGE, SUPPLEMENTARY ENGINE.

Suitable roads are required for traction haulage, and the degree of hardness of the road is much the most important. In a soft road the heavy load upon the wheels causes them to make a heavy rut; if the depth of the rut is 4 in., then the traction engine is practically climbing up a perpetual 4-in. ledge. On a hard road little difficulty is experienced, providing the grades are not too steep and the bridges strong enough.

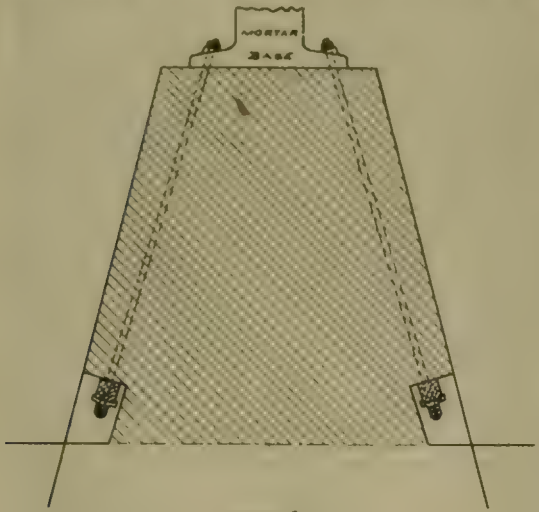
Discussion

Readers of the Mining and Scientific Press are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Battery Foundations

The Editor:

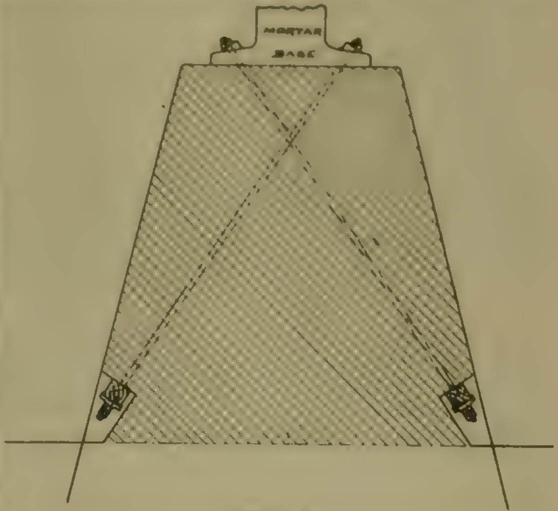
Sir—What is the best form of battery foundation assuming that some form of concrete block is to be used? I have been comparing forms recently built or planned, and find there is considerable difference as well as divergence of opinion among engineers as to the advantages of each form. Form No. 1 shown below, is essentially that in use at the Goldfield Consolidated, the Nevada Hills, the Mother Lode (British Columbia), and perhaps other mines. It is sometimes spoken of as the 'Fraser & Chalmers' design. Why, I do not know. In this form, as in all the others, a pipe is bedded in the cement and the bolts are placed in this pipe so that broken bolts may be easily replaced. There are nuts at each end. At the upper end an iron washer brings the nut snug against the mortar base. At the lower end a woden beam placed lengthwise of the battery distributes the stress and by its compressibility permits the bolt to be kept tight. This form works well in practice. It is simple and easily built, there being no hollow space in the concrete block, the strength of the latter is not impaired, and reinforcement of the concrete is not necessary. Where old cable or iron rods are available some reinforcement is, however, occasionally used. The disadvantages of this form are that renewal of broken rods is awkward. Owing to the shape of a mortar it is necessary to lift it off the block whenever a new rod is placed. It will be noted, too, that the mortars are tied not to the main body of the block, but to what amounts to a ledge or heavy cornice on each side. So far as I know, nonetheless there have been no failures in practice; perhaps some of your readers can inform me.



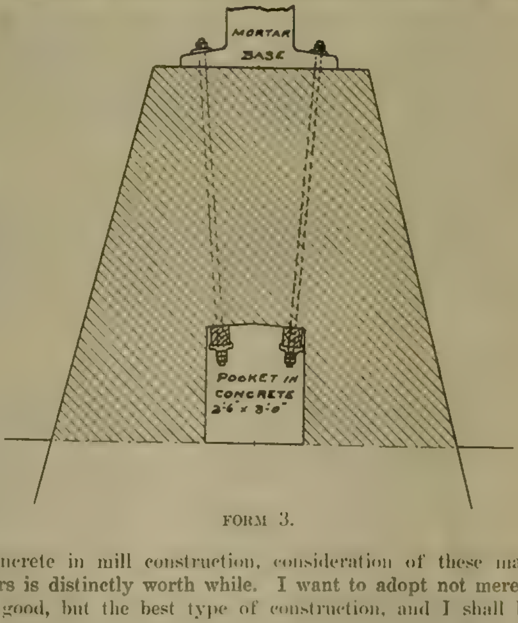
FORM 1.

To obviate the difficulties noted, Form 2 was designed, and it was reported that this form was to be used both at Goldfield and Nevada Hills. I understand that it was given up in each instance. It was, however, adopted for the Santa Gertrudis mill and is being built there. In Form 2 the bolts cross through the foundation. This attaches the mortar securely to the whole block of concrete and it also makes it possible to replace rods without lifting the mortar. The objection urged against this form is the danger of a rocking motion developing. Personally I am unable to see why this should be and I am attracted to this design. Has anyone had experience with it?

The third form has been adopted at a number of mills in Mexico. J. R. Long built it at the Alvarado Consolidated Palmillo mill, and it is also being put in at the Hollinger mine at Porcupine, Canada. It has the advantage that the mortar is securely anchored to the centre of the block, no rocking motion is possible, and bolts may be replaced often, though not, apparently, always, without lifting the mortar. It has the disadvantage that either more concrete or some reinforcement is necessary in order to build an arch which is as strong as the solid block of the other forms. The men who are using this form are entirely satisfied, but apparently experience with it has been too brief to determine what objections, if any, will develop. In view of the increased capacity of stamps set on concrete blocks and the widespread tendency to use concrete in mill construction, consideration of these matters is distinctly worth while. I want to adopt not merely a good, but the best type of construction, and I shall be very grateful therefore if some of your readers will give the benefit of their experience in the matter.



FORM 2.



FORM 3.

PUZZLED ENGINEER.

San Francisco, June 14.

The total quantity of portland, natural, and puzzolan cements produced in the United States during 1910 was 76,934,675 bbl., valued at $68,052,771. Compared with 1909, when the production was 66,689,715 bbl., valued at $53,610,563, the year 1910 showed an increase of 10,244,960 bbl., or 15.3% in quantity, and of $14,442,208, or 26.9% in value.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

IRON PIPES may be fully protected from rust for an unlimited period, by coating them with tar and filling them with light wood sawdust, which is set afire. A second coat is not necessary.

RUTILE in the powdered form, when mixed with powdered aluminum and ignited, gives an intense heat with the resulting production of ferro-titanium and alumina. It may be used to convert cast iron into titanium steel.

CRACKED vessels of glass or porcelain, for use in keeping acids, may be made tight by applying a cement made in the following manner: Take finely sifted sand, asbestos with short fibre, a little magnesia, and add enough concentrated water-glass to obtain a readily kneadable mass. The acid renders the putty firm and water-proof.

ELECTRIC FURNACES are used for copper smelting in Norway, where a 1000-hp. furnace is now in use, which is expected to produce 2000 tons per year, and a larger furnace, of 9000 tons per year capacity, is expected to start during this year. Another company is about to start the electric smelting and refining of nickel.

ROPES made of flax and hemp may be protected from rot by leaving them for four days in a solution of copper sulphate, 20 parts by weight to a litre, then allow them to dry, and then, to prevent the copper sulphate being washed away by the water, place in tar or a solution of soap—1 to 10. In the latter case an insoluble copper soap is formed.

CELLULOID can be rendered non-inflammable by denitrating it. A recent method which prevents shrinkage and deformation consists in digesting it with a suitable solution of ammonium sulphide, ammonia, and gelatin, under pressure. The gelatin replaces the nitro-derivatives thus extracted, preventing shrinkage. The gelatin is subsequently rendered insoluble.

WHERE water has been originally appropriated for hydraulic mining purposes and has not been used for such mining for more than five years, but has, nevertheless, been devoted by the claimant to some other beneficial use during said period, the title to said right is still alive. Change of character of use does not defeat water rights which have become vested prior to such changes.

WATER when used for driving hoisting engines introduces a number of troublesome problems, because power must be frequently shut off quickly and water is incompressible. The simplest means of meeting the difficulty is to attach to the water line near the wheel, a boiler or other steel shell into which the water can surge when necessary, compressing the air trapped at the top.

MONEL METAL is a nickel-copper alloy containing about 68% of nickel and a little iron, and has the non-corrosive properties of copper together with nearly the strength of steel. It is especially useful for pumps in mines, for ships' propellers, and for roofing material. It also retains its strength well at high temperatures, which has led to its adoption for locomotive firebox construction.

MANGANESE is best detected by its reaction when fused with soda before the blowpipe. Small amounts of a substance containing manganese, when dissolved in the soda bead, make it opaque and of a green color when cold. A little nitrate of soda will aid in bringing out the color, which may be obscured if too much of the substance to be tested is used, as this test is a delicate one. If a hot borax bead containing manganese is touched to a crystal of nitrate of soda, a rose-colored froth is formed. This is a useful test to corroborate the preceding one.

AIR-RECEIVERS of ample capacity are of benefit in that they equalize the load, and old boilers and tanks may frequently be connected with the system to advantage. At the Eagle-Shawmut mine a whole battery of boilers is now put to this use. At the Utica mine the manager, F. J. Martin, has an unusually large amount of air stored in the mine. This he accomplished by the simple means of bulkheading an old drift with concrete stoppings, and storing the air in it. The drift is 125 ft. long and of the usual cross-section. Being in solid rock, there has been no trouble from leakage.

STAMPS set on concrete have a larger capacity than when set on wood. This may amount to as much as 20% or even more. At the Harvard mine 30 stamps are set on wood and 30 on concrete. The latter are on anvil blocks with a single sheet of rubber belt between the concrete and the anvil block. The concrete block upon which they stand weighs approximately 300 tons. All the stamps are of the same weight (1000 lb.) and are fed with the same ore, crushing through the same screens (20 mesh). The 30 that rest on concrete crush 10 to 14 tons per day more than do the 30 on wood.

ALUMINUM is one of the most malleable of all metals. Moreover, it takes and retains a very high polish. For these reasons it is used in connection with the manufacture of articles of everyday use almost without limit. Some of these new uses are as wall 'paper,' ceiling panels, stamped or hammered trays, and finger-plates, in the form of very thin sheets as a substitute for lithographic stones and zinc plates; and in the panels of car and carriage bodies. The advantages of aluminum in the manufacture of cooking utensils is well known; among these advantages are long life, non-corrosion from acids, and lightness.

TWO TRACTS of land, A and B, are owned by the same person. He also owns a ditch which diverts water from a stream on tract A, the ditch conveying the water from tract A onto tract B where it is used. The owner sells tract A and his deed contains no reservation of the right to take the water out of the stream and convey it through the ditch and off of tract A. A question at once arises whether the original owner can continue to divert the water through the ditch, in view of the fact that he has conveyed the land it crosses without reserving such right in his deed to another. The authorities hold that he can, provided the ditch was in use at the time of the sale, and that no specific reservation is necessary. The purchaser takes the property burdened with all lawful easements which exist upon it at the time he acquires title. He is bound to take notice of the conditions visible at the time of his purchase.

BATTERY SCREENS rarely wear uniformly. In many mills they break first at the bottom immediately above the edge of the frame. Many devices have been tried to remedy this. In some mills the screen cloth is cut extra width and after it has worn at the bottom the screen is torn off, reversed, and refastened to the frame. This brings an unworn part at the place of greatest wear. It is difficult, however, to detach wire cloth, without tearing, after it has once been nailed to a frame, and various screen locking devices have therefore been invented. These consist essentially of a false frame setting down over the screen and wedged into place. One such device, an excellent one, invented by R. E. L. Lampson at the Harvard mill, is manufactured at Angels, but any good mill-man can make one that will serve his purpose. In places where the heavy wear is in the middle of the screen, a protective sheet of coarse wire netting may be placed inside the regular screen. This protects the latter from being hit by heavy pieces of rock and does not greatly reduce the capacity.

Special Correspondence

JOHANNESBURG, TRANSVAAL

Economies in Rand Working Cost.—Relation Between Cost and Grade.—Generalization Not Possible.—Effect of Fine on Crushing.—Rand Geology.

The paper recently read before one of the local mining institutes on 'Future Economies in Rand Reduction Plants' will not be allowed to pass without provoking considerable discussion, and expressions of opposite views. In the first place, the general statement that the cost of mining on the Rand must be expected to increase six pence per ton for every additional thousand feet in depth, and that the value of the ore on these fields is everywhere falling as greater depths are attained, cannot be said to be borne out by facts. The mining cost on the Rand has, as a matter of fact, fallen of late as working depths have increased, but this reduction in working cost has been obtained at the expense of the grade. It has been a general rule on the Rand, with only one or two startling exceptions, that high grade has been synonymous with high cost. If the cost is to be reduced, the reduction must be made at the expense of the grade. Lately some mines like the Robinson Deep and the Village Main have been raising their grade at the expense of higher working cost per ton, but the result has been higher aggregate profits. There are so many different conditions to take into consideration at the different mines here that the working cost can scarcely be regarded as affording any reliable criterion as to the efficiency or economy of either the working or management of any individual mine. Nor will the same policy of mining be applicable in every instance, because the handling of each mine to the best advantage will depend upon the individual circumstances of the mine. There is, however, much justification for the view that it will be only when the huge local mine amalgamations get into proper swing that mining proper will have commenced, and with the large scale of operations the mining and reduction cost is sure to be brought down to the neighborhood of ten shillings per ton. No doubt, as a result of increased depth, mining operations must be more expensive, but no definite increase can be fixed upon, as stated in the paper. The improved mining methods now being introduced must make for lower working costs in spite of the greater depth attained.

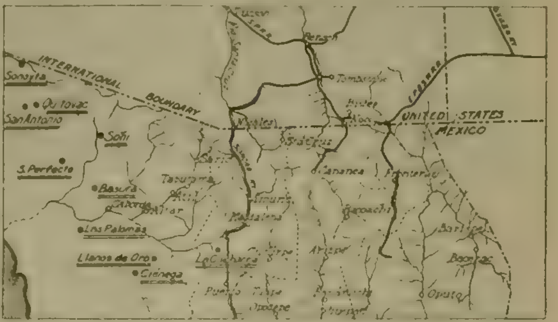
Then again, a member of the Mines Trials Committee of the Chamber of Mines disputes the statement that by taking the fine direct to the tube-mills without passing through the battery the cost of treatment will be reduced, either in capital outlay or operating costs, as it is urged that the absence of the fine does not enable the stamps to crush an increased quantity of ore. Experiments made at the New Kleinfontein mine tend to show that the reverse is the case. The same authority points out that it is possible that in some instances on the Rand second-stage crushing may be carried on to such an extent as to adversely affect the extraction, despite the additional cost incurred, and compares the results obtained at the New Kleinfontein, where there are no tube-mills employed, with the results obtained at the East Rand Proprietary Mines, where he considers tube-milling may possibly be carried to excess. It is clear that the paper will give rise to considerable discussion in mining and metallurgical circles here, and despite the evident traces it bears of hasty preparation can not help but do good by causing some further reflection to be made on the rapid and marked changes now in progress in the metallurgy of the Rand gold mines.

The author of that well-known work, the 'Mines of the Transvaal,' has been writing a series of articles on mining subjects for one of the Johannesburg newspapers. There can be no doubt of the ability of the writer to present his facts to his readers in a very readable and interesting manner, but these articles would seem to show that he is more of a tenderfoot in mining matters than his excellent book would lead one to believe, judging from the numerous blunders these articles contain. The last article written questioning whether the Van Ryn reef, on the East Rand, really belongs to the Main Reef Series, shows such a lamentable ignorance of well established geological facts that locally the article will be read with considerable amazement. He questions the identity of the reef on the Blue Sky mine with that of the Cason, being apparently oblivious of the fact that underground operations have conclusively proved that the reefs are undoubtedly one and the same. Then, with regard to the Van Ryn reef not being contemporaneous with the Main Reef Series, its connection has been traced all the way from Van Ryn to the Cason. In the Far East section of the Rand itself every underlying reef and underlying indication that the Van Ryn reef is nothing more nor less than the Main Reef Series exists, while the attempts to show that the Dupreez Series is a continuous series throughout the Rand, as the author of 'Mines of the Transvaal' does in this article, is directly at variance with the views of the Government Geological Survey, the members of which are now busily engaged in making a geological survey of the Rand goldfields.

MEXICO

Reopening of Railroad Communication.—Shipments Resumed.—New Smelters in Sonora.—Moctezuma Production.—New Properties of Esperanza, Ltd.—Suspension of Power Plant.

Railroad communication between Cananea and the United States was reëstablished after the signing of peace, and operations now are proceeding as usual. The burning of bridges in May left the camp without shipping facilities during a portion of that month but the Cananea Consolidated (Greene-Cananea) had sufficient supplies of fuel oil and coke to prevent a shut-down. The concentrate of the Miami Copper Co., which is being smelted at Cananea, was held at Naco during the tie-up. Supplies for the Cananea Consolidated accumulated at the border, and were rushed into Cananea as soon as the railroad damage was repaired. In the Sierra de Cobre property, purchased by the Greene-Cananea from the Phelps-Dodge interests, a 40-ft. vein was recently opened, and ore running as high as 5% copper and 100 oz. silver per ton is being taken out. The Henrietta mine, closed last year when it was decided to curtail production, has been reopened.



NORTHERN PORTION OF SONORA.

The Sonora Copper Smelting Co. and the Cobriza Mining Co. will shortly blow-in copper smelters in the Magdalena district of Sonora. Both companies have been carrying on development for several years, and both report extensive ore supplies. The plant of this company was built under a State concession providing for important tax exemptions for a period of 20 years. The company plans later to erect a concentrator, and to increase the smelting capacity from 100 to 500 tons daily.

In the first five months of this year the Moctezuma Copper Co. (Phelps-Dodge), operating the Pilares mine and concentrator at Nacozari, Sonora, had a production of 10,456,929 lb. of copper. In the corresponding period of

1910 the production was 9,911,608 lb. The company started the year with a production in January of 1,738,429 lb., and each succeeding month has shown an increase. This year's production is expected to be considerably in excess of that of 1910.

That the Esperanza, Ltd., the English company controlling the Esperanza gold mine in the El Oro district of the State of Mexico, is looking for another property is disclosed by the report of the company's consulting engineer. He states that during the past year no less than 29 properties were investigated, but none was considered sufficiently promising to be taken over. While it is denied that the end of the Esperanza is in sight, it is stated that the company is anxious to secure a mine that will be a guarantee of many more years of successful operation. At the end of 1910 there was an increase of 140,000 tons in the Esperanza ore reserve, the estimated total being 367,000 tons. Since organization, 7½ years ago, Esperanza has paid in dividends £2,229,000, equal to 490 per cent.

As a result of depredations committed by armed men, calling themselves revolutionists, at Salinas, State of San Luis Potosi, the power plant there was put out of commission, depriving the Salinas of Mexico, Ltd., and the Benito Juarez Mines Co. of power and forcing a suspension of work. The Salinas of Mexico is an English company controlling the principal salt enterprises of Mexico, and carrying on extensive operations at Salinas. The Benito Juarez company is a Los Angeles concern, operating several mines and a reduction plant. The mine workings have been flooded since the cutting off of power, and considerable damage has resulted.

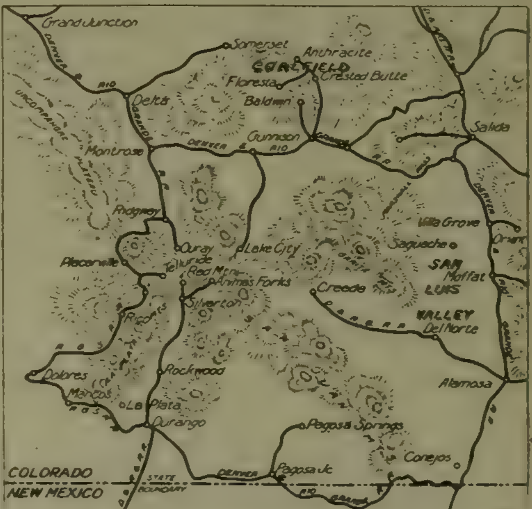
SILVERTON, COLORADO

Examinations of Peerless San Juan, Kittimac, and Tom Moore.—Vermillion Resumes Shipments.—Gold King Reduces Force.—Iowa Mill Temporarily Closed.—Silver Ledge Examined.—Pride of West Shipping.—Congress Sale.

Little new capital has been invested in this district this year, but several important deals are pending. The Peerless San Juan is being examined in the interest of an Eastern leasing company, and the Kittimac and Tom Moore have been examined by an agent of the A. S. & R. Co. The results of these examinations have not been made public. The Silverton railroad was opened to Animas Forks early in June, and the Vermillion mine resumed shipments of concentrate June 15. The mill has been running six weeks and the company has nearly 500 tons of concentrate stored in the bins. The products are lead and zinc concentrate, the former going to Durango, and the latter to Blende. The mill has a daily capacity of 75 tons of ore and the mine is reported to have 50,000 tons of ore available. The Sunnyside at Eureka is planning extensive development work and continues its average production. The Gold King closed down May 27 and resumed operations June 7 with a reduced force, at present employing 50 men and operating 40 of the 80 stamps in the mill. The company found operations on the scale originally planned impossible because of an inadequate ore supply. The ore available at present is low grade, and the property can only with the best management and engineering hope to show a profit. The mine is being operated under lease, and the leasing company seems to be suffering from a lack of sufficient funds to carry out the development required.

The Silver Lake lease has been forfeited by the lessees, because of the refusal of the company to grant certain modifications. It is rumored that the property will be operated on company account, although this seems unlikely in view of the history of the mine and the fact that the company closed it several years ago. Since then there has been no new development that would cause the company to regard the project with favor. The Iowa mill closed June 15 because of a low supply of ore in the mine. The lessees immediately started development on a large scale, and as they are driving toward orebodies that were extensive in all the levels above, it is believed that their efforts will succeed. The plan is to resume milling in July, when it is thought that the ore supply will be ample. The Intersection Leasing Co. cancelled the lease on this mine June 7, and the owners have decided to close the property indefinitely. The Hercules is still idle, but Mr. Kane, the manager, has been in Silverton two weeks and an early resumption is looked for. The Silver Ledge was examined in May for the Chicago lessees. A meeting of stockholders has been called June 24 to discuss means of raising money to liquidate the present indebtedness, and provide for the payment of the purchase price. The property is under bond and lease and the present operators have controlled the mine for two years, and have invested $100,000 in development work, but have never made a payment on the original price of $125,000.

The Danville company, operating the Trilby mine, has a force of six men engaged in cleaning up and putting the property in condition for active work. The Pride of the West has shipped two cars of ore and reports some good ore. The management expects to ship steadily during the summer. A deal is pending for the sale of the Congress, one of the well known Red Mountain mines, and the owners are at present in Denver on business connected with the transfer. Should the property change hands it will probably become an important producer. It has produced ore of a gross value of $500,000, and is down 200 ft. from the surface. The shaft has been sunk to the 400-ft. level and a cross-cut run toward the ore-shoot or chimney. This work is within 50 ft. of the ore, and if, when cut, the chimney shows the same richness as above, the mine will have a good future.



MAP OF SOUTHWESTERN COLORADO.

The lien law mentioned last month has been vetoed by the Governor. The Denver Chamber of Commerce and the newspapers have started a campaign to encourage prospecting. A sum of money has already been subscribed for a grubstake fund. As there is an immense amount of unexplored territory in the San Juan this district offers an excellent field for the prospector, and it is likely that some of the fund will be expended there. The railroad and smelter have reduced rates on all ores shipped and treated of a gross value of $15 or less. As this ore can hardly be shipped at a profit, except under the most favorable conditions, this reduction will be of little benefit, although every step in this direction is encouraging. A substantial reduction on ores from $30 to $50 would be of great benefit, but the railroads and smelters can not afford it under present conditions. Neither is there much prospect of local smelters, which would do away with long hauls, being of much assistance, for their working costs are so high that they cannot be operated at a profit.

SALT LAKE, UTAH

Hopeful Views of the Copper Situation. Increased Production of Lead Ore. Progress near Bingham. New Development in Park City District.

John D. Ryan, president of the Amalgamated Copper Co., has joined the chorus of officials of copper producing companies predicting higher prices for copper. While in Salt Lake on a visit to the Tooele plant, Mr. Ryan gave out an interview in which he predicted a steady advance in copper prices, with a better market than has existed for four years. He said that the consumption at home and abroad is increasing more rapidly than the production is likely to grow, and that the visible supply, together with stocks in consumers' hands, will continue to diminish. D. C. Jackling, general manager of the Utah Copper, Nevada Consolidated, Ray, and Chino, is also optimistic. He declares that the metal will sell at 13c. within two months. Mr. Ryan further said the company intended to make a special effort to encourage the production of lead ores. The International company is making an active campaign for lead ores. It recently made a contract for 70 tons of concentrate per day from the Hecla mine in the Coeur d'Alene district, and for some time it has been piling up ore and concentrate from the Daly-Judge mine in Park City, and accumulating ores from other properties. It is expected that the lead furnaces will be ready in October or November.

The Yampa company, operating at Bingham, is making a far better showing under its new management. Mr. Moodie, general manager, has been developing more ore, and it is stated he has succeeded in mining and treating it at a good profit. The company is now shipping about 600 tons of copper ore daily to the Garfield smelter, and it is developing some lead ore also. Experiments on concentrating the low-grade copper ore will be made at the Winnemucca mill in Bingham. The Utah-Apex at Bingham, after having closed down its mill for nearly seven months during a period of active mine development, has again started up its concentrator. During that period the management has opened up two good orebodies, from which 150 tons per day of shipping ore is being sent out, while ore of milling grade is being developed. Within a short time the mill will be treating about 175 tons per day, it is expected. While little progress is being reported on the new financing of Ohio Copper, the operating department is pushing ahead rapidly. Some 40 of the 60 Deister slime tables recently purchased have been installed, the regular concentrating tables being taken from the slime plant and transferred to the main mill. The entire equipment is reported to be doing excellent work. The tonnage has been increased from 1500 to 1600 tons per day to 1700 tons average, while one day's run was 2100 tons, and it is said the saving is high. Despite an active opposition campaign, the old management of the Bingham Copper Co. was well supported at the annual meeting. The directors elected were: President, Carl Brandt; secretary, W. T. Wheden; treasurer, George E. Davis; R. J. Evans and W. D. Bohm. The method of financing the requirements of the company was left to the board. In a statement issued shortly after the meeting, the board stated its expectation of resuming active work at the property within sixty days. Two additional sections of the Arthur concentrator of the Utah Copper have been overhauled and remodeled, making a total of five sections in operation with the new Janney classifiers and Garfield roughing tables. When the work is completed the two mills will be ready to handle regularly 20,000 tons of ore per day.

There is a great increase in activity in the Park City district. At the Daly-Judge the connection made with the Ontario drainage adit on the 1900-ft. level is important. The water is being easily handled by the adit, and the company is at last in a position to mine the lower levels from which it has hitherto been kept. Known ore-shoots will now be opened up at depth, and vigorous exploration work will be continued. The company is installing Richards-Janney classifiers in the mill and is making other preparations to increase both efficiency and capacity. The Daly West has added two more tables to its mill, and the management reports favorable developments in several parts of the mine. The Silver King Consolidated has opened large quantities of high-grade ore in the Ida May and Spitfire raises. Following the recent judgment in favor of this company against the Silver King Coalition for $737,007, these developments have given a great impetus to the company. A long term favorable smelting contract is reported by the management. The old Ontario, pioneer in the camp, is taking on new activity. The shipments of ore from Park City for May amounted to 9823 tons.

TORONTO, CANADA

New Discoveries. Development in Outlying Areas. Underground Work at Rea and East Dome. Hollinger Mill. Ontario Mineral Production. Quarterly Dividends.

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1910 the production was 9,911,608 lb. The company started the year with a production in January of 1,738,429 lb., and each succeeding month has shown an increase. This year's production is expected to be considerably in excess of that of 1910.

That the Esperanza, Ltd., the English company controlling the Esperanza gold mine in the El Oro district of the State of Mexico, is looking for another property is disclosed by the report of the company's consulting engineer. He states that during the past year no less than 29 properties were investigated, but none was considered sufficiently promising to be taken over. While it is denied that the end of the Esperanza is in sight, it is stated that the company is anxious to secure a mine that will be a guarantee of many more years of successful operation. At the end of 1910 there was an increase of 140,000 tons in the Esperanza ore reserve, the estimated total being 367,000 tons. Since organization, 7½ years ago, Esperanza has paid in dividends £2,229,000, equal to 490 per cent.

As a result of depredations committed by armed men, calling themselves revolutionists, at Salinas, State of San Luis Potosi, the power plant there was put out of commission, depriving the Salinas of Mexico, Ltd., and the Benito Juarez Mines Co. of power and forcing a suspension of work. The Salinas of Mexico is an English company controlling the principal salt enterprises of Mexico, and carrying on extensive operations at Salinas. The Benito Juarez company is a Los Angeles concern, operating several mines and a reduction plant. The mine workings have been flooded since the cutting off of power, and considerable damage has resulted.

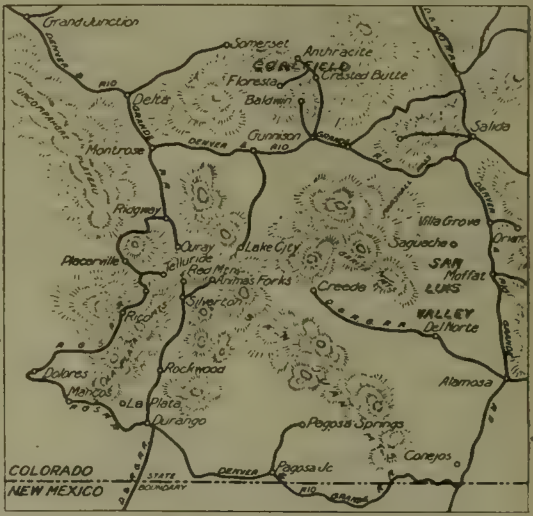
SILVERTON, COLORADO

EXAMINATIONS OF PEERLESS SAN JUAN, KITTIMAC, AND TOM MOORE.—VERMILLION RESUMES SHIPMENTS.—GOLD KING REDUCES FORCE.—IOWA MILL TEMPORARILY CLOSED.—SILVER LEDGE EXAMINED.—PRIDE OF WEST SHIPPING.—CONGRESS SALE.

Little new capital has been invested in this district this year, but several important deals are pending. The Peerless San Juan is being examined in the interest of an Eastern leasing company, and the Kittimac and Tom Moore have been examined by an agent of the A. S. & R. Co. The results of these examinations have not been made public. The Silverton railroad was opened to Animas Forks early in June, and the Vermillion mine resumed shipments of concentrate June 15. The mill has been running six weeks and the company has nearly 500 tons of concentrate stored in the bins. The products are lead and zinc concentrate, the former going to Durango, and the latter to Blende. The mill has a daily capacity of 75 tons of ore and the mine is reported to have 50,000 tons of ore available. The Sunnyside at Eureka is planning extensive development work and continues its average production. The Gold King closed down May 27 and resumed operations June 7 with a reduced force, at present employing 50 men and operating 40 of the 80 stamps in the mill. The company found operations on the scale originally planned impossible because of an inadequate ore supply. The ore available at present is low grade, and the property can only with the best management and engineering hope to show a profit. The mine is being operated under lease, and the leasing company seems to be suffering from a lack of sufficient funds to carry out the development required.

The Silver Lake lease has been forfeited by the lessees, because of the refusal of the company to grant certain modifications. It is rumored that the property will be operated on company account, although this seems unlikely in view of the history of the mine and the fact that the company closed it several years ago. Since then there has been no new development that would cause the company to regard the project with favor. The Iowa mill closed June 15 because of a low supply of ore in the mine. The lessees immediately started development on a large scale, and as they are driving toward orebodies that were extensive on all the levels above, it is believed that their efforts will succeed. The plan is to resume milling in July, when it is thought that the ore supply will be ample. The Intersection Leasing Co. cancelled the lease on this mine June 7, and the owners have decided to close the property indefinitely. The Hercules is still idle, but Mr. Kane, the manager, has been in Silverton two weeks and an early resumption is looked for. The Silver Ledge was examined in May for the Chicago lessees. A meeting of stockholders has been called June 24 to discuss means of raising money to liquidate the present indebtedness, and provide for the payment of the purchase price. The property is under bond and lease and the present operators have controlled the mine for two years, and have invested $100,000 in development work, but have never made a payment on the original price of $125,000.

The Danville company, operating the Trilby mine, has a force of six men engaged in cleaning up and putting the property in condition for active work. The Pride of the West has shipped two cars of ore and reports some good ore. The management expects to ship steadily during the summer. A deal is pending for the sale of the Congress, one of the well known Red Mountain mines, and the owners are at present in Denver on business connected with the transfer. Should the property change hands it will probably become an important producer. It has produced ore of a gross value of $500,000, and is down 200 ft. from the surface. The shaft has been sunk to the 400-ft. level and a cross-cut run toward the ore-shoot or chimney. This work is within 50 ft. of the ore, and if, when cut, the chimney shows the same richness as above, the mine will have a good future.



MAP OF SOUTHWESTERN COLORADO.

The lien law mentioned last month has been vetoed by the Governor. The Denver Chamber of Commerce and the newspapers have started a campaign to encourage prospecting. A sum of money has already been subscribed for a grubstake fund. As there is an immense amount of unexplored territory in the San Juan this district offers an excellent field for the prospector, and it is likely that some of the fund will be expended there. The railroad and smelter have reduced rates on all ores shipped and treated of a gross value of $15 or less. As this ore can hardly be shipped at a profit, except under the most favorable conditions, this reduction will be of little benefit, although every step in this direction is encouraging. A substantial reduction on ores from $30 to $50 would be of great benefit, but the railroads and smelters can not afford it under present conditions. Neither is there much prospect of local smelters, which would do away with long hauls, being of much assistance, for their working costs are so high that they cannot be operated at a profit.

SALT LAKE, UTAH

Hopeful Views of the Copper Situation. Increased Production of Lead Ores. Progress near Bingham. New Development in Park City District.

John D. Ryan, president of the Amalgamated Copper Co., has joined the chorus of officials of copper producing companies predicting higher prices for copper. While in Salt Lake on a visit to the Tooele plant, Mr. Ryan gave out an interview in which he predicted a steady advance in copper prices, with a better market than has existed for four years. He said that the consumption at home and abroad is increasing more rapidly than the production is likely to grow, and that the visible supply, together with stocks in consumers' hands, will continue to diminish. D. C. Jackling, general manager of the Utah Copper, Nevada Consolidated, Ray, and Chino, is also optimistic. He declares that the metal will sell at 14c. within two months. Mr. Ryan further said the company intended to make a special effort to encourage the production of lead ores. The International company is making an active campaign for lead ores. It recently made a contract for 70 tons of concentrate per day from the Hecla mine in the Coeur d'Alene district, and for some time it has been piling up ore and concentrate from the Daly Judge mine in Park City, and accumulating ores from other properties. It is expected that the lead furnaces will be ready in October or November.

The Yampa company, operating at Bingham, is making a far better showing under its new management. Mr. Moodie, general manager, has been developing more ore, and it is stated he has succeeded in mining and treating it at a good profit. The company is now shipping about 600 tons of copper ore daily to the Garfield smelter, and it is developing some lead ore also. Experiments on concentrating the low-grade copper ore will be made at the Winnemucca mill in Bingham. The Utah-Apex at Bingham, after having closed down its mill for nearly seven months during a period of active mine development, has again started up its concentrator. During that period the management has opened up two good orebodies, from which 150 tons per day of shipping ore is being sent out, while ore of milling grade is being developed. Within a short time the mill will be treating about 175 tons per day, it is expected. While little progress is being reported on the new financing of Ohio Copper, the operating department is pushing ahead rapidly. Some 40 of the 60 Deister slime tables recently purchased have been installed, the regular concentrating tables being taken from the slime-plant and transferred to the main mill. The entire equipment is reported to be doing excellent work. The tonnage has been increased from 1500 to 1600 tons per day to 1700 tons average, while one day's run was 2100 tons, and it is said the saving is high. Despite an active opposition campaign, the old management of the Bingham Copper Co. was well supported at the annual meeting. The directors elected were: President, Carl Brandt; secretary, W. T. Wheden; treasurer, George E. Davis; R. J. Evans and W. D. Bohm. The method of financing the requirements of the company was left to the board. In a statement issued shortly after the meeting, the board stated its expectation of resuming active work at the property within sixty days. Two additional sections of the Arthur concentrator of the Utah Copper have been overhauled and remodeled, making a total of five sections in operation with the new Janney classifiers and Garfield roughing tables. When the work is completed the two mills will be ready to handle regularly 20,000 tons of ore per day.

There is a great increase in activity in the Park City district. At the Daly-Judge the connection made with the Ontario drainage adit on the 1900-ft. level is important. The water is being easily handled by the adit, and the company is at last in a position to mine the lower levels from which it has hitherto been kept. Known ore-shoots will now be opened up at depth, and vigorous exploration work will be continued. The company is installing Richards-Janney classifiers in the mill and is making other preparations to increase both efficiency and capacity. The Daly West has added two more tables to its mill and the management reports favorable developments in several parts of the mine. The Silver King Consolidated has opened large quantities of high-grade ore in the Ida May and Spitfire raises. Following the recent judgment in favor of this company against the Silver King Coalition for $747,007, these developments have given a great impetus to the company. A long-term favorable smelting contract is reported by the management. The old Ontario, pioneer in the camp, is taking on new activity. The shipments of ore from Park City for May amounted to 9823 tons.

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A statement issued by the Ontario Bureau of Mines gives the total value of the output of the metalliferous mines of Ontario for the first three months of 1911 as $6,808,769. The leading place is occupied by silver, the production of which was 7,530,487 oz., valued at $3,708,544, being an increase in value of $667,386 over the corresponding months of last year. Nickel showed a decrease of $246,032. The gold output for the three months was only 1813 oz., valued at $33,990. The Nipissing has declared its usual dividend of 5% with an extra 2½%. The La Rose still adheres to its conservative policy and will not raise its dividend over the regular 2%, although it announces a surplus of over $1,250,000. The Trethewey, which pays dividends intermittently, has declared a dividend of 10%. The smelter of the Canada Refining & Smelting Works at Orillia, Ontario, is now in successful operation treating Cobalt ore, and the erection of additional buildings which will double its capacity has begun.

NEW YORK

Peculiar Features of the Copper Market.—Inspiration Merger.—Annual Report of New Keystone.—Ray Central.—Low Working Costs.—Sale of Gold Roads.—Sale of Summit Mine.—News from Porcupine. Market Prices.

There has been a strong attempt to renew public interest in copper, and the improved demand has been made much of from every possible point of view. Apparently the main object to be gained at this juncture is an upward movement in copper shares, headed by Amalgamated. It is an anomalous situation, that in a period of general appreciation in prices, a staple in which production and consumption are running at record figures remains at or below the average price for the past ten years. In a way, the progress made in methods of treatment and in the handling of ore has reacted to the disadvantage of the copper producers. The present controlling factors in copper production have been built up at great expense, and can only operate on an immense scale. Already it is plain that the present fractional advance in price will stimulate production, and while improved figures will appear in the Producers' Association figures for June, it is safe to say that later months will show accumulated stocks again on the increase. Conditions must inevitably emphasize the necessity for adjustment between production and consumption. The legal obstacles in the way of a copper merger seem at present to be insurmountable, so much so that for the time there is no discussion of plans or possibilities to be heard.

The Inspiration-Miami consolidation appears to be definitely sidetracked for the time being. It is stated that the Lewisohns, on behalf of the Miami, suggested a joint ownership of power plant and concentrator. The Gunn-Thompson interests responded with a counter proposition of consolidation, but while numerous conferences were held, it was impossible to agree on a basis satisfactory to all. The Inspiration is to erect a 5000-ton mill immediately, and W. H. Aldridge, manager, and Henry Krumb, consulting engineer, for the company are now on the ground for the purpose of starting the work. The New Keystone Copper Co., which, like the Miami, is a subsidiary of the General Development Co., has completed its report for the year ended June 1, showing some 2,000,000 tons of developed ore averaging 2.25% copper. Discoveries made by the Live Oak, adjoining the New Keystone on the west are considered very important by the latter, and some further drill work is to be done in the belief that new orebodies will be found in the same formation developed by the Live Oak. A computation of the developed ore reserve of the Ray Central is to be given out within a short time. During the period covered by the option held by the General Development Co. on Ray Central, the latter had a large public. Interest in the issue has declined ever since J. Parke Channing made public his determination to reject the property. It seems the last word never will be said on lowered copper costs. Nevada Consolidated is stated to have made its May output under 6c. per pound, and is working for still lower costs by constructing new converters, the largest in the world, and rebuilding reverberatory furnaces for the use of fuel oil. The various developments at Butte point to an increased production. There has been a steady advance in North Butte predicated upon betterment in ore reserve. The East Butte is building a third furnace at the Pittsmont smelter, and this mine will be producing 1,500,000 lb. monthly as soon as the price will justify it. The Tuolumne is installing a Nordberg hoist, and will be ready to make a greatly enlarged output within a short time. The issue is one of the strongest among the active copper shares traded in in New York.

It is definitely announced that the United States Smelting, Refining & Mining Co. has completed its negotiations for the purchase of the Gold Roads property near Kingman, Arizona. The agreed purchase price is $1,400,000. The property is said to have been purchased on the strength of ore developed approximately equivalent to the figure asked. There is a little mystery concerning the active canvass being made for proxies by some of the heavier holders in the Montgomery-Shoshone Consolidated Mining Co. The concern, once the pride of Charles M. Schwab, is to be wound up, the mill sold, and nothing remains to be done except to get the requisite authority from the stockholders. Inasmuch as the company's last statement showed some $225,000 due Mr. Schwab for money loaned, and as the mill and other equipment to be sold can hardly bring half that sum, it is a little curious that the requests for proxies should be so numerous and urged so strongly. The directors of the Tonopah-Belmont held a special meeting at Philadelphia this week and voted to erect a new slime mill of 500 tons daily capacity.

It is said that D. Lorne McGibbon and Frank C. Armstrong have purchased the Summit Gold mine on Sheep creek, near Nelson, in British Columbia. The interest in Porcupine is reawakening in the East. The opening of the railroad, a sensational strike on the Porcupine Gold Reef, in what is known as the Bannerman district; another on the North Dome, the latter being owned almost wholly on this side of the line, the property having been financed by Catlin & Powell in New York and London, where the issue is active on 'change. The class of new offerings is worthy of comment. The Daly-Taylor, the Ontario Porcupine Goldfields Development Co., are examples of the better class. The Development company is the Bewick-Moreing organization, to be under the direction of Gerrard Lovell, recently chief engineer of the Great Burmah Silver Mines in India and formerly of the Great Fingall Gold Mines in Australia. The Timmins-McMartin interests, which dominate the Hollinger, are on the advisory board of the Development company. The principal adverse comment is anent the lack of cohesion in the market for Porcupine shares. Hollinger has advanced bravely from around $6 to $16, but it has advanced alone, the tendency in other issues being, on the whole, toward lower levels. The fear is expressed that a market fiasco in Hollinger might have the same effect as did the unfortunate episode in Nipissing in the early days of Cobalt.

General Mining News

ALASKA

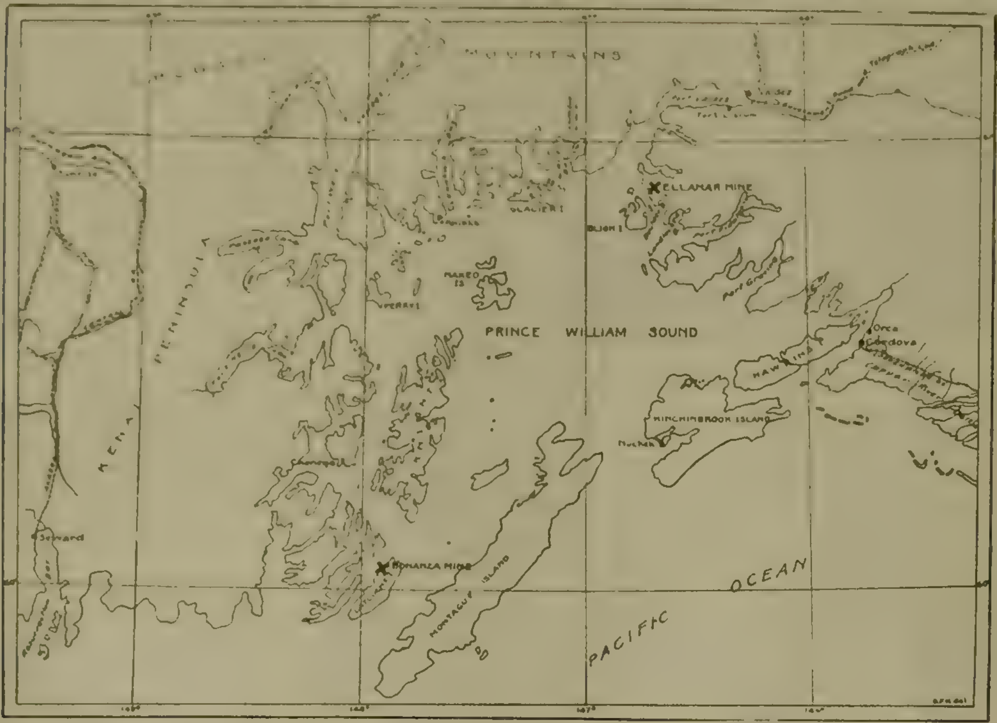
Juneau District

The report of the Alaska Mexican Gold M. Co., Douglas island, for the month ended May 15, 1911, shows that the 120-stamp mill was operated practically full time, that 15,936 tons of ore was crushed, and 128 tons of concentrate was saved. The estimated gross value of free gold recovered was $22,251; base bullion, $1324; concentrate, $24,404; total, $47,980; less $4383 for 2124 tons of ore from United 700 mine, $43,597. Estimated total realizable value of product, $43,161. Operating expenses, $28,275; net operating profit, $14,888. Construction expenses, $2601. Yield of ore milled, $2.77 per ton; stock of ore broken, 4713 tons; development, 108 feet.

Prince William Sound

The Vancouver Valdez M. Co., M. S. Kain manager, is developing its mining claims on Shoup bay, near Valdez. An adit-level is being driven on the vein. The ore found in the adit and in the vein cropping is of such grade as to justify confidence in further development. There is reported at Valdez a growing tendency to encourage the leasing system as a means of developing the mining resources of that region. Among those who recently located mineral claims between tidewater and Shoup glacier are J. E. Haggerty, E. F. German, L. Graham, D. Sheehan, R. A. Clousterman, Harold Graham, C. H. Hill, M. L. and J. B. McAllister, J. O'Brien, H. L. Jaynes, and Joseph Child.

The 40 claimants who filed on coal lands known as the Stracey group, situated in the same locality as the Cunningham claims, have been cited by the Juneau land office officials to show cause why their claims should not be recommended to the Commissioner of the General Land Office for cancellation. A special agent of that department has charged that the claims were not made in good faith, but that each claim had been filed upon under an agreement with the Alaska Development Co. and the Pacific Coal & Oil Co. It is said that the claimants are Seattle men, and that A. H. Stracey of Vancouver, B. C., was concerned in the alleged effort to secure 6400 acres of coal land for these companies. The Secretary of the Interior, on June 26, disallowed the 33 coal land claims of the Cunningham group, about which there has been such a protracted controversy, on the ground that the claimants were under agreement to turn the property over to a syndicate as soon as title was secured, which was held to be in direct violation of the law. Patents will not be issued, and the claims are ordered canceled.



PRINCE WILLIAM SOUND, ALASKA.

Seward Peninsula

The spring clean-up of winter dumps on the Nome tundra is estimated at $400,000.

The Tanana

George Lamontagne, who with three partners composed the Union Mining Co., which operated as a lessee on No. 17 Goldstream, near Fairbanks, during the seasons of 1908, 1909, and 1910, has sold out his interests there and has purchased a mining property on Kenai peninsula, which he is developing. No. 17 Goldstream, which belongs to L. L. James & Co. of San Francisco, is said to have yielded about $1,000,000 in the three seasons named.

ARIZONA

Cochise County

A custom concentrator is to be built at Paradise by Ray people, represented by R. H. Hickey. The proposed mill is expected to be operated on ores produced in the Chiricahua mountains, where there are a number of mines which are small producers. Paradise, the centre of the district, is 20 to 30 miles from the nearest railroad station.

The labor liens, amounting to $29,000, filed against the Tombstone Con. Mines Co., since its mines closed down last winter, are expected to be paid off in July, and that the company may be able to resume operations in August. The 100 miners who were working for the company at the time work was suspended have since then been working in the mines as lessees. The leased ground is above water-level where there are high-grade streaks of ore. By this arrangement the Tombstone camp has been kept fairly active.

Greenlee County

The *Copper Era*, published at Clifton, announces on the authority of a director of the Arizona Copper Co., at Edinburgh, Scotland, that this company has decided to build new smelting works to supplant the old works which have been in use over a quarter of a century, and that in the designing and construction of the proposed plant L. D. Ricketts has been engaged as consulting engineer. The site selected for the new plant is on the San Francisco river, 3 miles downstream from Clifton.

The Frisco Placer M. Co., made up of several people at Morenci, has acquired the Lennox placer holdings on the Frisco river, below Clifton, upon which a plant has been erected, consisting of trommels, sluice-boxes, and Pierce amalgamators, by which it is expected to wash and sluice about 4000 yd. of gravel per day. J. M. Erickson is in charge. It is claimed the ground has been proved rich in gold by test runs.

Mohave County

The Tennessee mine has two veins, one of which is being opened by a cross-cut from the 700-ft. station. By this means a level will be established on the Tennessee vein 100 ft. below the old workings. The other vein is being opened by driving a cross-cut from the 500-ft. station of the same shaft. The mine belongs to the Needles Mining & Smelting Co., and is at Chloride. The Gold Bug M. Co., for which O. B. Amsden is manager, has developed enough ore in its property in the River range, west of Whitehills, to warrant the building of a mill. It is stated that a plant will be built as soon as a water-supply is assured. The ore is gold bearing and the mine is being developed from a 500-ft. shaft. The property is 30 miles from Chloride.

The Frisco Mines & Power Co., operating at Union pass, is milling ore that assays $12 per ton, and it is claimed an extraction of 90% is being made. The principal metal in the ore is gold, and this is extracted by cyanidation, preceded by pulverization in a Hardinge conical mill and a tube-mill. This company has purchased the old Burns ranch on account of its water-supply, which is to be piped to the mine, situated 25 miles from Kingman. H. W. Squires is the company's manager.

Yuma County

Doten brothers have given a lease and bond on their claims in Castle Dome district, situated about 40 miles east of Yuma. The ores of that region contain silver and lead, the camp lies several miles north of the Gila river, and the prospective purchasers are Los Angeles people. A carload of ore mined on the Singleton claims, near Kofa, was hauled to the railroad and shipped to market. Charles Sam has shipped two cars of ore from his Ironwood claims, in the same locality. This ore assays $50 to $100 per ton.

CALIFORNIA

Amador County

The Ione mine, situated on the Campo Seco zone, has been developed by a 300-ft. shaft, and is equipped with a steam hoist and a small concentrating-mill. The ore content is principally copper, with which is some gold and silver. The shipments of ore lately have amounted to about 1000 tons. D. T. McLennan is in charge of the property.

(Special Correspondence.)—The South Eureka shaft has reached an incline depth of 2800 ft., with drifts from the 1600 and 2750-ft. levels connecting with the Central Eureka shaft. The 80-stamp mill is running on ore from the two west veins, the principal orebodies of the mine. These veins occur in slate, about 800 ft. apart, and in places attain a width of 40 ft. The average width ranges from 25 to 35 ft. The ore assays approximately $6.50 per ton. The veins dip toward each other and may be found to meet below the 3000-ft. level. The ore-shoots have been explored for a distance of about 500 ft. They show a width of fully 40 ft. in some places. On the 2000-ft. level a 10-in. vein carries quartz assaying $1500 per ton. This has been prospected for 135 ft. On the same level an 8-ft. shoot has been opened about 100 ft. This orebody contains good ore and is expected to extend to the hanging wall. It is estimated that 900,000 to 1,000,000 tons of ore is developed, or sufficient to keep the mill in operation for over seven years. The mill has sixteen 5-stamp batteries of 950-lb. stamps, operated by four 50-hp. Westinghouse motors, and crushes 400 tons per day. The recovery is by plate amalgamation. The pulp passes from the plates to 6 6-ft. Frue vanners. At present this completes the treatment, but arrangements are being made to provide a canvas-plant to handle the tailing. The South Eureka ores carry a high percentage of sulphide, which is shipped to the Selby smelter at Vallejo Junction. Mining and milling costs average $2.63 per ton, and 250 men are employed. The company is disbursing regular monthly dividends of 7c. per share, aggregating $21,000. The directors are seriously contemplating the sinking of a new shaft and the construction of another mill, as under present circumstances one shaft and the mill now in use are inadequate to handle the tonnage of ore to best advantage. The proposed shaft, if sunk, will be west of the present one, which will bring the main workings closer to the orebodies. V. H. Schmal is superintendent.

The orebody on the 1950-ft. level of the Bunker Hill is proving one of the most remarkable ever opened on the Mother Lode. In places it is 80 ft. wide, and the ore is of sufficient value to be milled direct. Practically all the ore now being treated comes from this level, although of lower grade than in the upper workings. The 40-stamp mill is producing about $30,000 per month. The company has declared dividend No. 60 of 5c. per share. Operations were resumed at the Amador Queen on June 19. The shaft will be cleaned out and explorations conducted in hopes of intersecting the old shoot. The South Jackson Gold Mining Co. has been formed to develop a group of claims lying southwesterly of the Zeila mine. The directors are W. P. Miller, San Francisco; John McSorley, Mokelumne Hill; Adam Huberty, C. F. Vicini, and F. W. Ruhser, Jackson. The owners of the Jackson copper mine, 12 miles southeast of Jackson, report the uncovering of a new orebody. The vein is said to carry copper ore of good grade. The property was recently equipped with a gas-engine, air-compressor, and machine drills. The vein recently intersected at the Lincoln Con. is reported to be looking well. Driving from the 1200-ft. level is being pushed to intersect the orebody at depth.

Jackson, June 24.

Butte County

The placer property of the Mineral Slide Gold M. Co. is three miles from Magalia. Part of the work in progress consists in extending what is called bedrock tunnel No. 10 to the opposite border of the property. It is now in several hundred feet, and is expected to tap the channel of gold-bearing gravel at its lowest stratum. It is being driven on a grade that gives it a rise toward the heading of 10 in. to every 16 ft. The plan is to pipe water to the breast of the drifts and sluice the gravel out through the tunnel.

(Special Correspondence.)—The Indiana dredge is being worked on the gravel of the Feather river below the bridge. When the two dredges of this company were overturned during the high water, amalgam valued at $6000 was lost, and it is expected that the Indiana will recover part of this during the next month. R. E. Lyons, examining engineer for the Yukon Gold Co., is in Oroville en route to Alaska and Dawson to make tests on the platinum and other rare metals of placer deposits, and to study methods of saving same for his company.

Oroville, June 24.

Calaveras County

The Dolling Gold M. Co. is operating a 40-stamp mill at Angels Camp, treating about 150 tons of ore per day. This ore runs $2.50 to $3 per ton in gold. The mill is operated by electric power, and the ore is hauled from the mine in cars over a surface tramway. The costs of mining and milling are close to $1.25 per ton.

Inyo County

The Skidoo Mines Co., operating at Skidoo, during the month of May milled 1404 tons of ore, recovered bullion valued at $17,861, and cyanide precipitate worth $[illegible], received $1272 as royalties and charges for custom milling, making a total of $[illegible]. The operating costs amounted to $7820, the expenditure on development work was $1148, making a total of $8968, leaving net profits for the month of $15,014.

SIERRA COUNTY

The Red Star mine, near Alleghany, was under bond for three years to Denver people who were represented by L. P. Woodbury. During the term of this bond about $100,000 was expended on equipment, buildings, and in development work. The time expired, those who held the bond decided not to take it up, and the property reverted to H. L. Johnson, who put a force of men to work sinking where previous development had been in progress. The result was the discovery of high-grade ore, some of the best samples of which were estimated to be worth $20 to $30 per pound.

SISKIYOU COUNTY

(Special Correspondence.)—The Siskiyou Coal Co. reports finding of a large seam of lignite coal in Shasta valley, near Agen. The coal is said to be of good quality and the company is arranging for greater developments. Prospecting has been going on for several weeks, the property having previously yielded several hundred tons of fair-grade coal.

W. W. Turney, representing New York investors, has purchased 1000 acres of placer ground along the Klamath river, near Happy Camp. The company, known as the Siskiyou Mining Co., has also acquired water rights to 5000 in. of water from Thompson creek. The operations will be with hydraulic giants. The Riverhead Mining Co. is working a group of gravel claims on the Klamath river by means of a steam-shovel. The gravel is dumped by cars into an elevated flume which transports it by gravity to the sluices. It is said the operations are profitable. A. B. Aiken is superintendent. The Bullion Mountain M. Co. is developing a group of claims on Hungry creek, about eight miles from Hilt. The group includes the Last Chance, Tomahawk, E. A. C., Missing Link, and Rose Lee claims. The E. A. C. is developed by two adits, one 320 ft., the other 150 ft. long, with a 40-ft. raise from the latter. At the Last Chance the tunnel is in 450 ft., while 200 ft. has been driven on the Tomahawk. The ore in the E. A. C. vein is said to run about $65 per ton. A shoot of ore, 20 to 24 in. wide, has been intersected in the Cub Bear mine, near Snowden. The ore is said to contain tellurium, and much free gold. The property is controlled by the Siskiyou Syndicate. W. E. Everson is general superintendent.

Yreka, June 24.

COLORADO

LAKE COUNTY (LEADVILLE)

The *Carbonate Chronicle* of Leadville reports that many of the old shafts on Fryer hill have been retimbered and made active by lessees. Nearly all these properties, on which work has been commenced within the last six months, have ore exposed. Active shafts include the Hayden, Chrysolite, Little Chief, Virginius, Amie, Sliver, Matchless, Climax, Dunkin, and Discovery.

The opening of fissure veins in granite, in Leadville district, is regarded as most important. One of the first of these discoveries was that of the Cleveland fissure, on South Evans gulch. This has been opened by drifts on different levels from the Cleveland and Valley shafts. Gold, silver, lead, and copper ore has been found in the vein on both properties, and a considerable tonnage has been shipped from the Cleveland. The continuity of this fissure is being demonstrated on the Cleveland, Valley, and Silver Spoon, and the development in progress on the Great Western and Great Eastern groups is expected to show its extension to the northeast. The last two groups named had been idle since 1880, when early this year they were leased to George W. Cook and W. G. Boyle. George Argall, now manager for the Iron-Silver M. Co., has found ore at the depth of 1210 ft. in the Tucson mine of that company, the ore containing gold, silver, copper, and lead.

SAN MIGUEL COUNTY

The Emma mine, situated in Ice Lake basin, near Telluride, belongs to J. A. McCrimmon, and is being operated by John Mativi and associates, as lessees. The ore being mined assays 60% lead and about 45 oz. silver per ton. It is carried by pack animals to the foot of the mountain, then hauled in wagons to the railroad. The Black Bear mill is being operated at part capacity on good ore. The product consists partly of amalgam and partly of concentrate.

TELLER COUNTY (CRIPPLE CREEK)

Dahlgren, Leddy, and Ball, working leased ground on the Last Dollar, Bull hill, have opened a 4-ft. vein of ore at the depth of 112 ft., the ore assaying about $18 per ton. They are working through No. 1 shaft, and have done considerable development. O. D. Fogleman and associates, lessees of the W. H. P. mine, Ironclad hill, are keeping up shipments of ore from the lower workings, and at the 300-ft. level the ore in a 3-ft. vein averaged $45 per ton. Within this vein was a 3-in. streak of stuff that ran 10 oz. gold per ton. Fogleman and Vaughn, having a lease on a block of Ajax ground, Battle mountain, sent out a car of ore that sampled close to $50 per ton. One vein on which they are mining has a width of 3 to 5 ft., the ore in which averages about $40 per ton. The Ajax mill is expected to be in operation this month. The Strong mine, at Victor, is producing about 40 cars of ore per month, most of which is high grade. A recent shipment of two cars of ore, taken from the 1000-ft. level, sampled $100 per ton. The Anaconda mill has been supplied with some new equipment, making it more modern, and is now in operation on low-grade ore.

ISABELLA MINE, BULL HILL, CRIPPLE CREEK.

The Western Reduction Co. has a cyanide plant of 300 tons daily capacity ready to operate on Isabella dump material, which is estimated to contain $1 to $1.25 in gold and silver. It is figured that this can be treated at a cost of 30c. per ton. The Cripple Creek Mining & Metallurgical Society has been organized, with Philip Argall, Jr., as president, and Fred Jones as secretary. The members of the society meet once a month, when a prepared paper is read, and this is followed by discussion.

Ritchie and Rose, who have a lease on the Pinto mine of the Free Coinage Gold M. Co., Bull hill, are mining 15 to 20 tons of ore per day from an orebody that measures 8 ft. between walls. This ore samples about $30 per ton. The first car of ore from this shoot was recently shipped. Between May 1 and June 15 there were shipped 33 cars of ore from the Mabel M. and Husted shafts of the Gold Dollar group, on Beacon hill, which averaged about $25 per ton. Ore shipments at the rate of a car per day are being made by Olsen and Van Tilborg, lessees at the 400-ft. level of the Trilby main shaft. Jones & Nicholson have the contract to drive a 600-ft. cross-cut on the 600-ft. level at the Blanchard shaft of the Hiawatha mine, Beacon hill. The Cavanaugh M. & M. Co. has a long-time lease on the dumps of the Jo Dandy mine, and is building a cyanide plant in which to treat this dump material and some of the low-grade ore direct from the mine. The mill is expected to be ready for work this month. The mill of the Blue Flag Gold M. & M. Co., Raven hill, is to be operated again. It has the capacity of 100 tons of ore per day. The Montrose mine, Ironclad hill, has been leased for three years to the Pride of Cripple Creek M. & D. Co. of Colorado Springs. The leased ground is to be developed and worked through the 600-ft. shaft of the Pride of Cripple Creek mine, which is also being operated by this company.

IDAHO

BONNER COUNTY

The Pondera Group M. Co. has performed 4000 ft. of development work on its claims near Sand Point, has opened an 8-ft. vein of silver, copper, and gold ore, running over $100 per ton, and announces that a carload of sorted ore is to be shipped to a smelter.

LEMHI COUNTY

The Leesburg Gold Dust M. Co., controlled by Salt Lake City men, has four lode claims and a placer claim at Leesburg, which is 14 miles from Salmon, the nearest railroad town. A contact vein, said to be 80 ft. wide, has been opened and developed to some extent by means of a 387-ft. cross-cut. The ore has sampled $2.80 to $7.40 per ton in gold, and it contains some silver. A 10-stamp mill was built some time ago, and now equipment for cyaniding is being put in place. The intention is to treat a lot of tailing that has accumulated at the mill.

SHOSHONE COUNTY

The Stewart Mining Co., owner of the Stewart mine, in the vicinity of Kellogg, is sending about 500 tons of ore per day to its leased mill at Wallace to be concentrated, and is marketing at the smelters between 450 and 500 tons of high-grade ore per month. It is asserted that the company is out of debt and that its ore reserves are being increased.

The Coeur d'Alene Development Co., owner of the Silver King mine, on Government gulch, near Kellogg, is being reopened and further developed under direction of Robert Sterling. The mine is to be worked through an adit, now in 450 ft., and which is being extended. This property was formerly a producer of high-grade lead-silver ore, but it had been idle eight years prior to the time the present operations were commenced.

The Marsh M. Co., which is making a success of its operations on the Marsh claims at Burke, is concentrating its ore at a leased mill on Nine Mile, and is reported to be shipping 65 tons of concentrate per day. Within six weeks the gross returns for concentrate marketed was $24,500, the net profit being $9500. The ore being milled is taken mostly from the stopes above No. 2 adit.

Recent improvements made at the Gold Hunter mill, at Mullan, raised the capacity to over 400 tons of ore per day. The mill is about ready to be operated again. The Snowstorm M. Co. has opened a shoot of ore by driving from its No. 4 cross-cut, by which the ore zone was tapped at a depth of 1900 feet.

MICHIGAN

HOUGHTON COUNTY

The Hancock has been shipping six carloads of ore per day, from which was extracted 25 lb. of copper per ton. The Winona Copper Co. is milling 360 tons of ore per day, although its new mill, built at a cost of $300,000, has a capacity of 1500 tons. The tonnage sent to the mill is being gradually increased, however. The Mass Copper M. Co. has acquired the Evergreen group, which enlarges its holdings to 5000 acres. It is mining and milling 280 tons of ore per day that yields about 20 lb. copper per ton. The company's B shaft, which has a depth of 1800 ft., is to become the main working shaft.

NEVADA

ESMERALDA COUNTY

(Special Correspondence.)—The Jumbo Extension Co. is driving south on the Polverde claim, adjoining the Clermont and Laguna claims of the Consolidated, on the 1030-ft. level from the Goldfield Annex shaft. The Annex lessees have shipped some good ore from the 800-ft. level, have exposed ore on the 760 and 850-ft. levels, and have cut a station at 600 ft., near which point the shaft entered the vein. On July 15 the Jumbo Extension company will pay its initial dividend of 10c. per share. This was made possible by the recent sale to the Consolidated of a one-half interest in the Vinegorone claim. After the dividend is paid the Jumbo Extension company will have a cash balance of more than $100,000 in its treasury. Later the work of development will be extended to the northern part of the Polverde claim on the 1030-ft. level. This shaft is 1070-ft. deep, has two compartments and manway, and is well equipped for deep mining.

NYE COUNTY

The Tonopah-Belmont Development Co. has decided to proceed with the construction of a reduction plant of 450 tons daily capacity. The millsite selected is a short distance south of the Belmont shaft. The mine is producing about 1700 tons of ore per week, that of lower grade being treated at the company's old mill at Millers, while the high-grade ore is shipped to smelters. The deepest workings from which ore is now being extracted in the Belmont are on a drift from a winze which was sunk 35 ft. below the 1166-ft. level.

Work has been commenced on the mill at the MacNamara mine. The plant is to contain two 5-stamp batteries of 1250-lb. stamps, working in mortars having 4-ft. bases, a height of 15 in. between mortar block and the dies; a Dorr classifier, a tube-mill, a 26 by 12-ft. Dorr thickener, two Trent agitating tanks, a 40-leaf vacuum filter, and zinc-boxes for precipitating. The machinery is to be run by electric power, and the plant is to have the capacity of 70 tons per day. The company is controlled by San Francisco men, Herbert Haas being manager.

STOREY COUNTY (VIRGINIA CITY)

The output of the Mexican and Union mines for the week ended June 24 was $21,504; that of the Ophir was $5715. The tonnage and grade of Mexican ore is shown by the following: The 18 mine-cars extracted on the 2300-ft. level assayed an average of $62.83 per ton; ore from the 2400-ft. level consisted of 30 cars running $18.13, 17 cars assaying $11.23, and 6 cars at $15.70; that mined on the 2500-ft. level consisted of 39 cars averaging $77.73, 6 cars running $45.88, 169 cars assaying $87.92 per ton. The 166 mine-cars hoisted from the 2100-ft. level of the Ophir shaft averaged $88.10 per ton. The Mexican company, for the week, shipped three railroad cars of ore to the smelter. The shipment of Ophir ore to the Kinkead mill amounted to 148 tons. The Chollar company received $826 in royalities from Hahnewald brothers on ore they extracted during May, and the Potosi company received $1166 in royalties from the same source. During the week ended May 24 there was treated at the Yellow Jacket mill 1202 tons of ore from the Jacket dump.

NEW MEXICO

(Special Correspondence.)—Gold Dust Mines Co. has three shifts of miners at work on the lower tunnel, which will intersect the vein 450 ft. below the first tunnel. The Deadwood mill is now operating with 15 stamps. A large part of the ore treated is now coming from the third level, recently unwatered. The gravity water systems affords an ample supply all summer. The Ernestine Mining Co., on June 10, made a clean-up of 7350 Troy ounces of gold and silver; 5 tons of concentrate was shipped for the same period. The past week's tonnage of ore treated was 600, with 45 sacks of concentrate. The plant is again running at full capacity.

Socorro Mines Co. will probably order a De La Vergne high-compression oil engine, to supplant the wood-burning engines on Whitewater creek. The reduction plant continues its large shipments of bullion and concentrate. The Enterprise Mining Co. is making alterations in its mill, and some special machinery will soon be received.

Mogollon, June 24.

OKLAHOMA

The new Oklahoma School of Mines, at Wilburton, is to have an unusually complete ore-dressing laboratory. The contract recently awarded to the Allis-Chalmers Co. provides for a crushing plant having Blake, Dodge, and Gates crushers, a Bridgman automatic sampler, and a sample grinder. For fine crushing a tube-mill, steam drying pans, and ore bins are provided. There are three elevators and three sets of screens, also two sets of rolls with feeders. For concentration a 4-compartment and a 2-compartment jig are provided, also a Callow pulp-thickener, two small tables, and a Frue vanner, together with the necessary pumps. For stamping a battery of five 500-lb. stamps, together with the necessary ore bin, feeder, copper plates, amalgam trap, and pump are provided, also a 3½-ft. Huntington mill. Completely equipped cyanide and chlorination plants are also provided. For magnetic separation a Dings separator, with its accessory equipment will be used. The machinery will be motor-driven and the total cost of the laboratory will approximate $25,000.

OREGON

BAKER COUNTY

The Golconda mine, situated near Bourne, and under bond and lease to W. H. Turner of Spokane, and his associates, will soon be unwatered. On June 15 the water had been lowered to the 300-ft. level, and by now the 400-ft. level is probably free of water. The mine had been idle about seven years. Frank E. Pearce, operator of the Morning mine, in Greenhorn district, 20 miles from Sumpter, made a clean-up of 70 oz. gold, and he is just getting started.

JOSEPHINE COUNTY

A mining congress is to be held at Grants Pass on July 18, at which a good attendance of mining men from Oregon and adjoining States is expected. An exhibit of ores and mineral products of western Oregon is being prepared.

The Grey Eagle mine, in Gold Hill district, has been leased by the Oregon-Gold Hill M. Co. to the Grey Eagle M. Co., for which W. B. Stevens is manager, and J. R. Wolfe consulting engineer. The property is equipped with a new mill, an air-compressor, and drills. The plan of the lessee is to do 500 ft. of sinking from the 125-ft. station of the shaft.

James T. Logan and Schmitt brothers, who had a 30-day option on the Higgins property, in Cheteo district, declined to carry out the terms of the option, claiming the time had not been long enough to allow them to determine as to the probable merits of the ground. Higgins declined to extend the time. The price named in the option was $50,000.

TEXAS

EL PASO COUNTY

(Special Correspondence.)—The Hazel mine, situated 16 miles northwest of Van Horn, recently passed into the hands of George Culter, and he is preparing to unwater the old workings and resume operations. Pumping machinery has been provided. This mine has a record of having produced much rich ore, but it has been shut down for several years. The workings extend to a depth of more than 800 ft., and the task of unwatering them is a big one. The shaft and levels will be re-timbered. The old Sancho Panszo mine, in the Van Horn district, is to be reopened by J. C. Hay. This property was worked more than 20 years ago by Peter Nicol, L. H. Davis, and Joseph Beech. They found a pocket of ore averaging about $100 in silver and copper per ton. The Black Shaft mine in the same district has been leased and bonded by a syndicate of Minnesota men who are preparing to start development. The workings of this mine extend to a depth of 300 ft., and it is said to contain a body of copper and silver ore.

Van Horn, June 24.

UTAH

BEAVER COUNTY

A lot of 250 tons of zinc-iron ore has been shipped from the Horn Silver mine, at Frisco, to Midvale for treatment at the plant of the U. S. S. R. & M. Co., which is equipped with concentrators and the Huff electrostatic separators. If the results prove as satisfactory as anticipated, steady shipments probably will be made to that plant.

JUAB COUNTY

A body of ore, not previously found, is being developed on the 800-ft. level of the Mammoth mine, Tintic district. About four carloads of ore per week is being mined on this shoot and shipped to the smelters, the gross proceeds being close to $2000 per car. Work is being performed on the 1000-ft. level in an effort to open the same ore-shoot at that depth. This mine is in charge of Samuel McIntyre, one of the owners.

The exploration work being done in the Centennial Eureka mine, at Eureka, consists in driving from the 2200-ft. station for the orebodies which were worked on higher levels. The driving done thus far aggregates 1500 ft. This work is below water-level, and it is to be connected by a raise with similar drifts on the 2000-ft. level. The sinking, which has been in progress for some time at the Sioux mine, is finished, and driving for ore from the lowest station has been commenced. Ore shipments are being resumed at the Sioux.

The May shipments of ore from the Eagle and Blue Bell mine, at Eureka, amounted to 6 carloads, which sampled about $18 per ton in gold, silver, and lead. During June ore was mined on the seventh level which was higher in grade, and there was an increase of tonnage.

SALT LAKE COUNTY

The mill of the Ohio Copper Co., at Lark, is concentrating 1700 tons of ore per day, and is said to be making a higher saving than at any previous time. The Wilfley tables have been removed from the slime-plant to the main concentrating mill, and their place in the slime-plant has been given to 60 Deister slime-tables. The mining and milling operations of the company are in charge of Al Frank.

The ore found on the tenth level of the mine of the Utah Con. runs much higher in copper than that mined on the higher levels. The tonnage sent to the smelter has been increased since this orebody was developed.

WASHINGTON

FERRY COUNTY

(Special Correspondence.)—The San Poil Consolidated Co. is driving northward on the vein in the North San Poil ground on the lower adit-level and continuing the raise. The machinery is working satisfactorily, and the ore shipments have been increased.

The Hope Consolidated Co. is shipping the second carload of ore from a newly developed vein, at a depth of 60 ft. below the adit-level. This is a lateral vein 7 to 10 ft. wide. The pay-streak is 4 ft. wide and at present follows the hanging wall. A cross-cut from 100 ft. below the adit-level is in 200 ft., with a similar distance ahead to the main vein. The ore shipped averages about $30 per ton.

A streak of $130 gold-bearing ore, about 12 in. wide, has been found in a new winze in the Morning Glory mine.

Republic, June 25.

SPOKANE COUNTY

C. E. Mitchell, a mining promoter of Spokane, was convicted of using the United States mails to defraud in connection with promotion schemes, and was sentenced to serve one year in the Federal prison, and pay the costs of the case.

MEXICO

CHIHUAHUA

(Special Correspondence.)—Conditions at Parral, so far as they concern mining operations, are normal and operations are active. The Veta Colorada Mining & Smelting Co., for which C. F. Spaulding is manager, shipped seven tons of silver bullion from Parral to Monterey on June 20. This was bullion that had accumulated during the insurrection period when the express companies declined to take the risk of shipping it. The company's property is at Villa Escobedo, fifteen to twenty miles from Parral.

Parral, June 22.

Company Reports

UTAH COPPER CO.

The report of the Utah Copper Co., operating the great **porphyry copper mines at Bingham, Utah, and controlling** the Nevada Consolidated, includes reports by the president, **C. M. MacNeill, the general manager, D. C. Jackling, and the certified public accountants, Edward P. Moxey & Co. Collectively they give an excellent insight into the opera**tions and present conditions of the property. Engineers will be mainly interested in Mr. Jackling's report, though the following summary from Mr. MacNeill's, gives the **briefest statement of conditions.**

The net profits for the year ended December 31, 1910, amounted to $5,401,775.23. Of this sum $3,890,912.41 was the profit resulting from the operation of the plants in Utah. After payment of dividends aggregating $4,648,675.50, together with interest on a few outstanding bonds—$187.50—or a total of $4,648,863, there remained a balance for the year of $752,912.23, which was passed to undivided profits. The total amount standing as credit to undivided profits on December 31 last amounted to $3,696,539.06, and is the amount over and above dividends and interest charges **which has been derived from operating profits and income. Undivided profits in no way has any bearing upon the** amount shown as surplus, of $6,083,980. This is the amount received in cash from the sale of stock in excess of the par value thereof. On December 31, 1909, the issued capital **stock was 734,375 shares. On December 31, 1910, the total** issued capital stock was 1,562,599 shares, an increase during the year of 828,224 shares. This increase is accounted for, being the acquisition of the Boston Consolidated Mining **Co.'s property, 310,000 shares; that of 1,000,152 shares of** stock of the Nevada Consolidated Copper Co., 444,512 shares; sales for cash at $50 per share, 73,437 shares; and conversion of bonds. The total authorized stock of the **company is 2,500,000 shares. There remains unissued, there**fore, 937,401 shares. But $2000 par value of the convertible bond issue now remains outstanding. Quarterly dividends were paid during the year at the rate of $3 per share per annum.

Because of the acquisition within the year of the Boston Con. holdings the ore reserve has been entirely re-calculated. **Mr. Jackling's statement, condensed below, is illustrated** by maps and sections not reproduced for lack of space.

The total area of mining claims owned is shown in the **following table:**

	Acres.
Original Utah Copper group	195
Original Boston Consolidated group	359
Shawmut Consolidated group	100
Outlying fractional claims	11.5
Total area of lode mining claims	665.5

The total acreage of land, other than lode claims, owned **by the company, is as follows:**

	Acres.
Lands in Bingham canyon	1586
Lands at and near Garfield	3377
Lands in Utah county	509
Total	5472

The underground development of the original Utah group during the year consisted of driving 1480 ft. of adits, which, added to the 179,861 ft. previously driven, makes a total of underground work on this portion of the property, at the end of the year, of 181,341 ft., or 34.34 miles. Previous to 1910, the underground work on the Boston Con. consisted of 109,876 ft. of adits, drifts, and raises, and **during the year an additional 45,567 ft. was driven, making** a total of 155,443 ft., or 29.44 miles. The total length of all underground work done on both groups, up to the end **of 1910, was therefore 63.78 miles. A considerable por**tion of this underground work has been destroyed by steam-shovel operations on the Utah group, and by underground mining on both groups, the total length so destroyed being 20.43 miles, leaving now accessible in both groups 43.35 miles of underground openings. Churn-drills were operated on both groups for a portion of the year. During the period sixteen drill-holes were driven, the total number of feet drilled being 6209. Previous to 1910 there had been drilled on the property seven diamond-drill holes, having a combined footage of 2609, and four churn-drill holes, aggregating 1197 ft., making a total of all drilling for development purposes on the property of 10,015 ft. The cost of underground development for the year amounted **to 7.02c. per ton on all ores mined and shipped to the mills.** This cost was charged against operations, and is included in the per ton mining costs hereafter stated. By the **acquisition of the Boston Con., and by further development** during the year, the total area of fully and partly developed **ground was increased to 166.15 acres. The average thickness of the developed and partly developed ore in this area,** as hereafter shown, is 345 ft. The entire orebody has been re-blocked and sectionalized, and the tonnages and values re-calculated upon a basis that is as definite and accurate as the character of orebody permits. After deducting all ore mined up to January 1, 1911, there remains in the area in which our principal development has been done, 203,500,000 tons of fully and partly developed ore. Of this amount 152,130,000 tons are fully developed and blocked. The **stated tonnage of developed and partly developed ore in**cludes 22,325,000 tons of partly developed ore in the slopes calculated to apply to steam-shovel workings, but outside of the ore area of 166.15 acres previously described. In calculating ore tonnages, 13 cu. ft. of ore in place is taken as one ton. Of the fully developed ore, 60,000,000 tons has an average copper content of 2%, and the remaining **92,130,000 tons of ore fully developed contain 1.6% copper.** The average assay of the partly developed ore is 1.4% copper. The entire 203,500,000 tons developed and partly developed ore contains an average of 1.67% copper. In obtaining these averages, there have been used the samples **from 225,722 ft. of drifts, raises, winzes, and drill-holes,** the total number of samples taken being 27,186. As a check against the average percentages of copper stated, it is interesting to note that the average assay of the total 11,175,916 tons of ore mined and milled from the Utah and Boston groups, prior to the date of this report, was 1.64% copper.

In connection with steam-shovel mining, it is difficult, if not impossible, to avoid the admixture of some lower-grade material with the ore. It is estimated that in the extraction **of the entire ore reserve stated, the average copper content will fall possibly as low as 1.6%; but, as steam-shovel** mining results in the loss of no ore, the lowering of grade from this cause is in a measure compensated by a corresponding increase in tonnage.

The average thickness of capping on that portion of the **Utah group now developed, is 80 ft. The best data at** hand on the Boston group indicates that the capping is **about 160 ft. thick, although further determinations may prove it to be somewhat thinner. Assuming 160 ft. as the thickness of capping on the Boston area so far developed,** the average thickness for the total developed and partly **developed ore of both groups is 105 ft., or a ratio of ore** to capping of approximately 3.3 tons of ore to one ton of **capping. During the year 1910 the total capping removed** from both the Utah and Boston areas was 2,814,764 cu. yd., of which 2,145,844 was removed from the Utah area, and 668,920 from the Boston area. Prior to the acquisition of the Boston group, 1,116,000 cu. yd. of capping had been **removed from that property. Prior to 1910 there had been** removed from the Utah group 3,231,792 cu. yd. of capping. Adding to this the yardage removed during the year 1910, makes the total capping removed from both groups to January 1, 1911, 7,162,556 cu. yd. **The total area upon which stripping operations have been conducted on both groups, and which is therefore either wholly or partly stripped, is** 85 acres. The actual area completely stripped on both groups is 20.87 acres, of which only 0.33 acre is in the Boston area. The total yardage removed from both areas represents the equivalent of completely stripping 11.67 acres of capping, of the average thickness previously stated, for the combined groups. Such an area would contain [illegible] tons of ore, the quantity of ore per acre, at the average thickness of [illegible] ft., being [illegible] tons. The previously stated total amount of ore removed from the mines is, therefore, approximately one-fifth of this tonnage.

Of the total ore mined during the year, 82% was mined by steam shovels from the Utah mine, and 18% by underground methods from the Boston mine. The average cost of mining for the year was 40.97c. per ton, of which 13.3c. was charged to cover development and stripping expense, leaving a total cost for producing ore of 27.67c. per ton. The total cost of producing 20% of underground ore was approximately the same as that of producing the other 80% by steam shovel methods. These costs include their proper apportionment of all fixed and general charges.

The Magna plant was operated continuously throughout the year. The Copperton plant was permanently closed on August 1, and has been dismantled, the machinery being taken to the Arthur (old Boston Con.) plant to be used in remodeling it. Portions of the Arthur plant were operated intermittently during the year, as the tonnage produced was in excess of the Magna plant's existing capacity. On November 1 three of the thirteen sections of the Arthur plant were permanently closed and partly dismantled, for the purpose of remodeling them along the lines of design, and for the methods of operation employed at the Magna plant. When the remodeling of the Arthur plant is completed, it will have a capacity of approximately 8000 tons per day, as compared to 3000 tons for the old plant. During the year the capacity of the Magna plant has been increased to more than 10,000 tons per day, and its metallurgical results have been improved. The total tonnage treated at all plants for the year was 4,340,245, of which the Magna plant milled 3,209,984 tons, the Arthur plant 936,900 tons, and the Copperton plant 193,361 tons. The average grade of the ore treated at all plants was 1.54% copper, and the average extraction at all plants 66.55%, equivalent to a recovery of 20.51 lb. of copper per ton of ore. The average extraction at the Magna plant, on the grade of ore stated, was 67.3%, and that of the Arthur plant, on the same grade of ore, 64.41%. The improvements in the Magna plant have resulted in a gradual betterment in its metallurgical results, until at the close of the year it is making an extraction of about 70% on this grade of ore. The average cost of milling for all plants for the year was 46.63c. per ton. The average cost of milling at the Magna plant was 43.76c. per ton, and that at the Arthur plant 51.34c. per ton, these milling costs including their proper proportions of all fixed and general charges.

The total production of all plant for the year, of copper contained in concentrate, was 89,019,511 lb. The average grade of concentrate produced was 27.28% copper. The average price received for copper sold during the year was 12.672c. per pound. The average cost per pound of copper produced, based on the net pounds of copper resulting after smelting deductions and allowances were made, and after applying credits for the gold and silver recovered, was 8.069c., as compared to 8.787c. for the year 1909. This cost includes all expenses of smelting, refining, transportation, and selling the metal. The average cost of production at the Magna plant for the period, and on the same basis, was 7.8828c. per pound. During two months of the year, September and December, on an average grade of ore for those months containing only 1.43% of copper, the Magna plant produced copper from this lower-grade ore at a net cost of 8.5c. per pound. The average total cost of mining and milling, exclusive of transportation charges, was 87.6c., as compared with 94.43c. for the previous year. Included in this cost is the charge previously referred to, under the discussion of mining, of 13.3c. per ton, covering all underground development costs at the mine, and a proper proportion of stripping expense. Economies now being effected are expected to materially decrease costs during the next fiscal year.

Book Reviews

Any of the books noticed in these columns are for sale by or can be procured from, the MINING AND SCIENTIFIC PRESS

APPLIED ELECTROCHEMISTRY. By M. deKay Thompson. 325 pp., ill. The Macmillan Company, New York, 1911. For sale by the *Mining and Scientific Press*. Price $2.10.

In gathering together in one volume the scattered results of the recent developments of electrochemistry, Mr. Thompson has done useful service. The criticism may be leveled at his volume by electrometallurgists that too much space has been devoted to theory and too little to the discussion of practice, but an author is his own best judge of what he wishes to discuss, and in this case he does not claim to have produced a work intended to cover the subject in all its phases. Many engineers will welcome his treatment of the electrometallurgy of iron; the storage battery and the electric furnace are discussed, and cyanide metallurgists will find much to interest them in the chapter on the fixation of atmospheric nitrogen.

HANDBOOK OF THE PORCUPINE DISTRICT. By H. P. Davis. 131 pp., ill. 25 Broad street, New York. For sale by the *Mining and Scientific Press*. Price $1.

This is a companion to the handbook of the Cobalt district, by the same author, and contains a brief historical sketch and an outline of the geology of the district, leading up to the chief feature, a directory of the incorporated companies and operating syndicates of the district. This is followed by a review of the Cobalt district and a brief discussion of the South Lorrain, Montreal river, and Gowganda districts. Six pages of general information for prospectors and mine-owners, and a fairly good index complete the book. It is well illustrated, printed on good paper, and will prove a useful book of reference to all those who are interested in this promising new district.

GOOD ENGINEERING LITERATURE. By Harwood Frost. 422 pp. Chicago Book Co., 1911. For sale by the *Mining and Scientific Press*. Price $1.

This is not a check-list of engineering reference, as might be inferred from the title, but is a general text on literary expression, what to write about, how to write, the processes of publishing, and the art of literary criticism. The beginner can derive much benefit from the study of this volume, for it is written in an elementary style, and some parts of it are a compilation of what others have written upon the subjects under discussion. The author is conscientious and gives full credit to those whose material he has made use of, but his choice of a misleading title indicates that he is not a master of the literary art, and his first page amply confirms that inference. In spite of, or perhaps even because of, that fact, his work will be of great service to the many poor writers in the engineering profession, and is one of the best of the low-priced publications on the art of writing and of book-making.

THE PRINCIPLES OF SCIENTIFIC MANAGEMENT. By Frederick W. Taylor. Harper & Brothers, New York, 1911. For sale by *Mining and Scientific Press*. Price, $1.50.

In this little volume Mr. Taylor gives the deductions as to the principles of works management derived from his wide and comprehensive experience, during which he has made several series of scientific experiments to obtain the data upon which his system is based. The author, as a scientific man, can scarcely intend to give the impression that the amount of experimental work which he has done is sufficient to base a complete system upon, but he has disclosed broad lines along which to work, and the book would be worth while if it did nothing more than emphasize the necessity for definite data as to efficiency in work and what really constitutes a day's work, in place of the vague general ideas, derived in haphazard fashion, that often are the only guides of the management. There is much more to the book than this, and whether the reader agrees with the author in all cases or not, he can not fail to be stimulated by what Mr. Taylor has to say.

Decisions Relating to Mining

Specially reported for the Mining and Scientific Press.

Action to Recover Possession of Mining Ground—Remedy by Appeal

Any error of a court in ordering judgment for plaintiff for possession in an action to recover possession of certain mining ground under an agreement providing that the complainant might take possession of and work the mines, is reviewable by appeal only, and cannot be inquired into by a writ of prohibition.

Silver Peak Mines *v.* Second Judicial District Court, (Nev.), 110 Pac., 503. Aug. 1910.

Deed for Coal and Mining Privileges—Right to Subjacent Support

Where a deed conveys the coal under a tract of land, together with the right to enter upon and under the land, and to mine, excavate, and remove all the coal under such land, there is no implied reservation in such a deed that the grantee shall leave coal enough to support the surface in its original position, but on the contrary is a waiver or surrender of such right, and the grantor cannot recover damages for injury to the surface resulting from the removal of all the coal without leaving sufficient support.

Kuhn *v.* Fairmont Coal Co., 179 Federal, 191.

Death of Miner by Suffocation—Assumption of Risk

In an action for damage for the death of a miner caused by suffocation it is proper to prove that the superintendent directed the miner to enter the mine and told him that it was perfectly safe. And such evidence is competent in determining the question of assumption of risk and contributory negligence on the part of the miner. And where the miner was informed by a third person in the presence of the foreman that it was safe to go into the mine and the foreman immediately directed the miner to go ahead that everything was all right, the court cannot say as a matter of law there was existing a degree of danger calculated to deter a person of ordinary prudence from the undertaking, and such as to make him guilty of contributory negligence in going into a mine.

Alabama Consolidated Coal & Iron Co. *v.* Healds, Alabama 53 Southern, 162.

Statute Limiting Power of Directors as to Purchase of Additional Mineral Ground

The statute of California provides that directors of a mining company shall not sell, lease, mortgage, or otherwise dispose of the whole or any part of mining land owned by the corporation, nor shall they purchase or obtain in any way, except by location, any additional mining land, unless the action of the board be ratified by the stockholders of at least two-thirds of the corporation stock then outstanding. In the application of this statute, the Supreme Court of that State decided that it went to the power and authority of the directors to act, and not merely to personal liability of such directors, and a mortgage of the mining lands of a mining corporation executed by the directors in the absence of such a ratification by the stockholders passed no title to such lands. But the particular form of ratification provided by the statute is not exclusive, and it is sufficient where the holders of the requisite majority of the stockholders had in some formal and unequivocal way announced their assent to the proposed mortgage; and all stockholders of record holding stock for lawful purpose, though not the beneficial owners thereof, are stockholders within the meaning of this statute. However, in the absence of such a ratification, neither the corporation itself nor any stockholder may raise the question of the invalidity of such mortgage.

Royal Consolidated Mining Co. *v.* Royal Consolidated Mines Co., (Cal.) 110 Pac., 123.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

W. S. Noyes has returned from Oregon.

E. A. S[illegible]erry has left for China.

W. C. Greene was in San Francisco last week.

Charles Janin has gone to southern California.

A. K. Beatson, of Oakland, was recently in Nevada and Utah.

E. J. Collins has been in San Francisco during the week.

Fred L. Lowell has returned to San Francisco from Mexico.

J. Parke Channing is motoring near Lenox, Massachusetts.

R. J. Cannon has been visiting the dredging fields of California.

R. S. Botsford has arrived in London from Rio Grande do Sul, Brazil.

H. F. Bain is returning to Seattle from Juneau, on his way to Valdez.

Lionel Lindsay sails for England today from Guaymas, by way of Tehuantepec and Cuba.

Courtenay De Kalb was in San Francisco on Wednesday and will return to Mexico in about ten days.

Howland Bancroft will be in South America until about October 1; he will visit various mining districts in Peru, Bolivia, and Chile.

Oliver B. Finn will be several weeks near Twin Lakes, in Lake county, Colorado, doing some examination work on a dredging placer.

Arthur J. Hoskin has resigned from the faculty of the Colorado State School of Mines and has opened an office in the Commonwealth building, Denver.

S. B. Flagg and C. D. Smith, of the Bureau of Mines, presented a paper on the work of the Bureau at the meeting of the American Society of Mechanical Engineers, Pittsburg.

Earl C. Galbraith, a recent graduate of the Mining Department of the State College of Washington, has been appointed Mineral Examiner to the United States Land Office and is stationed in Montana.

Obituary

Andrew V. Corry, born in Maryland in 1837, a miner at Georgetown, Colorado, in its early days, and a resident of Montana for 48 years, died at Butte early in June. He was engaged in placer mining on Alder gulch, Virginia City, in 1863-5, and later became a resident of Butte, where he acquired interests in mines.

John Y. McKane, an engineer well known especially in Nevada, at Goldfield and Tonopah, died recently in San Francisco from congestion of the lungs. Mr. McKane was born in Scotland and some years ago returned to his native heath to live. While in San Francisco on business he was stricken with a brief and fatal illness. He was a man of wide business interests and leaves a large circle of friends.

Technical Schools and Societies

The senior class of the Mining Department of the State College of Washington, recently completed a tour of the mining camps of Washington and British Columbia. The class was accompanied by Francis A. Thompson, head of the department, and visited the mines and mills of Republic, Washington, the smelters and mines of the Boundary country, and the Consolidated properties and plants in Rossland and Trail, in addition to other points of minor interest.

Market Reports

LOCAL METAL PRICES

San Francisco, June 29.

Antimony	11—12½c	Quicksilver (flask)	46
Electrolytic Copper	14—15½c	Tin	47—48½c
Pig Lead	4.75—5.70c	Spelter	7—7½c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50—9.75, large $7.50—8.00

METAL PRICES

By wire from New York

Average daily prices in cents per pound

Date	Electrolytic Copper	Lead	Spelter	Silver, per oz.
June 22	12.55	4.45	5.68	53⅞
" 23	12.55	4.45	5.68	53⅞
" 24	12.55	4.45	5.68	53¾
" 25	Sunday.		No market.	
" 26	12.55	4.45	5.73	53⅝
" 27	12.55	4.45	5.73	53⅞
" 28	12.55	4.45	5.73	53⅞

ANGLO-AMERICAN SHARES

Cabled from London.

	June 22. £ s. d.	June 28. £ s. d.
Camp Bird	1 11 6	1 11 3
El Oro	1 5 3	1 5 3
Esperanza	1 10 7½	1 10 7½
Dolores	1 5 0	1 5 0
Oroville Dredging	0 6 9	0 6 9
Mexico Mines	8 5 0	8 1 3
Tomboy	0 18 9	0 18 1½

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing prices, June 28.		Closing prices, June 28.
Amalgamated Copper	$ 70¼	La Rose	$ 4¼
A. S. & R. Co.	79⅝	Mason Valley	9⅝
Braden Copper	4⅛	Miami Copper	22⅞
B. C. Copper Co	5¼	Mines Co. of America	5¼
Butte Coalition	19⅝	Nevada Con	19¼
Chino	23⅝	Nevada Utah	¾
Davis Daly	1	Nipissing	10⅝
Doble	2⅞	Ohio Copper	1⅝
Dolores	5	Ray Central	1⅝
First National	1¼	Ray Con	17⅞
Foley O'Brien	1¾	South Utah	¾
Giroux	6¾	Superior & Pittsburg	17½
Goldfield Con	6	Tenn. Copper	41½
Greene-Cananea	7⅞	Trinity	4⅝
Guanajuato Con	⅝	Tuolumne Copper	4⅝
Hollinger	15⅝	United Copper	2¾
Inspiration	8⅞	Utah Copper	50¼
Kerr Lake	4⅞	Yukon Gold	4

COPPER SHARES—BOSTON.

	Closing prices, June 29.		Closing prices, June 29.
Adventure	$ 6	Mohawk	$ 49
Allouez	31	North Butte	33¼
Atlantic	6	Old Dominion	48
Calumet & Arizona	59	Osceola	103
Calumet & Hecla	472	Parrot	12⅛
Centennial	12	Santa Fe	1¼
Copper Range	61½	Shannon	11¼
Daly West	6	Superior & Pittsburg	16¾
Franklin	12⅛	Tamarack	35
Granby	37⅛	Trinity	4¼
Greene Cananea, ctf	7⅞	Utah Con	18
Isle Royale	18	Victoria	1¾
La Salle	8½	Winona	8⅛
Mass Copper	8⅞	Wolverine	113

(By courtesy of J. C. Wilson, Mills Building.)

NEVADA STOCKS.

San Francisco, June 29.

Atlanta	$ .12	Mayflower	$ .04
Belcher	.53	Mexican	4.40
Belmont	6.12	Midway	.17
B. & B.	.29	Montana Tonopah	.75
Booth	.07	Nevada Hills	3.12
Chollar	.10	Ophir	2.05
Combination Fraction	.08	Pittsburg Silver Peak	.65
Con. Virginia	1.25	Round Mountain	.57
Florence	1.35	Sandstorm Kendall	.08
Goldfield Con	6.00	Savage	.21
Gould & Curry	.19	Tonopah Extension	.93
Jim Butler	.26	Tonopah of Nevada	6.00
Jumbo Extension	.23	Union	1.15
MacNamara	.18	West End	.49

(By courtesy of San Francisco Stock Exchange.)

OIL SHARES

San Francisco, June 29

Associated Oil	$51.50	Palmer	$ 1.30
Bay City (New Stock	70	Palmer Union	51
Brookshire	1.15	Peerless	6.00
Caribou (New Stock	75	Premier	.60
Claremont	1.05	Producers	2.50
Coalinga National	17	Republic	.48
Con. Midway	.42	Sauer Dough	1.60
Creceus	.58	Silver Tip	1.10
De Luxe	1.15	S. & F. McKittrick	14.00
Empire	1.50	S. W. & B.	.16
Knob	.52	Sunset Monarch	.62
Maricopa National	18	Turner	1.20
Monte Cristo	2.20	United Oil	.87
Nevada Midway	.16	Wolverine	.40
Occidental	.15	W. K. Oil	2.90
Pacific States Petroleum	.26	Yellowstone	.15

(By courtesy of San Francisco Stock Exchange.)

Current Prices For Chemicals

(Corrected monthly by Braun-Knecht-Heimann Co.)

Prices quoted are for ordinary quantities in packages as specified. For round lots lower prices may be expected, while in smaller quantities advanced prices are ordinarily charged. Prices named are subject to fluctuation. Other conditions govern Mexican and foreign business.

	Min.	Max.
Acid, sulphuric, com'l, 66°, drums, 100 lb.	$0.75	$1.00
Acid, sulphuric, com'l, 66°, carboy, 100 lb.	1.00	1.50
Acid, sulphuric, C.P., 9-lb. bottle, bbl., lb.	0.13	0.18
Acid, sulphuric, C.P., bulk, carboy, lb.	0.09½	0.12
Acid, muriatic, com'l, carboy, 100 lb.	1.60	2.00
Acid, muriatic, C.P., 6-lb. bottle, bbl., lb.	0.15	0.20
Acid, muriatic, C.P., bulk, carboy, lb.	0.10½	0.15
Acid, nitric, com'l, carboy, 100 lb.	5.25	6.50
Acid, nitric, C.P., 7-lb. bottle, bbl., lb.	0.16	0.22
Acid, nitric, C.P., bulk, carboy, lb.	0.12½	0.15
Argols, ground, bbl., lb.	0.20	0.25
Borax, cryst. and conc., bags, 100 lb.	2.75	3.85
Borax, powdered, bbl., 100 lb.	3.00	4.00
Borax glass, gd., 30 mesh, cases, 100 lb., tin lined	10.00	13.00
Bone ash, 60 to 80 mesh, bbl., 100 lb.	4.50	5.50
Bromine, 1-lb. bottle, lb.	0.55	0.65
Candles, adamantine, 12 oz., 40 sets to case	3.50	4.15
Candles, adamantine, 14 oz., 40 sets to case	4.00	4.55
Candles, Stearic, 12 oz., 40 sets to case	4.95	5.50
Candles, Stearic, 14 oz., 40 sets to case	4.65	5.20
Clay, domestic fire, sack, 100 lb.	1.50	2.00
Cyanide, 98 to 100%, 100-lb. case, lb.	0.20¾	0.24¾
Cyanide, 98 to 100%, 200-lb. case, lb.	0.20	0.24
Cyanide, 127-129%, 100 lb. case, lb.	0.27½	0.28½
Cyanide, 127-129%, 200-lb. case, lb.	0.26¾	0.27½
Lead acetate, brown, broken casks, 100 lb.	8.75	9.00
Lead acetate, white, broken casks, 100 lb.	10.00	10.25
Lead acetate, white, crystals, 100 lb.	11.75	12.25
Lead, C.P., test., gran., 100 lb.	13.00	15.00
Lead, C.P., sheet, 100 lb.	15.00	18.00
Litharge, C.P., silver free, 100 lb.	10.50	13.00
Litharge, com'l, 100 lb.	7.50	9.00
Manganese ox., blk., dom. in bags, ton	20.00	25.00
Manganese ox., blk., Caucasian, in casks, ton (85% MNO_2—¾% Fe)	42.50	50.00
Nitre, double ref'd, small cryst., bbl., 100 lb.	7.00	8.00
Nitre, double ref'd, granular, bbl., 100 lb.	6.50	7.50
Nitre, double ref'd, powdered, bbl., 100 lb.	7.25	18.00
Potassium bicarbonate, cryst., 100 lb.	12.00	15.00
Potassium carbonate, calcined, 100 lb.	15.00	18.00
Potassium permanganate, drum, lb.	0.11	0.12½
Silica, powdered, bags, lb.	0.03	0.05
Soda, carbonate (ash), bbl., 100 lb.	1.50	1.75
Soda, bicarbonate, bbl., 100 lb.	2.00	2.50
Soda, caustic, ground, 98%, bbl., 100 lb.	3.15	3.50
Soda, caustic, solid, 98%, bbl., 100 lb.	2.65	2.85
Zinc shavings, 800 fine, bbl., 100 lb.	10.75	11.75
Zinc sheet, No. 9—18 by 84, drum, 100 lb.	9.50	10.50

Catalogues Received

Chrome Steel Works, Chrome, N. J. 'Adamantine Chrome Steel Stamp Mill Parts.' 27 pages. Illustrated. 6 by 9 inches.

The Hayward Co., New York. Pamphlet No. 571. 'Hayward Orange Peel and Clam Shell Buckets.' 4 pages. Illustrated. 9 by 7½ inches.

Hendryx Cyanide Machinery Co., New York. Supplement to Catalogue No. 7. 'The Hendryx Agitator.' 12 pages. Illustrated. 5½ by 8½ inches.

Current Prices for Ores and Minerals

(Corrected monthly by Atkins, Kroll & Co.)

The prices are approximate, subject to fluctuation, and to variation according to quantity, quality, and delivery required. They are quoted, except as noted, f.o.b. San Francisco. Buying prices marked*.

	Min.	Max.
Antimony ore, 50%, per ton	*$20.00	$25.00
Arsenic, white, refined, per lb	0.01¾	.0.02¼
Arsenic, red, refined, per lb	0.06¾	0.07¼
Asbestos, according to length and quality of fibre, per ton	100.00	350.00
Asbestos, lower grades, per ton	10.00	100.00
Asphaltum, refined, per ton	15.00	20.00
Barium carbonate, precipitated, per ton	42.50	45.00
Barium chloride, commercial, per ton	42.50	47.50
Barium sulphate (barytes), prepared, ton	20.00	30.00
Bismuth ore, 10% upward, per ton	*75.00	upward
Chrome ore, according to quality, per ton	10.00	12.50
China clay, per ton	15.00	20.00
Cobalt metal, refined, f.o.b. London, per lb	2.50	
Coke, foundry, per 2240 lb	15.00	17.50
Diamonds:		
Borts, according to size and quality, per carat	2.00	15.00
Carbons, according to size and quality, per carat	75.00	100.00
Feldspar, per ton	5.00	25.00
Firebrick:		
Bauxite, per M	175.00	
Magnesite, per M	190.00	275.00
Silica, per M	42.50	47.50
Flint pebbles for tube-mills, per 2240 lb	15.00	25.00
Fluorspar, per ton	10.00	15.00
Fullers earth, according to quality, per ton	20.00	30.00
Gilsonite, per ton	35.00	40.00
Graphite:		
Amorphous, per lb	0.01	0.02½
Crystalline, per lb	0.04	0.13
Gypsum, per ton	7.50	10.00
Infusorial earth, per ton	10.00	15.00
Magnesite, crude, per ton	7.50	10.00
Magnesite, dead calcined, per ton	22.50	27.50
Magnesite, brick (see firebrick).		
Manganese ore, oxide, crude, per ton	10.00	25.00
Manganese, prepared, according to quality, per ton	40.00	120.00
Mica, according to size and quality, per lb	0.05	0.30
Molybdenite, 95% MoS_2, per ton	400.00	500.00
Monazite sand (5% thoria), per ton	150.00	200.00
Nickel metal, refined, per lb	0.45	0.60
Ochre, extra strength, levigated, per 100 lb.	2.25	3.25
Platinum, native, crude, per oz	30.00	40.00
Scheelite (see tungsten ore).		
Sulphur, crude, per ton	15.00	25.00
Talc, prepared, according to quality, per ton.	20.00	50.00
Tin ore, 60%, per ton	450.00	475.00
Tungsten ore, 65%, per ton	487.00	520.00
Vanadium ore, 15%, per ton	200.00	250.00
Wolframite (see tungsten ore).		
Zinc ore, 50% up, per ton	*15.00	20.00

Commercial Paragraphs

The Kennicott Co. of Chicago, Ill., has recently secured an order for a self-supporting steel stack 13 ft. in diameter and 205 ft. high, for the Kentucky Electric Co., Louisville, Kentucky.

H. A. Hunt has been appointed Eastern sales agent of Edgar Allen American Manganese Steel Co., with headquarters at New Castle, Del., which appointment was made in order to fill the vacancy caused by the resignation of V. W. Mason, Jr.

Falkenburg & Laucks, Seattle, Wash., have a physical laboratory in connection with their ore-testing plant, containing a Reihle machine of 200,000 lb. capacity for making tensile tests of iron and steel, and compressive tests of bricks, concrete cubes, and stone.

The Goulds Manufacturing Co. of Seneca Falls, N. Y., is about to build four large additions to the No. 2 plant, in which will be housed the part of the works known as the No. 1 plant, a portion of which must be torn down to make way for the new barge canal.

Allis-Chalmers Co. announces the appointment of G. T. Hansen as manager of its Salt Lake City office. Mr. Hansen has been connected with the Allis-Chalmers Co. for several years in the capacity of metallurgical engineer and has had a wide and varied experience in the mining field, both in this country and in Mexico.

The Electric Weighing Co. has been formed to manufacture and sell the Messiter weighing machine. This apparatus is used for weighing moving loads on belt or bucket conveyors. A recent installation was made of two of these machines at the Nevada Consolidated Mining Co.'s mill. The factory and office of the Electric Weighing Co. are at 180 13th avenue, New York City.

O. H. Johnson is now a salesman with the Mine & Smelter Supply Co. For the last five years Mr. Johnson has been identified with the engineering and sale of some of the most prominent plants and mills in Utah, Nevada, and Idaho, among them being the Goldfield Consolidated, Farmers Mining, Bagdad-Chase Gold Mining, Geo. F. Roth Mining, Inland Crystal Salt, and many others.

On June 1, 1911, the Fort Wayne Electric Works was merged with the General Electric Co. of Schenectady, N. Y. Its business will be conducted under the name of Fort Wayne Electric Works of General Electric Co. The same lines of apparatus and supplies will continue to be manufactured and sold under the immediate direction of the same individuals as heretofore, with F. S. Hunting in responsible charge as general manager.

The Ellsworth Collieries Co., which operates considerable mining property at Ellsworth, Pa., will install a central plant for generating and distributing electric power to its several mines. With this end in view, it has ordered of the General Electric Co. one 750-kw., 60-cycle, 2300-volt generator, driven by a mixed-pressure Curtis turbine; one 360-kw., 60-cycle, 2300-volt belt-driven generator; one motor generator exciter, one belted exciter, and switchboard.

R. B. Woodworth, engineer for the Carnegie Steel Co., read an interesting paper on steel derricks and drilling rigs before the sixth annual convention of the Natural Gas Association of America, which was held at Pittsburg in May. The paper has been published in the *Proceedings* of the Association together with illustrations and data that will be particularly interesting to well-drillers and oil operators. Mr. Woodworth has gone into the matter most thoroughly and added a valuable contribution to literature on this subject.

The Santa Rosa Mining Co., a subsidiary of the Exploration Company of England and Mexico, situated in the State of Zacatecas, Mexico, near Concepcion del Oro, has received and is erecting most of the machinery for its mill. All of the equipment has been purchased from the Cia. Ingeniera, Importadora y Contratista, S. A., of Mexico City, which has furnished Westinghouse equipment throughout. The motors are of a new type which the Westinghouse company has brought out for especially heavy duty service. When completed, this property will have one of the most modern equipments in Mexico.

In an article now in preparation, the Foos Gas Engine Co. will give out data collected from actual power-plant experience with its engines operating on petroleum and distillates. Advance reference to this bulletin shows a reliablility and economy that makes the most economical gasoline engine a luxury. In proof of this, comparison is made between a Foos engine using kerosene at 5c. per gallon and a gasoline engine using 12c. fuel. A 10-hour day with a 25-hp. oil engine at full load shows a fuel cost of $1.55. A gasoline engine under the most favorable conditions would use 31¼ gal. of fuel, which at 12c. would cost $3.75. A total saving for 300 working days would give the oil engine a lead of $660 per year. As a matter of fact, the advantage in favor of the oil engine is shown to be even greater. Kerosene can be bought as low as 4c., and in many fields oils are available at 2¼c. The Foos company claims that nothing is sacrificed to gain this economy, and that 25 years experience enables it to produce an oil plant with all the durability and reliability of a steam-engine. The new literature on this subject will be known as 'Oil Bulletin 92'.

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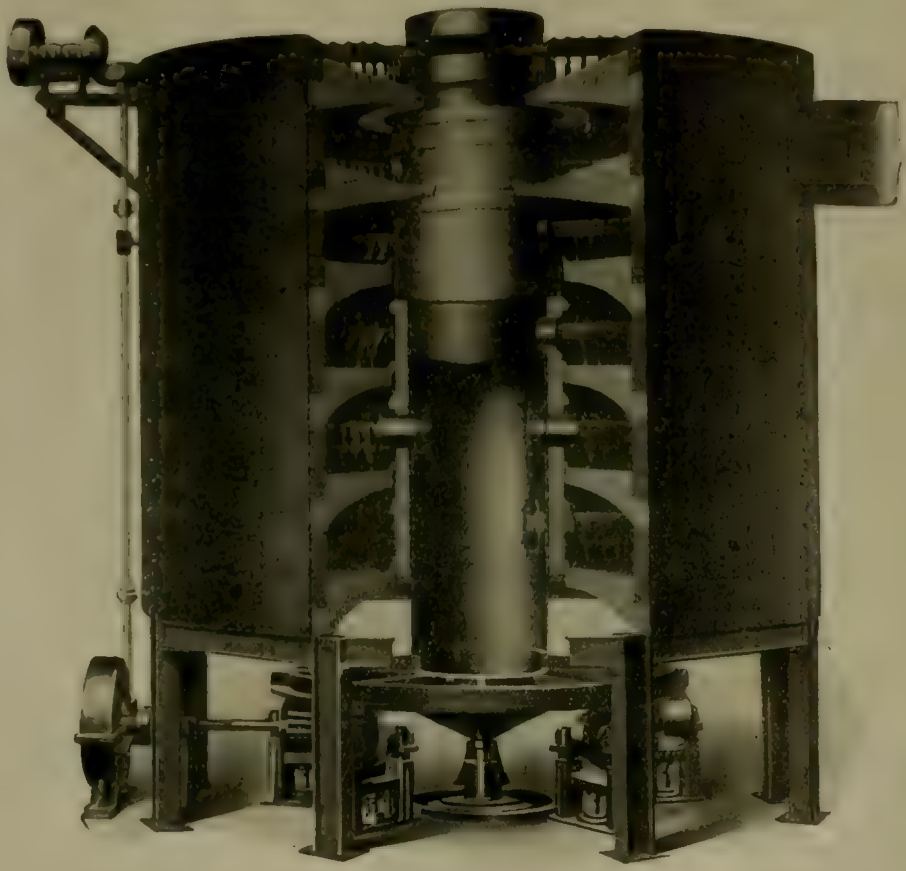

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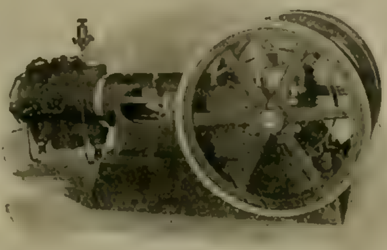

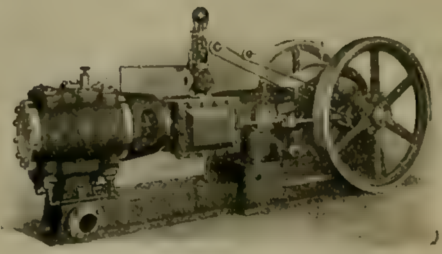

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designed and started. Specialty: Treatment of ores, fine grinding, and slime filtering. Patentee Burt Slime Filters.
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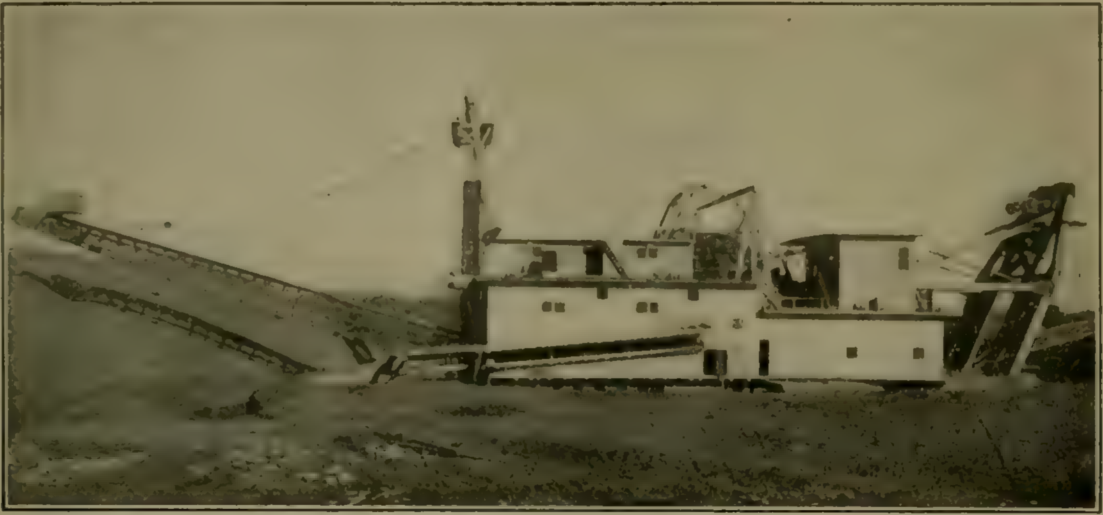

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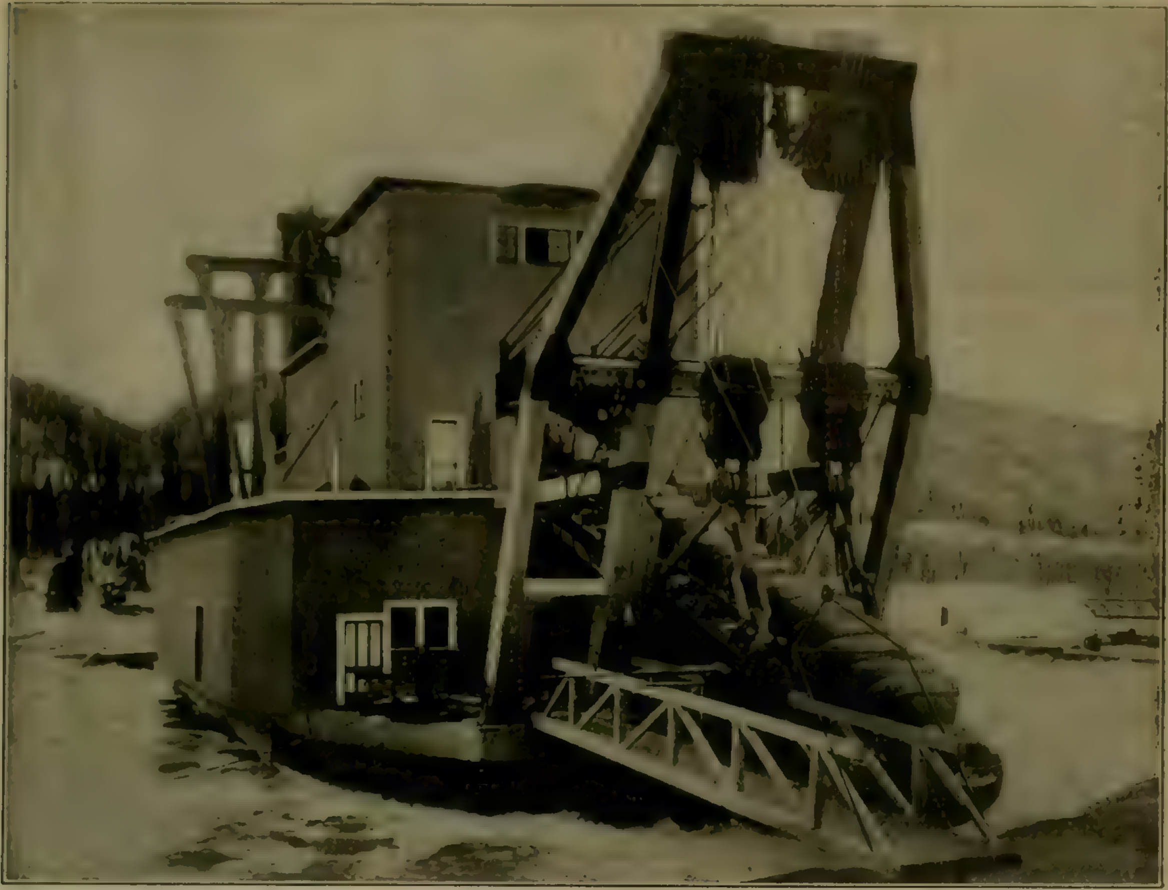
SEE PAGE 24.

MARION ELEVATOR DREDGES



"CANADIAN"—The 16 Cubic Foot Elevator Dredge built by us for the Canadian Klondyke Mining Company, Ltd.

Vital Points Which Mark the Difference Between Success and Failure in Placer Mining

In elementary design all gold dredges are somewhat alike.

The difference comes on what may seem secondary features, which, however, are really vital.

These include the perfection of detail.

The design and method of construction of essential features—

And quality of materials.

Important among the reasons for the Marion Elevator Gold Dredge's efficiency is the fact that practically its every part is made in our own plant.

We even have our own open hearth steel foundry to make special parts of selected material.

How the Marion Dredge is built in detail—

How it solves the problem of working in cold climates and handling a maximum output of hard gravel cannot be explained here.

Our Catalog, however, with descriptions, and illustrations of parts and photographs of Dredges in operation, does explain it to you.

We'll be glad to send you a copy.

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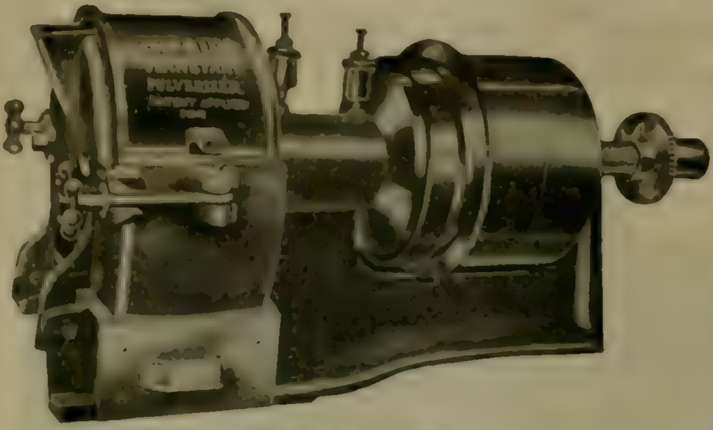
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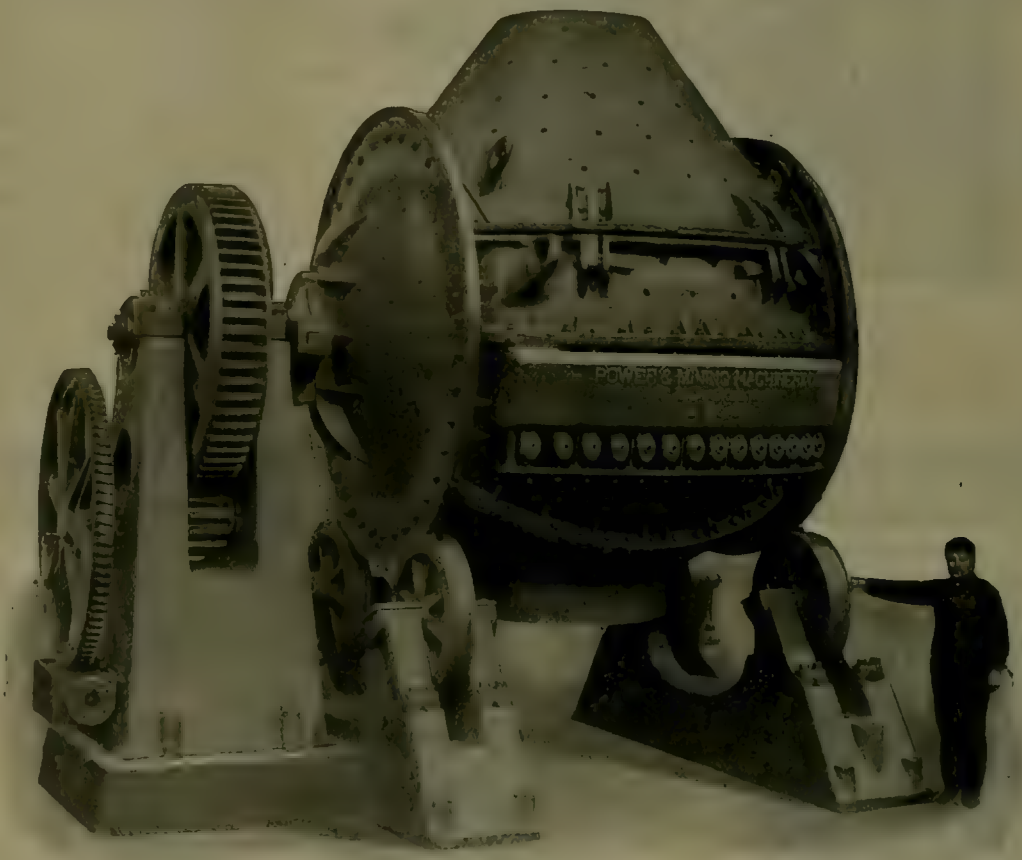

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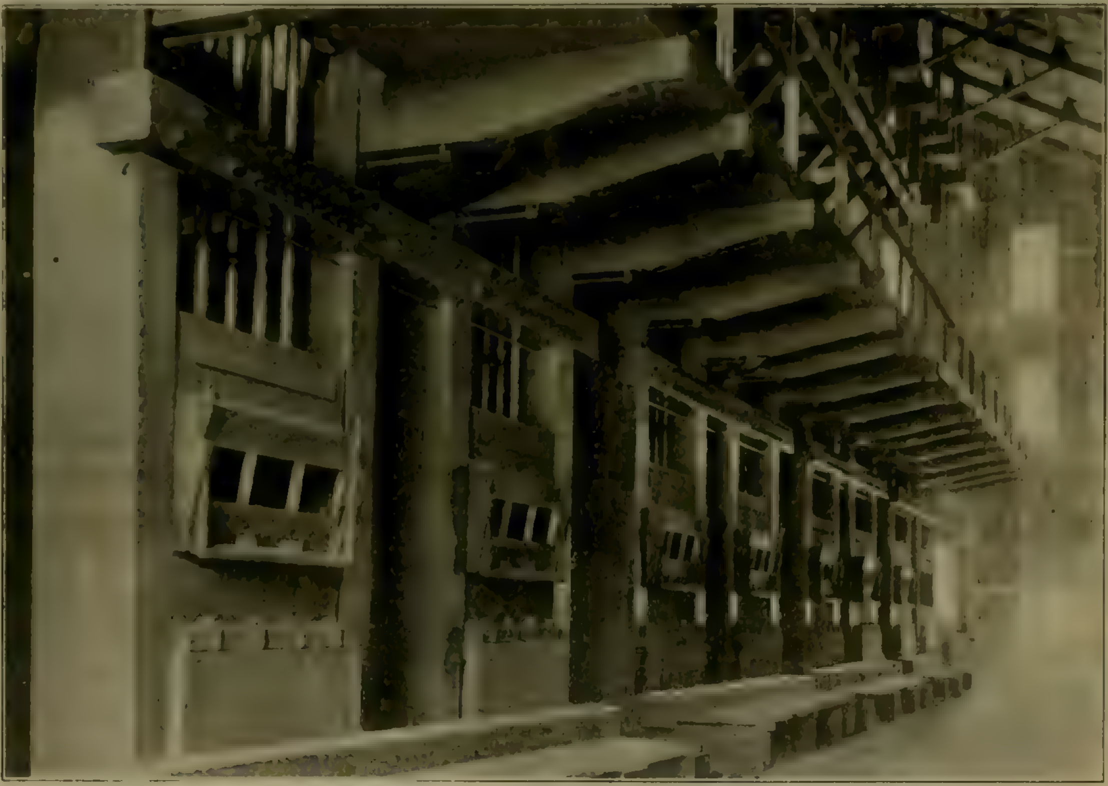

The above shows the Forty-stamp battery, Four-post frame construction, 1000 pound stamps, for crushing in cyanide solution, built in 1910 for the Trinity Gold Mining and Reduction Company, Trinity County, California. Office, Fuller Building, New York City

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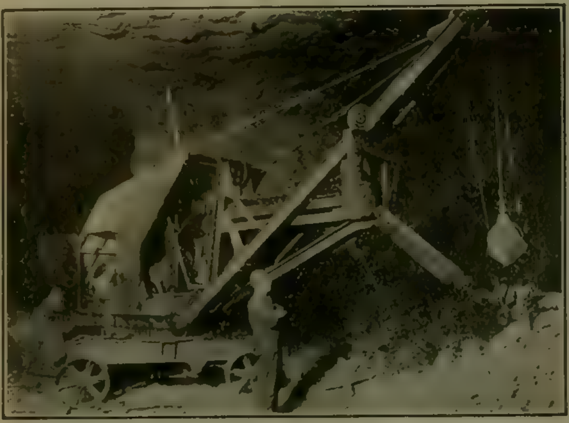

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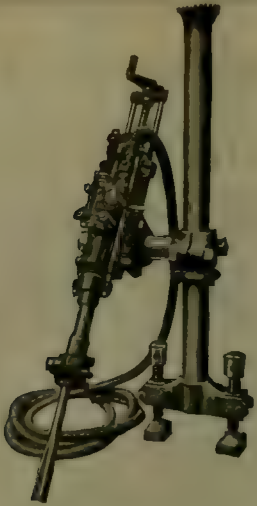

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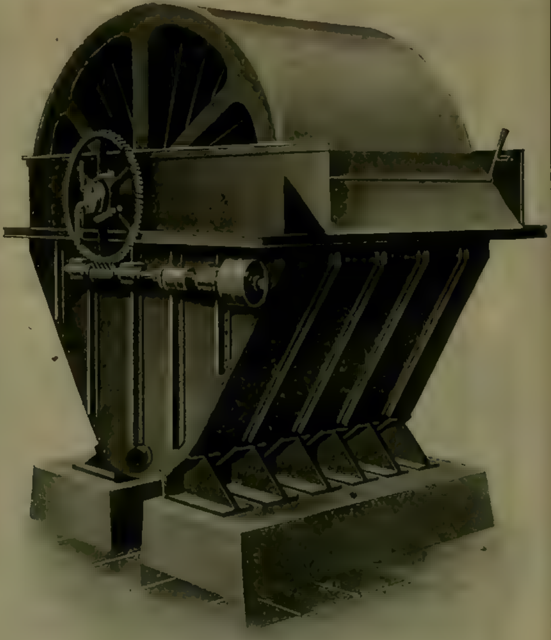

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"The total costs for labor, power, cyanide and supplies have been reduced from $1.20 to $0.80 per ton—a saving of 35% in working costs."

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Register ore as conveyed from mill storage bins to ore mill, thus keeping tally on the daily work of the mill;

Register ore, coal or rock shipped from mines or quarry, thus obtaining a continuous record of the amount produced and delivered;

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The machine weighs the continuous unbroken flow of material.

It takes up small space and has no complicated mechanism.

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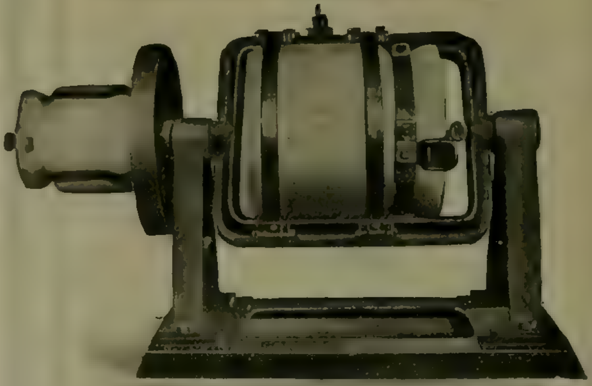
TROJAN MILL WITH SAMPLE JAR



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Shipping weight, 135 pounds. Floor space, 10½ x 34 inches.

The Sample Jars measure, outside, 5.2 x 5.71 inches.
Will handle from ¼ ounce to 1½ pounds at a time.
The Trojan Jars measure, outside, 8.75 x 9.65 inches.
Will handle from a few ounces up to 5 pounds at a charge.

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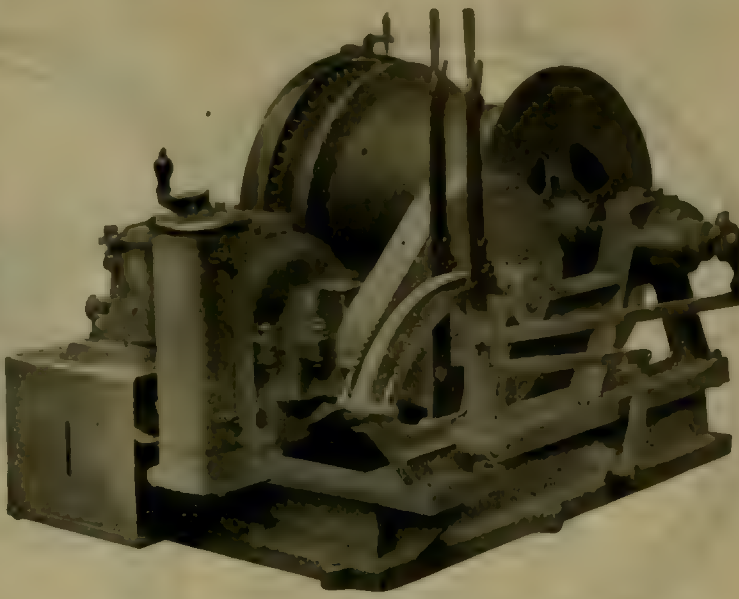
The average mining man places a small steam hoist or pump in an underground winze and drives it by compressed air. Under such conditions it may easily take 100 i.h.p. at air compressor to do the work of a 20 h.p. motor. If it is necessary to maintain air pressure outside of working hours the efficiency may fall to about 1 per cent.



In one case a steam engine of a hoist was replaced by a 50 h.p. 3 phase induction motor which paid at the rate of 15 per cent a year on the investment.

General Electric Company ITC Motors

are made especially for this service to stand overloads, moisture and dirt when operated by unskilled labor.

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Mine Hoists And Pumps as recommended by the General Electric Company, are best because they represent years of careful study by men who have equipped many of the largest mines in the world. The records of these installations are before them when your problems are studied.

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Fort Wayne Electric Rock Drill

The Fort Wayne will not only save you power, but will advance your work faster, easier and better than ever before.

Can be installed anywhere an electric wire can be run, either above or below ground, at one-third the cost of pipe lines.

It has many exclusive features, such as impossibility of drill steel sticking in loose or broken ground, self-clearing steel which requires no water for sludging on flat or up holes, ability to change quickly from D. C. to A. C. current, etc. No flexible shafts, solenoids, etc., to get out of order. Bulletin 1120 describes and illustrates the design, construction and operation in detail. Send for it.

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D-10

THE LEYNER BULLETIN

July 1 Littleton, Colo., U. S. A. 1911

In the Frozen North

THE SUPERIORITY OF WATER LEYNER DRILLS IS APPRECIATED, as the following extract of letter from Alaska testifies:

"We purchased one of your Model 6, No. 7 Drills as an experiment, to see if it was possible to reduce the cost of point driving.

Point driving is our big expense, and, thanks to your machine, we are enabled to make a 50% saving.

The No. 7 with two men is doing the work of six to eight point-men. The machine is being operated by inexperienced runners.

Our experiment has been watched with a great deal of interest by the mining operators of this district, who have their profits reduced to a minimum by the present method of point driving.

Your machine will be one of the big helps in reducing expenses."

NOTE.—Point driving is a system of drilling and thawing frozen gravel. A hole varying from 8 to 18 feet in depth is drilled. A sweater is then inserted and a small amount of steam turned into the hole, until the gravel has thawed. One steaming will usually thaw the gravel to six feet.

The gravel is then removed by pick and shovel to frost and the thawing operation repeated.

Water Leyner Drills have yet to encounter ground that they cannot drill faster and more economically than any other type.

WRITE US YOUR PROBLEM AND LET US TELL YOU HOW YOU CAN OBTAIN MAXIMUM FOOTAGE AT MINIMUM LABOR, POWER AND UPKEEP EXPENSE.

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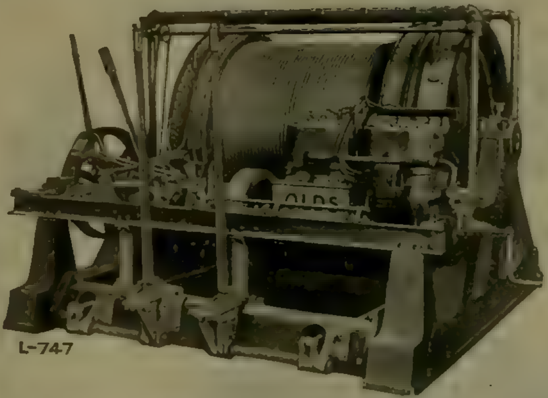

San Carlos, Arizona, August 16, 1910.

Olds Gas Power Company,
Los Angeles, Cal.

Gentlemen: In compliance with your request, as to keeping a record of the performance of the Olds-Close Multi-Cylinder Mine Hoist, installed for the company, and the amount of fuel consumed, I am below tabulating the work of the hoist and the fuel consumed for a seven day period:

Number of loads up.	Empty	Fuel used each day.
6	7	½ Gal.
11	10	⅞ "
7	7	9/16 "
6	11	⅝ "
7	6	½ "
7	11	⅝ "
8	9	⅝ "

Distance 170 feet.

I have been very careful in giving you the most correct measurement, but think the amount of fuel consumption will be less as soon as we get skips put in, which have been ordered. I then will give you another measurement if you so desire.

I am pleased to say that the hoist is giving entire satisfaction to the company, both for work and for fuel consumption, and it is a pleasure to run it. Yours very truly,

SAM J. BAKER, Hoisting Engineer.
C o COPPER REEF CONS. MINES, San Carlos, Arizona.

A Revolution in Mine Hoisting.—This hoist was designed by a mining engineer. It is different from the ordinary single-cylinder hoists. It has the flexibility of steam—It lifts different loads at different speeds—It starts in 10 seconds and the engine can be shut down between lifts.

Fuel economy wonderful—see letter—less than one gallon per shift.

Can be knocked down for transportation on muleback—It runs smoothly—Does not jerk; is clean, compact and convenient. Is perfectly safe—Has two self-clearing adjustable brakes.

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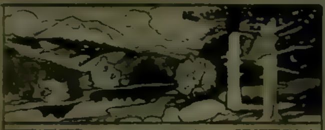

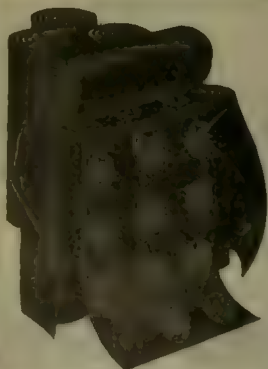

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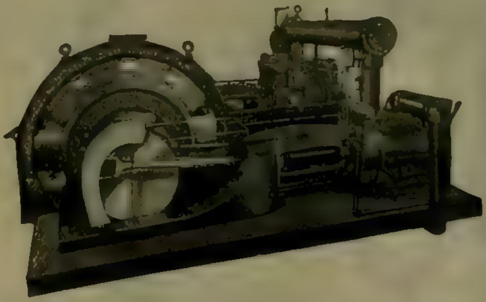
AIR COMPRESSORS

THE Laidlaw-Dunn-Gordon Duplex two-stage Cincinnati gear type Air Compressor, with motor mounted on compressor shaft, is illustrated below. This type solves the problem of transmission gear and represents the highest development in power driven compressors. Especially compact and more efficient than any other type. The Laidlaw-Dunn-Gordon line includes air compressors for every service. Write for Bulletin L51832 and state requirements.

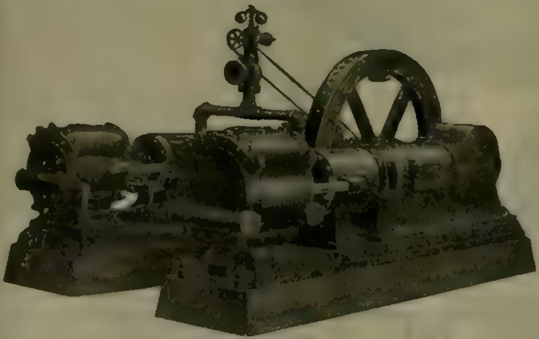


General Offices and Works
Cincinnati, Ohio

New York, 115 Broadway

L6.4

BLAISDELL AIR COMPRESSORS



43 DESIGNS—ANY CAPACITY

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Cost of drill saved in 60 days.

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Rock Drills **Core Drills** **Hammer Drills** **Sheet Pile Hammers** **Air Compressors**

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Boring an Angle Hole in Northern Michigan.

Mining methods and operating expenses are watched as closely in the Lake Superior Iron and Copper district and in the South African Goldfields as anywhere in the world.

In these two regions, Sullivan Diamond Core Drills are perhaps more widely employed than in any other field.

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The engineers of the great properties in Michigan and South Africa have understood for years that no process is costly which gives accurate information about undeveloped orebodies; and that these drills represent the most rapid, economical and reliable way of securing such knowledge.

CATALOGUE No. 1355

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Air Compressors
Hammer Drills

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WELLMAN-SEAVER-MORGAN ENGINEERING DIVISION **ENGINEERS AND MANUFACTURERS** WEBSTER, CAMP & LANE DIVISION

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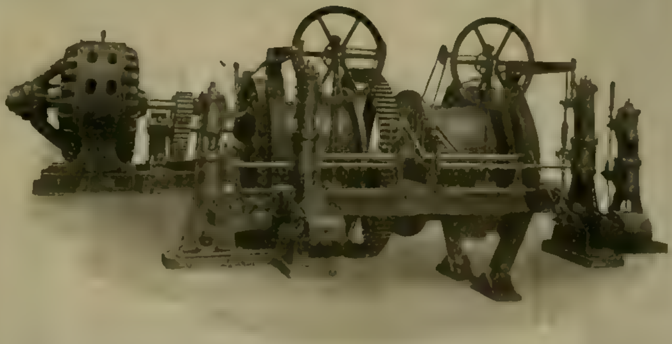

Installed at the Mine of the Tonopah-Belmont Mining Co.

Purchasers of our

HOISTING MACHINERY

receive the benefit of our engineering experience covering a period of thirty years in building equipment of this kind.

Clutches and brakes are operated by air cylinders, and the brakes are so connected as to set immediately upon failure of air pressure.

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THE SUCCESSOR TO NITROGLYCERIN DYNAMITE

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In addition Trojan Powder will not explode from any ordinary impact or jar, is fumeless, may be stored for long periods without attention and with no impairment of its efficiency.

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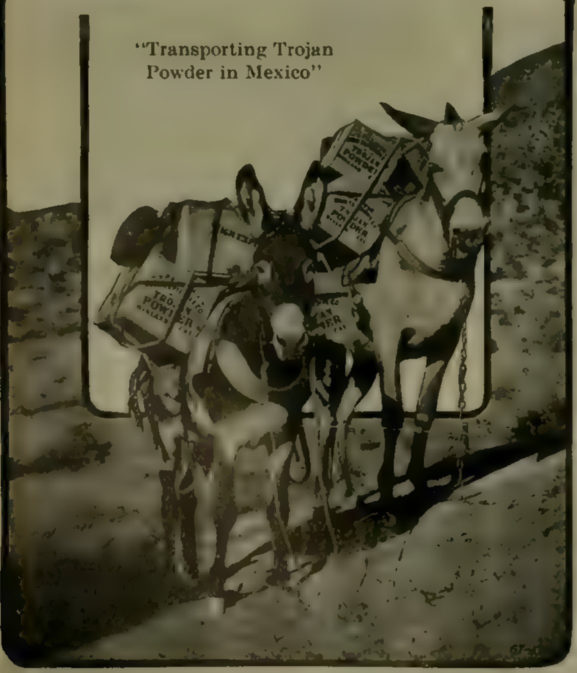

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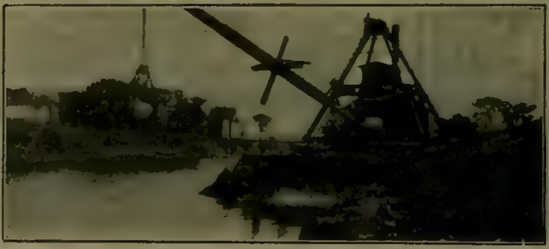

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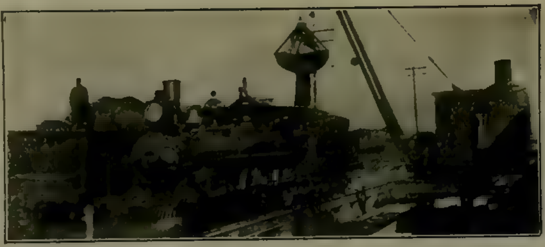

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Improved Wood Rock Drills

They are of Vanadium Tungsten Iron.

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— FOR —
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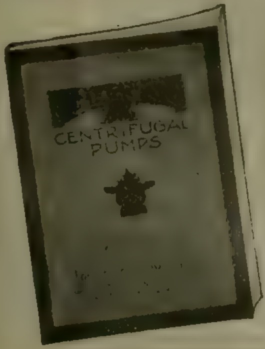

It's neither first cost nor efficiency.

It's the total cost after a period of years when you've figured all the cost, as compared with the duty done—first cost attendance cost and up-keep cost. What's the total expense, that's the question?

American Centrifugal Pumps

have a reputation for economy when you've figured **all the cost.**

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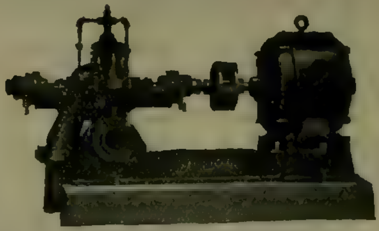

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For handling Coal, Ore, Stone, Gravel, etc., are economical and dependable in operation.

Jeffrey Belt Trippers

discharge materials into bins or at any point along the conveyer line. They are automatic in operation and compact in construction. All parts carefully finished.

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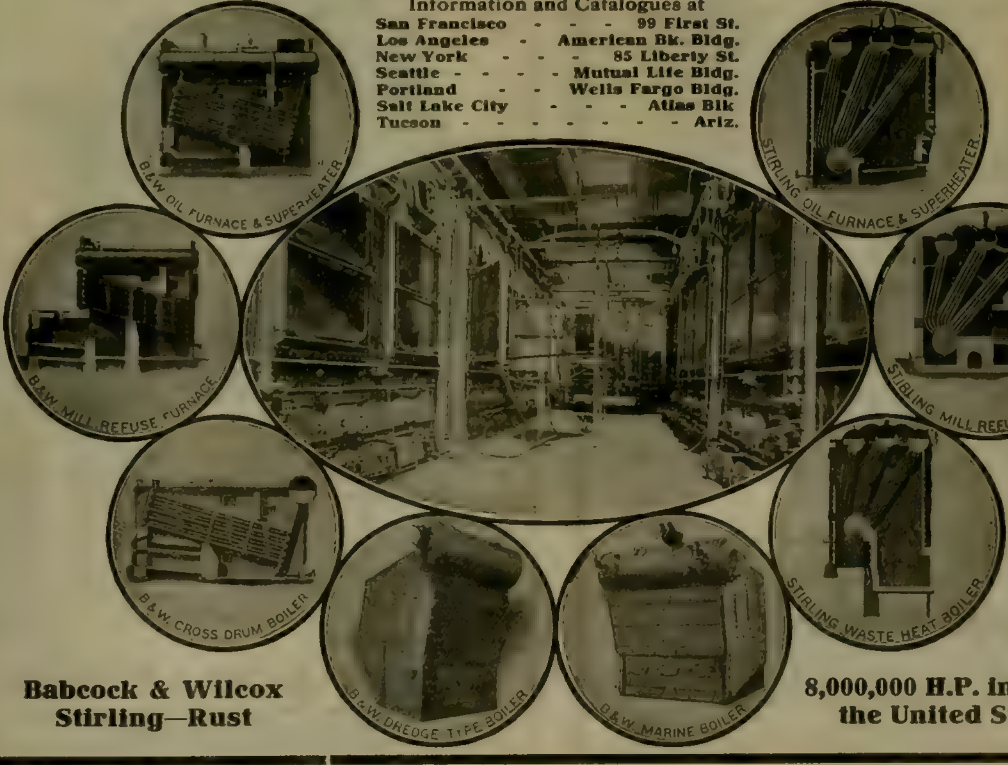
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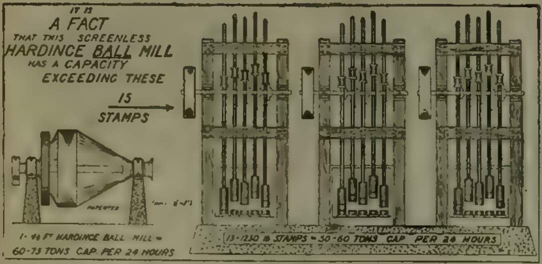
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1- 6 FT HARDINGE BALL MILL =
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We are prepared to prove our claims.

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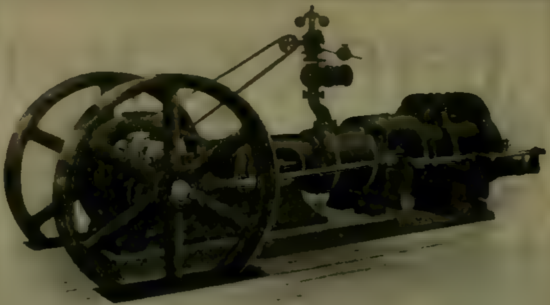

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embody the highest engineering developments and are the product of skilled workmen.

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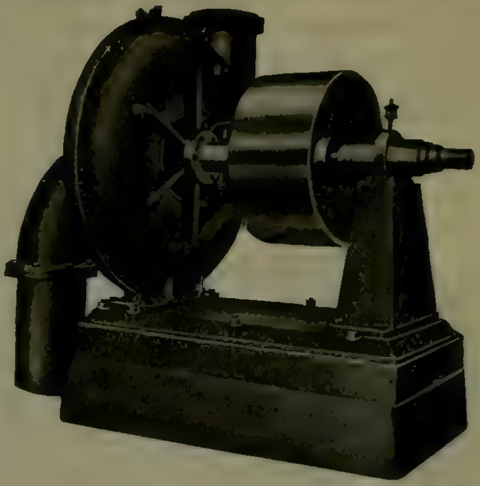

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We Make Vertical and Horizontal Pumping Machinery for all conditions of service, and adapted to any kind of prime mover.

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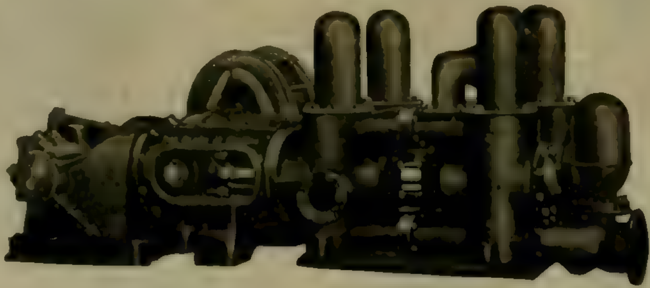

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D117.4

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FOR EVERY SERVICE

MINE PUMPS DRIVEN BY ELECTRICITY

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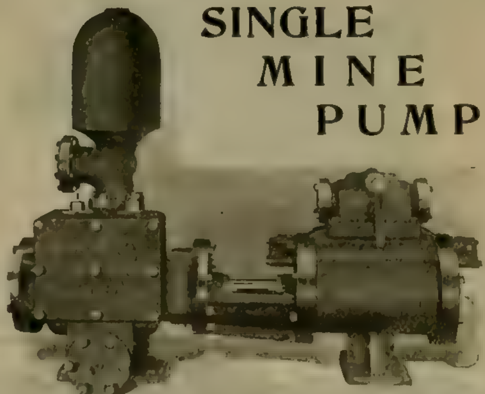
SINGLE
MINE
PUMP



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This pump is built to stand rough usage. The steam valve mechanism is entirely enclosed and cannot be tampered with or broken by accident.

Liberal valve areas permit high speed. Valves and seats positively locked in position. Removal of side plate gives immediate access to all water valves.

Suction opening cast on both sides. Discharge can be turned any direction.

Can be operated by steam or compressed air.

Our MINE PUMP BULLETIN 101-G sent on request.

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68

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PATENTED

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Gentlemen :

The Case 2" Burner is doing most excellent and economical work. I have all short fires—always am through in less than 2½ hours from the time of lighting up, and have been averaging less than $^{5}/_{10}$ gallon of fuel per hour. On such short runs I consider this a mighty small consumption.

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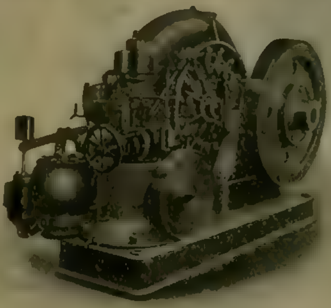

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HIGH SPEED AND EFFICIENCY COUPLED WITH SATISFACTORY REGULATION.

COMPLETE WATER POWER PLANTS CONTRACTED FOR AND INSTALLED.

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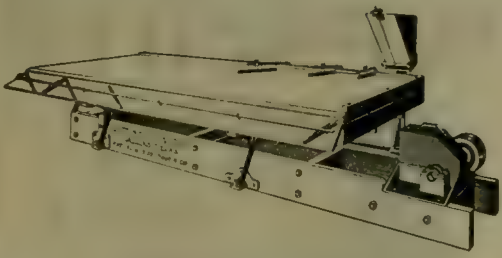

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Especially adapted to the treatment of refractory ores having close specific gravities.

The S. S. & S. System of dust control eliminates all dust made in dry crushing.

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Reciprocating engines grow less economical as they age—Westinghouse Steam Turbines retain their initial steam economy through years of service, simply because there is nothing to wear out. The adjustments do not change; the bearing parts are the only rubbing parts, but being flooded with oil, the shaft never comes in metallic contact with the bearing.

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Designers and Builders of
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For the Pacific Coast;
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It has but one water-tight joint to take care of and thus eliminates all leakage.

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For heavy weight Stamps, especially, "Adamantine" quality is most essential for economical milling. Our long experience in the manufacture of Shoes and Dies enables us to meet every demand of increase in both strength and quality for the heaviest stamps.

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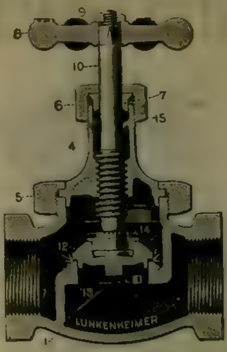

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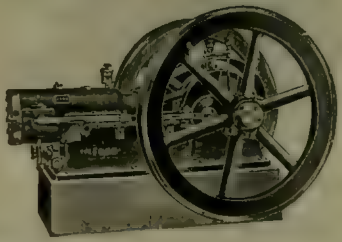

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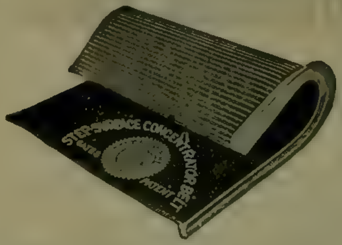

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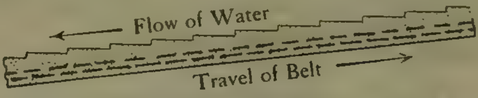

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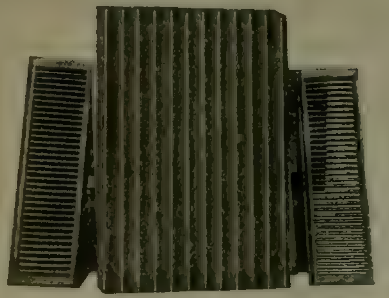

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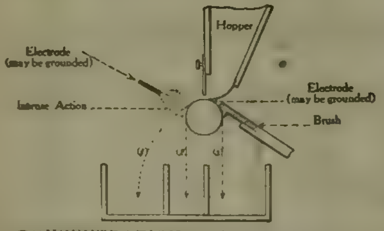

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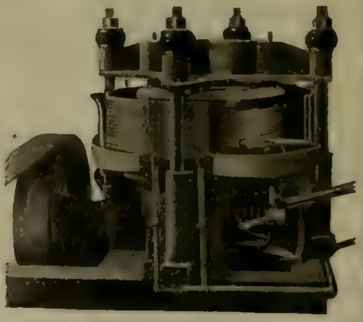

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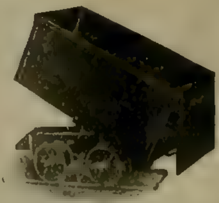

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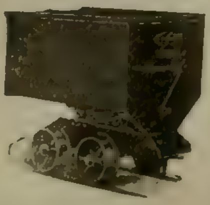

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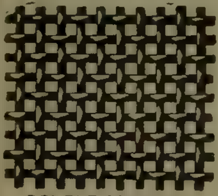
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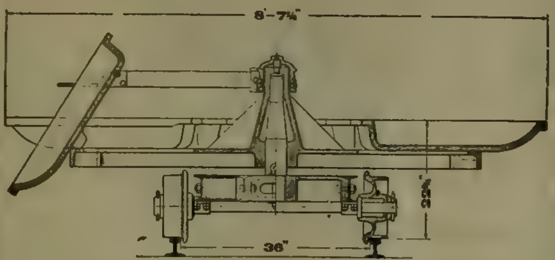

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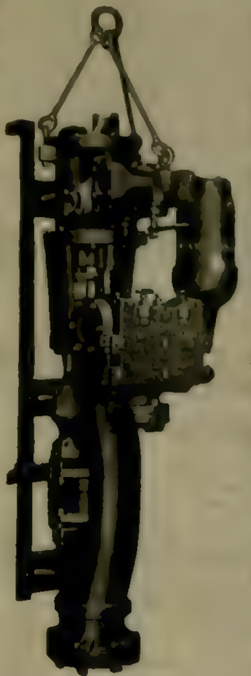

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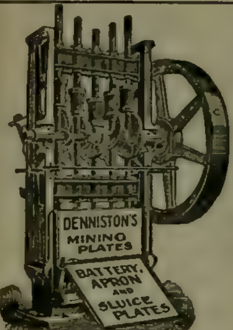
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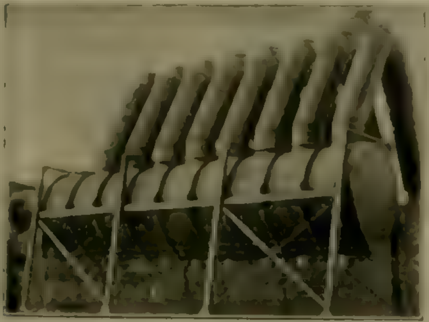

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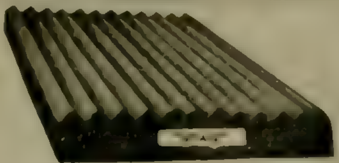

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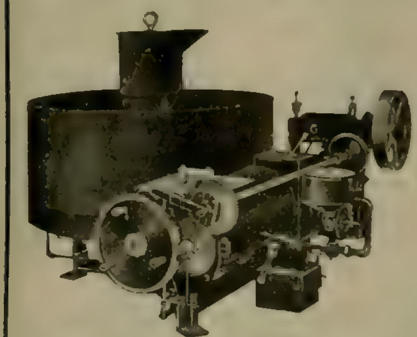

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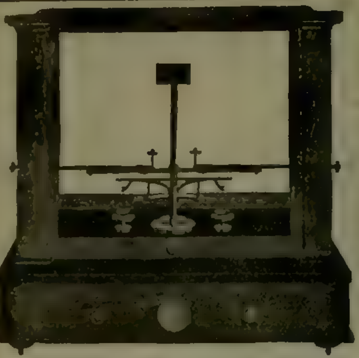

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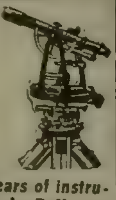

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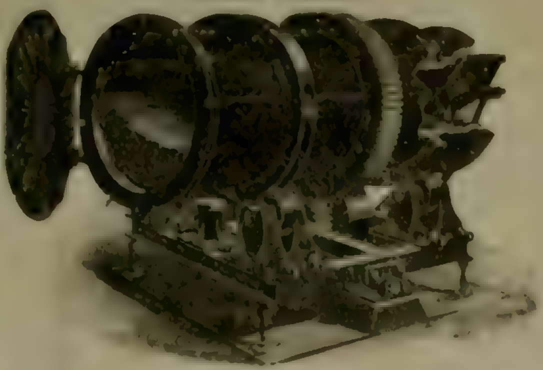

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PUMPING SYSTEM.—No. 994,335; June 6, 1911. Elijah H. Perkins. It is the object of this invention to provide means for removing water or other liquids from two or more wells with a single pump.

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CURTAIN MATTRESS FOR RIVER WORK.—No. 994,999; June 13, 1911. Lou G. Hare. The object of this invention is to provide a protecting mattress or revetment to be used on river improvement work in conjunction with jetties, etc., for the purpose of diverting the current of the stream or protecting the bank.

DEEP WELL PUMP.—No. 995,248; June 18, 1911. Peter J. Gildea. This pump is automatic and has a large capacity and high degree of efficiency, and by it large volumes of water, etc., can be raised from a considerable depth by the combined use of compressed air and vacuum.

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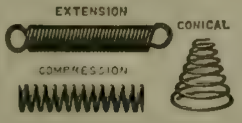

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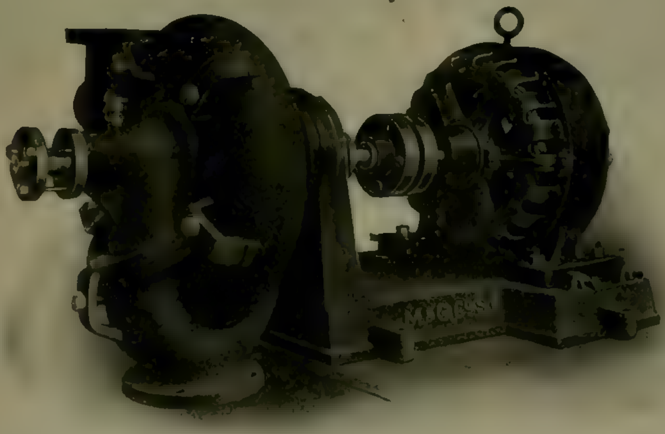

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EDITORIAL

ARIZONA has asked the Senate Committee on Territories to amend its constitution by eliminating the provision for the recall of judges, in order that statehood may be secured.

INTERNATIONAL amenities were shown at the recent dinner at the Savoy by the Iron and Steel Manufacturers Association of Great Britain to visiting American steel producers.

RECIPROCITY in a pleasing form is seen in the proclamation of the President that subjects of Sweden residing in the United States are entitled to the benefit of our copyright law, since citizens of the United States enjoy similar privileges in Sweden.

MIAMI is a recent accession to the American shares listed on the Paris Bourse, but a later report is to the effect that no more American securities will be added for the time being, as the American Telephone incident has demonstrated that the French market is not yet wide open to American stocks.

PROSPECTORS have frequently more enthusiasm than knowledge. One such recently wrote a Denver paper that he had located a strip of territory "covering about a mile that is strictly eruptive—no country-rock whatever", and added, to clinch the matter, that the ore "at the grass roots contained $2.65 gold per ton, 2 per cent silver, and 14 per cent aluminum." Why look farther for the new Leadville?

ON ANOTHER page Mr. Edward Juessen contributes an analysis and summary of the working costs at the Pittsburg-Silver Peak mine. The notable work done there is of great interest, but we wish to commend especially the action of the general manager in thus making public, for the good of the profession, the results obtained at the mine under his direction. With the growing tendency toward the formation of large corporations has come a tendency to prevent the giving out of information that has any value or significance. This is a retrogression, and we hope that Mr. Juessen's example may be followed by others who still hold to the wiser and better policy.

CARELESS writing is often responsible for misstatements. In a report written by a gentleman who signs himself 'Mining Engineer' the statement that "silver values were encountered, and no other substance of any nature found" somehow fails to carry conviction as to the valuable nature of either the find or the report. This is not helped by the further statement that there are "no base substances present." Probably the engineer intended to say that base metals were not present in sufficient amounts to interfere with the proposed treatment. It is not necessary to write an Addisonian essay in order to describe a mine, but exactness of statement is imperative in making reports if the confidence of the reader is to be secured and held.

MANY of our readers are interested in the application of the Federal corporation tax to corporations engaged in developing minerals, and on another page we present the most important sections of the regulations thereon. As is usually the case, it will be necessary to wait for the courts to construe the law before it can be thoroughly understood. An interesting effect of the working of the law is seen in the recent action by Phelps, Dodge & Co. of increasing the book value of its properties from $2,500,000 to $24,114,045, their estimated value at the time of their purchase, in order to avail themselves of the provisions of the law as to depreciation.

MORE SPEED is the modern demand. This is exemplified by the proposal to dock trans-Atlantic liners at the end of Long Island, forwarding the passengers to New York by train at the rate of a mile a minute. A Londoner has recently made the interesting statement that it is impossible to secure speed in New York, baggage and other needs of the moment being handled with provoking slowness. The observer was slightly in error in his mechanics; speed is characteristic of American life; what is difficult to secure is acceleration, the second derivative with respect to time. The point he wishes to make in comparing New York and London in this regard hinges upon the relative cost of labor in the two cities. Personal attention can be more quickly secured in London, for life in America has somewhat the nature of a huge machine, fast-running but not easily accelerated.

PROMISES of mining development have lately characterized the movements for reform in China. The Prince Regent has urged upon Prince Pu Lun, President of the Board of Agriculture, Industry, and Commerce, the necessity for the development of the mineral resources of the empire. The immense mineral wealth of China is, next to her agriculture, her greatest natural resource. For instance, in the province of Hunan there is a series of coal beds stretching north and south for two hundred miles and east and west for sixty miles, associated with extensive deposits of iron. Shansi contains enough coal to supply the world's needs for two thousand years to come, as yet almost undeveloped. The province of Yunnan is the second in importance of the tin producing districts of the world. Up to this time mining has been entirely by native methods, but recently modern ore-dressing and smelting machinery is being introduced and will soon be at work. Modern methods will probably double the output of the mines at once, and improve the quality of the product.

THERE is an evident growing conviction that the so-called campaign of 'trust busting' has not reopened any of the avenues of opportunity, and a coincident evident growing demand for some effective deterrent punishment. The evidence is not more manifested by the attitude of the general public and the continued depressed condition of general business, than in the utterances of some of the best known representatives of large interests. Following the lead of Mr. E. H. Gary, who recently advocated Government control of the large corporations, Mr. Daniel Guggenheim, in a recent interview discussing prevailing conditions in the metal market, suggests the formation of a Government commission with power to permit or prohibit combinations in handling various products, according to the conditions prevailing. It is undoubtedly true that the more far-seeing representatives of large interests are anxious to regain general confidence. Time was, when the captains of industry felt their greatness; now, they are wearying of being classed as malefactors. The principal result for the time being is a waiting attitude, and, so far as security markets are concerned, continued dullness.

COLORADO, some time since, re-created its State Geological Survey, under the direction of Mr. R. D. George, professor of geology at the State University, and good work has been done. The legislature has voted an appropriation of $15,000 a year for the next two years for the carrying on of the work. By a recent decision of the attorney-general this becomes available at once, and in conjunction with the United States Geological Survey some excellent work on the study of the mineral wealth of Colorado can be expected. This is as it should be, but turning to California we see the other side of the picture. No appointment has yet been made to the office of State Mineralogist by the Governor and the best interests of the State suffer while the matter remains unsettled. There is no lack of properly qualified candidates; selecting the best should not require months of deliberation. Let us have action.

Concrete in Mining

Criticising a critic somewhat savors of painting the lily, yet it seems desirable to add further comment to that which Mr. Jerome B. Landfield makes on mixing concrete. Providing a skilled workman with superior tools will permit his doing better work, but providing unskilled labor with better tools than their needs require frequently produces worse rather than better results. Using an arbitrary proportion for concrete will ensure that a sufficient proportion of cement is used. To employ the experimental method suggested by Mr. Landfield both requires an expenditure of time and effort greater than is justified except for large jobs, and, unless the superintendent be unusually apt at experimental work, is extremely likely to give results that are seriously in error. To determine the voids in a given mass of sand by filling them with water appears at first sight a simple operation, but, as is well known, is actually one that presents much difficulty in the obtaining of accurate results. Furthermore, having found the amount of voids, it is practically necessary to use more cement than the theoretical amount, the added quantity being a matter of judgment, so that the operation recommended is almost the reverse of estimating in a fire-assay that one assay-ton of a flux is required, and then weighing it out within a tenth of a gram. In large pieces of work it will, of course, be both advisable and economical to determine the proportions more accurately than is worth while in ordinary work. The greatest economy in any large undertaking can be secured by grading the aggregate. The function of the cement and sand is to fill the voids in the broken rock and act as a binder. If, instead of using rock all of one size, a carefully-graded mixture of sizes is used so that the small pieces fill the spaces between the larger, the amount of cement and sand necessary can be materially decreased.

It is best, of course, not to use an excess of water in mixing, but the amount necessary varies according to the requirements of the work. In reinforced concrete work, for example, it is common good practice to use concrete much wetter than would otherwise be required, in order that it may flow freely around the reinforcing. The chief disadvantage attaching to the use of concrete for mine construction, aside from cost, is the unalterability of the resulting structure. Superintendents who have been obliged to make a hole through a ten-inch concrete wall for a steam, water, or air pipe can testify vigorously as to this. An outhouse made from two-by-fours and galvanized-iron roofing that have been utilized in several previous structures, is the best testimonial to the usefulness of these materials. Concrete has many great advantages, but it can not be used for everything, nor in every case. It needs no great commendation, for the rapidity with which its use is growing assures that it will receive proper consideration.

A National University

The now denied rumor that Mrs. E. H. Harriman was considering the founding of a new university which should excel all others in enrolment and endowment, gives rise to the question whether there exists a need for one. A privately endowed university is likely to be regarded by the donor as privately owned, and it may well be questioned whether it would not be better to increase the effectiveness of those universities now in existence rather than to increase their number. Washington, D. C., is the only city in America that has any real need of a great university, and a university there should be national in character. James Smithson's gift suggests an analogy that might well be followed, and the gift to the Nation of a site and the buildings and equipment for a great National University would be an enviable memorial. One marked deficiency in our foreign relations has been the lack of men with any adequate training for the work; ambassadors, ministers, and consuls are chosen haphazard, often with haphazard results. A step toward improvement has been introduced in the system of student interpreters, by which young college graduates are at least taught to speak the language of the country in which they are afterward expected to serve. But this is a mere learning of the alphabet; in our public service, both abroad and at home, we need a large body of men trained in the principles of government and familiar with the larger features of national life. The United States in its foreign relations has too long been in the position of the wealthy farmer who drives to town in his overalls and hickory shirt, disregarding appearances in the knowledge of his solid financial standing. It is high time that Uncle Sam put on a white collar and necktie. It is an economic waste to allow the educational influences and facilities of a great centre of government to go unutilized, and the national feeling on the conservation of our natural resources might well exhibit itself in the demand for a National University to bear to the Federal Government in some degree the same measure of usefulness that the University of Wisconsin has borne to that State.

Selling Prospects

Recent editorials of ours relative to the money available for investment in mining, have attracted much attention, and our incoming mail has increased amazingly. Apparently a large number of our readers have prospects for sale. The trouble is just that; the properties are but prospects and have not been developed sufficiently to prove what value they may possess. It is not for us to disparage a good prospect; without such there would never be mines. When engaged in the active work of the profession we put money into more than one good prospect that subsequently belied its indications, but we have no regrets. Every mining man may properly be expected to spend his quota in developing the basis of the industry. Prospects, however, are not salable; at least in the sense that they can be appraised, bought, and sold on their merits alone, as can mines. The amount involved is usually too small to stand the expense of examination by an experienced engineer, and large investors can not afford to rely on the advice of any other. Furthermore, until there is at least some ore blocked out, it is rare that sufficient work has been done to permit any exact estimate of the value of the property. There are exceptions. The fortunate circumstance that an unusually capable engineer visited the property when preliminary work had developed unusually significant indications, warranted the payment of a considerable sum for what became the Commonwealth mine in Arizona, while it was still a prospect. No one, however, could afford to pay this particular engineer his usual fees and keep him busy examining prospects. Until something definite is developed, investment must be made on the faith of the man on the ground. Without raising any question whatever as to either the competence or honesty of the prospector, it is evident that this is not a sufficient basis upon which a stranger may properly invest money in what is admittedly a long chance. Individual effort and small partnerships based on personal acquaintance, must be the main reliance in converting prospects into mines. Until that stage of development has been reached, any effort to interest strangers is not likely to be successful. Occasionally when the investor or his engineer can, with nominal expense, inspect a prospect, it is possible to interest outside capital, but such instances are rare.

There is another and an important phase of the matter. A prospector almost invariably overestimates the extent of his knowledge of the property. He sees favorable indications everywhere. If he did not, he would not continue to prospect. How serious this may be is instanced by the experience of one engineer sent to examine a pile of tailing represented, in good faith, as amounting to 300,000 tons. It took but a few minutes on the ground for the engineer to convince the optimistic owner that the actual tonnage could not possibly be much more than one-tenth of the amount claimed. The man simply knew nothing about the methods of estimating such materials. In another case a prospect was represented as showing "a thousand tons" of ore of a certain value "in sight". Questioning the owner developed the fact that the deepest hole on the vein was twenty feet, that there were no cross-cuts, levels, or winzes, and nothing in fact but the outcrop and a few assessment holes. It is possible that more than a thousand tons may sometime be mined from this property. We sincerely hope this may prove true, but it is evident that there was no ore 'in sight'. The method followed in determining the value of the ore was equally accurate. The owner had "broken off pieces along the outcrop" to the total amount of fifteen pounds, and had the material quartered and assayed. He was honest in his belief that he had not selected the best ore, though any experienced sampler, remembering the hypnotic influence a valuable mineral exerts over a prospector's pick, might well reserve a doubt. The disproportion between a 15-pound sample and a 1000-ton block of ore, had not appealed at all to him. In still another case a bright and earnest young man wanted some stranger to join him by putting in two or three thousand dollars to drive along a vein to find a possible ore-shoot not discovered when cross-cut by an adit, and lost at forty feet in sinking from the surface. Questioning in this case revealed the fact that it was by no means certain that the 40-foot shaft had not been sunk in a landslide. In that event the search for the parent ore-shoot might well be long and costly. In any event, expert knowledge of a peculiar type was evidently needed as much as money.

These cases have been cited, not in levity, but to illustrate the very real difficulties that lie in the way of developing and selling prospects. In each instance the owner impressed us as honest, as having more than usual ability, and the properties as having some probable merit. But these are not, in our judgment, good investments on the basis of the facts as the prospector was able to present them. Until prospectors learn much that they do not now know about sampling and measuring ore, and until they have more knowledge of economic geology, they are likely, we fear, to have to continue to depend upon personal friends for funds supplementary to their own. A few mining men, wearied in the search for mines, occasionally pay roundly for a prospect, but this is the exception rather than the rule.

Cost of Mining at Silver Peak

By Edmund Juessen

The mines of the Pittsburg-Silver Peak Gold Mining Co. are situated on the slopes of Mineral ridge, a spur of the Silver Peak mountains, three miles distant from and 2000 ft. above the company's mill and cyanide plant at Blair, Nevada. They comprise a number of properties on a 'gold quartz' bearing zone of metamorphic schist, forming the basal member of a series of sedimentaries, and resting on an intrusive mass of granite.

MINING EXPENSE

Classification	Labor	Material	Totals	Average Cost per Ton for the Months of		
				Dec.10	Nov.10	Dec.09
Superintendent	225.00		225.00	0.015	0.016	0.017
Foreman	168.75		168.75	0.011	0.012	0.013
Engineer	248.70	108.41	357.11	0.023	0.023	0.013
Shift bosses	279.00		279.00	0.018	0.020	0.028
Compressors	279.15	105.28	384.43	0.025	0.018	0.022
Blacksmith shop	297.85	48.42	346.27	0.022	0.025	0.033
Elec. haulage	469.05	8.93	477.98	0.030	0.033	0.032
Timbering	92.85	116.76	209.61	0.014	0.025	0.026
Miners	1928.15		1928.15	0.125	0.143	0.183
Mucking & tramg.	2350.50		2350.50	0.152	0.137	0.234
Electricians	83.25		83.25	0.005	0.006	0.007
Carpenters	83.25		83.25	0.005		0.003
Sampling						0.017
Other labor	959 05		959.05	0.062	0.071	0.103
Power		728.48	728.48	0.047	0.052	0.054
Pipe lines	99.25		99.25	0.006	0.009	0.004
Explosives		1257.61	1257.61	0.081	0.096	0.093
Elec. appliances	12.00	13.49	25.49	0.002	0.001	0.009
Tools		351.20	351.20	0.023	0.013	0.007
Iron and steel		77.72	77.72	0.005	0.005	0.006
Other supplies		214.02	214.02	0.014	0.012	0.020
Water	126.75	27.71	154.46	0.010	0.013	0.011
Steam shovel	594.90	143.60	738.50	0.048	0.040	0.000
Locomotive	159.50		159.50	0.011	0.011	0.000
Maint. bldgs.	3.75		3.75			0.014
Heating		110.83	110.83	0.007	0.006	0.005
Pro general	832.40	1573.39	2405.79	0.155	0.135	0.296
Suspense acct.		537.43	537.43	0.035	0.076	
Totals	9293.10	5423.28	14716.38	0.951	0.997	1.250
Tons mined				15480	13802	13319

DEVELOPMENT EXPENSE

Labor	2714.80		2714.80	0.175	0.176	0.213
Power		285.46	285.46	0.018	0.016	0.015
Supplies		997.36	997.36	0.065	0.049	0.086
Pro general	282.63	534.22	816.85	0.053	0.041	0.085
Suspense acct.		184.74	184.74	0.012	0.024	
Valcalda Ry.	159.00	548.16	707.16	0.046		
Totals	3156.43	2549.94	5706.37	0.369	0.306	0.399

Some of these properties were first worked forty years ago, the ores being treated in small stamp-mills at Silver Peak, requiring a wagon haul of over seven miles. These early operations were restricted to 'rich streaks' of the outcropping ores, the handling en masse of the large low-grade orebodies, of which they were part, being undertaken by the Pittsburg-Silver Peak Gold Mining Co. after consolidating the properties and providing for the transportation facilities required for their joint and economical operation.

The profitable handling of the low-grade ores, occurring in flat-dipping, lens-shaped bodies intercalated in schist, required a method of development and mining which would reduce the elements of cost, such as 'dead work,' handling of ore in stopes, supporting underground excavations, and transportation in general, to the minimum obtainable under the existing high-labor scale of the district. The firm hanging wall of the individual lenses, and the further fact that an appreciable extent of the ore zone had been partly bared through erosion of its overburden, favored economical extraction under otherwise trying conditions; permitting the use of pillars in place of timbers or filling for the support of the underground excavations and making possible the employment of the glory-hole and open-cut methods of mining in the extraction of from 35 to 40% of the total ore tonnage.

The following details of mining and development expense for the month of December 1910, are illustrative of the mine performance since the beginning of 1910, when certain changes were made in the underground methods, bringing about a reduction in the cost of handling the material in the stopes and providing the facilities for winning a large percentage of the ores remaining in the pillars supporting the excavations.

The costs of underground and glory-hole mining and the incidental development have not been segregated in these statements. They vary slightly from month to month, in keeping with the relative percentage of tonnage gained from the different workings. At present the underground ore represents 60% of the total tonnage and 73% of the total cost, while glory-hole and open-cut mining produces 40% of the ore at 27% of the total cost.

The ore won through glory-hole and open-cut mining is considerably lower in grade than that coming from underground workings. This is partly due to a more scattered condition of lens occurrence near the surface; partly to a cutting down of the ore values through an admixture of waste in mining, unavoidable in carrying on glory-hole operations in a flat-lying orebody having an overburden of barren material.

The ability to vary the proportion of underground and glory-hole ore in keeping with any material fluctuation in value and cost of production has been provided for through extensive development of the property. These figures include a *pro rata* portion of the general expense and in addition a charge for *Suspense Account*, in which all expenditures are carried that are made for betterments, reconstruction, and large items of equipment necessary to maintain the plant at full work-

COST PER TON

Quarter ending	Tonnage	Miners	Direct Operating Charges						Indirect Charges		Totals	Total Operating Charges
			Muckers and Trammers	Supervision Shop Elec. Haulage Other Labor	Total Labor	Power	Supplies	Total Direct Operating	Pro General	Suspense		
Mch.08 Mining	21332	0.574	0.604	0.331	1.509	0.078	0.415	2.002	0.163	During this period all machinery purchases charged to Mine Equipment Account	2.165	
Devel.					0.291	0.033	0.324	0.324	0.027		0.351	2.516
Jun.08 Mining	37039	0.317	0.416	0.331	1.064	0.065	0.368	1.497	1.166		1.663	
Devel.					0.309	0.033	0.090	0.432	0.044		0.476	2.139
Sep.08 Mining	29306	0.428	0.531	0.511	1.470	0.099	0.454	2.023	0.151		2.174	
Devel.					0.473	0.042	0.097	0.612	0.044		0.556	2.830
Dec.08 Mining	27168	0.281	0.510	0.400	1.191	0.078	0.289	1.558	0.397		1.955	
A Devel.					0.787	0.094	0.152	1.023	0.237		1.250	3.205
Mch.09 Mining	37092	0.226	0.363	0.287	0.876	0.080	0.336	1.291	0.223		1.514	
Devel.					0.606	0.051	0.201	0.858	0.147		1.005	2.519
Jun.09 Mining	38662	0.194	0.308	0.289	0.731	0.070	0.189	0.990	0.207		1.197	
Devel.					0.647	0.051	0.141	0.839	0.184		1.023	2.220
Sep.09 Mining	39850	0.194	0.268	0.247	0.709	0.065	0.214	0.988	0.324		1.312	
B Devel.					0.564	0.037	0.129	0.730	0.177		0.907	2.119
Dec.09 Mining	38995	0.184	0.251	0.290	0.725	0.055	0.198	0.968	0.252		1.220	
C Devel.					0.306	0.016	0.105	0.426	0.098		0.524	1.744
Mch.10 Mining	41374	0.171	0.212	0.281	0.664	0.053	0.296	1.013	0.217	0.027	1.257	
D Devel.					0.198	0.013	0.056	0.267	0.062	0.005	0.334	1.591
Jun.10 Mining	44909	0.167	0.170	0.281	0.618	0.053	0.211	0.882	0.099	0.160	1.141	
Devel.					0.091	0.007	0.030	0.128	0.029	0.010	0.167	1.308
Sep.10 Mining	43844	0.161	0.167	0.251	0.579	0.055	0.231	0.865	0.148	0.069	1.082	
Devel.					0.116	0.016	0.058	0.190	0.026	0.015	0.231	1.313
Dec.10 Mining	43625	0.146	0.146	0.228	0.520	0.052	0.232	0.804	0.146	0.090	1.030	
Devel.					0.154	0.018	0.052	0.224	0.040	0.036	0.300	1.330
Mch.11 Mining	45108	0.151	0.136	0.214	0.501	0.047	0.254	0.802	0.146	0.049	0.997	
Devel.					0.212	0.024	0.078	0.314	0.056	0.029	0.399	1.396

A Commenced work on flat raise
B Completed flat raise haulage system
C Commenced glory-hole mining
D Changed underground mining methods

ing efficiency. Depreciation of plant is not considered under operating costs, being cared for through an annual 'writing off' from profits of an amount commensurate with the estimated lifetime of the property. As is the case in all enterprises of this character, the initial costs of operation at Silver Peak were materially higher than those shown in the preceding statement, economies being effected gradually, as the knowledge of conditions to be met grew and the methods of work were perfected. This is shown by the following analyses of costs, including in its scope the mine performance from the beginning of the year 1908 to the close of the March quarter, 1911. To emphasize the gradual increase in efficiency of labor resulting through improved methods of work, the charges for miners, muckers, and trammers appear separately from other labor.

The flat raise haulage system is 1400 ft. in length, and connects all of the operating levels of the property. Its driving cost was charged off to *Development*, its equipment to *Mine Equipment* account, as the *Suspense Account* now in use was not in effect at that time. This accounts for the fact that the development costs during the period December 1908 to September 1909 were materially higher than during the other operating periods of the property.

It is manifest from an inspection of the cost figures for the period March 1908 to March 1909, that the Silver Peak mines, at that time, were no exception to the rule that "the producing power of a mine is always overtaxed through a heavy tonnage demand before the handling methods have been sufficiently advanced to permit of economical extraction."

The average efficiency per shift of mine labor can be calculated from the following division of labor for the month of December 1910, and the mine perfomance during the same period of time:

Mine Labor.	Shifts.
Shift bosses	62
Machine men	531
Machine men helpers	167
Shovelers	529
Timbermen	16
Timbermen helpers	16
Trammers	145
Shovel crew	84
Shovel train crew	29
Hoist men; pipe men	243
Total shifts	1822
Other Labor.	**Shifts.**
Supervision	155
Shop	217
Electricians	122
Carpenter	31
Yard	124

During this month 13,061 cars of ore and 2187 cars of waste were handled; the ore tonnage amounting to 15,668. Expressed in terms of tons of product per mine-labor shift, considering only the ore tonnage, the performance per man equals 8.6 tons per shift of eight hours.

The wage-scale paid will be of interest in comparing the labor efficiency secured at the Silver Peak mines with the performance at other mines, operating on low-grade ores, occurring under similar mining conditions.

WAGE SCALE

(Per shift of 8 hours.)

Shift bosses, carpenters, machinists, electric workers, shovelmen	$6.00
Locomotive engineers, blacksmiths	5.50
Hoist and compressor engineers, motormen, tramway brakemen, linemen	5.00
Machine men, timbermen, skipmen, crushermen, shovel helpers, machine men helpers	4.50
Muckers, trammers, blacksmith helpers, yardmen, and all other labor	4.00

The complete costs of mining, crushing, aerial tramming, and milling for December 1910 are given in the table below. As in the figures for mining and development discussed, the other items of this statement contain a charge for *General Expense* and *Suspense Account*. It will be observed that all items of cost other than aerial tramming are in harmony with the low cost of mining. The excessive tramming cost for December 1910, as well as for the month of November of the same year and December 1909, are due to an almost complete reconstruction of the tramway line, which is 12,800 feet in length. This was necessary in order to increase its handling power in keeping with the increased mine tonnage.

TOTAL COSTS

Classification	Labor	Material	Total	[illegible]	[illegible]	[illegible]
[illegible]	$3395.10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Development	3156.45	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	741.93	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Tramming	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	$3.26[illegible]

Concrete in Mining

By Jerome B. Landfield

No engineer is today inclined to doubt the large part that cement is destined to play in the future of mining and milling operations. Already mine managers have had much to do with concrete in the building of foundations, retaining walls, sluices, and the like, and successful experiments have been made in adapting it to supersede mine timbers under certain conditions. But the employment of concrete in mining is still in its infancy, and practical methods in the use of cement are not as familiar to mining engineers as they should be. Mr. Del Mar's article on concrete in the *Mining and Scientific Press* of April 15 contained much interesting and valuable information, but there was also much in it that savored of the handy reference book, and in certain details it should be revised.

In the first place, no mine or mill superintendent, in mixing concrete for any important use, can afford to go by the rule-of-thumb method of proportioning his aggregate. To lay down a rule that the mixture should be 1 : 2.5 : 4.6, or any other arbitrary proportion, is to ignore absolutely the differences in materials in different places. There is, on the other hand, a simple method of determining the proper proportions of any materials selected. Two things only must be borne in mind. The first is that the cement is just what its name implies—it is the binding element. By itself it is neither as strong nor as durable as in combination. It is a common error to believe that concrete is necessarily made stronger by increasing the proportion of cement. The other thing to remember is that the best proportioning of the aggregate is that which leaves the smallest amount of voids. This is a comparatively simple matter to ascertain, and differs materially according to the character of the sand, gravel, and rock used. To determine it, first take a given amount of the gravel, or broken stone, and place it in a bucket the contents of which are known. Having calculated the number of cubic inches in the bucketful of gravel or broken stone, fill it with water. The amount of water required to fill it will show you the voids that must be filled with sand and cement. A similar test of the sand will give you the proportion of cement to sand.

It is a mistake to suppose that an excess of water in mixing concrete will do no harm. The right amount of water should be used—no more and no less. This differs under various conditions. If concrete is placed in mass in practically watertight molds, the amount of water used may be increased considerably without harm, but there must not be enough to have a tendency to flush neat cement to the surface, or to cause a sizing of the aggregate.

On the other hand, where a large surface is to be covered with a comparatively thin layer of concrete, much less water should be used. In floors and the like, one surface is subjected to absorptive action, while the other is at the mercy of atmospheric influences. Here the danger is that if water drains off it will carry with it particles of cement, and if it flushes to the top it will delay finishing, so that the trowel will disturb elements that have begun to get their initial set. In general, a floor that has been laid with concrete mixed too wet will dust off badly. The correct method is to mix coarser concrete so that it will tamp without quaking, and finer concrete for a top coat so that it may be molded in the hand. To secure a hard and durable finish, tamp this latter material so that just enough moisture comes to the surface for finishing immediately. Then be careful not to trowel it too much. It then should be protected against atmospheric influences and the best method is to cover it with damp sand as soon as it has taken its initial set.

There is a little trick known to practical concrete men that may interest mining men, and that is the way in which fresh concrete is made to bond to old. This is especially important where concrete work has to be done by stages, or where repairs have to be made. The old surface is, of course, first carefully cleaned, preferably with a wire brush and plenty of water. Then it is painted over with a grouting of neat cement mixed to the consistence of batter. If the fresh concrete is then promptly put on, there will be no difficulty in making a good bond.

One of the most important problems that have engaged the attention of concrete engineers is that of waterproofing, and it is not necessary to say that this is of particular interest to the mining man. There are in the market scores of waterproofing devices, most of them unsatisfactory for one reason or another. Most of them waterproof but temporarily, and others waterproof at the expense of strength. Nearly all waterproofing devices may be divided into integral and surface treatment. The surface treatments are many, but at the present time the most satisfactory are two. One of these is to paint the surface with some kind of gilsonite paint, and the other is to wash the surface with sodium silicate (water glass). The process is to put on the wash, let it remain for a few hours to sink in, then wash it off. The operation is repeated several times, and the result is a glazed surface.

Waterproofing agents to be mixed with the concrete are legion, and most of them are worthless. A simple method sometimes followed with success, is to add a little alum to the cement, and put some soap in the water with which the concrete is mixed. The aim of integral waterproofing is to attain density, and the most satisfactory way of attaining this density is to add to your cement a small proportion of pure hydrated lime. The most perfect method of waterproofing, however, is just now the subject of patent litigation before the United States Supreme Court. This may be termed the calcium oleate process, and consists in making a combination of lime and animal fat, pulverizing it, and then adding to it the clinker in the cement mill before this is ground. The result is a waterproof cement for all uses. The strength is not impaired, but is in fact increased, owing to the fact that the finest particles, which would naturally set too quickly, have their setting somewhat retarded.

Possibly the most interesting recent development in cement matters, from the standpoint of the mining man, has been the invention of a means of applying concrete to a surface by means of compressed air. This process, familiarly termed the 'cement gun' process, is the invention of Carl Akeley, the naturalist of the Field Columbian Museum at Chicago, and it was for renovating the façade of this building that it was first used. Some practical business men and engineers obtained the invention, and proceeded to develop its commercial possibilities. For two years laboratory experiments were carried on, and last December it was for the first time exhibited publicly, at the Cement Show in New York. The principle of the machine is to force a steady stream of dry sand and cement, previously mixed, through a hose. Another smaller hose carries water, which is injected into the mixture of sand and cement just as it is leaving the nozzle. A most remarkable result is thus attained. When the mass thus projected strikes any surface, the sand falls and a grouting of neat cement automatically forms on the surface. Then the sand commences to take hold and regular cement mortar is formed. This mortar bonds with almost any surface, brick, concrete, iron, etc., and is exceedingly dense, owing to the fact that each particle is practically shot into place under pressure. All surplus moisture is forced out, and the mortar in setting becomes very hard and will absorb only a fraction of the water absorbed by ordinary hand-made concrete.

That this machine possesses wonderful possibilities for mining men will be seen at a glance. In the first place, it is possible to build sanitary and fireproof houses and other buildings in desert and tropical regions at a very low cost. All that is necessary is to put up a light steel frame, cover this with wire mesh outside and inside, with a backing of tar paper to act as a mold, and then with the 'cement gun' put on an outside and inside layer of cement stucco. Inasmuch as one machine will put on a square yard of one-inch stucco in two minutes, it will be seen that the operation is not expensive. Old frame buildings may be made over and fireproofed in this way. An example of this I recently witnessed at Orange, N. J., where the manufacturing company took a contract to make over a large frame building into a fireproof milk depot. Much could be done underground with a machine of this character. All that is required is a comparatively inexpensive machine for use in connection with the air from the compressor, and a supply of sand and cement. A stream from the nozzle will penetrate a layer of broken stone to a depth of six to eight inches, making of it a mass of dense concrete. A quantity of waste rock simply piled up or crated in with wire netting could quickly be turned into a retaining wall or support that would last to the end of time. With the machine many clever ways of dealing with soft ground could be devised. Thus far the machine in question has only been used commercially in house building, so far as I know, and I shall await with interest experiments with it in the mining field. At any rate, it seems deserving of a little description, so that mining men, as well as those in other fields, may be prepared to take advantage of whatever possibilities it has in store.

The Tin Disease

It is a well known fact that tin exists in two allotropic modifications known as the white and gray. The white is the ordinary form, the former passing into the latter when the temperature is sufficiently low. The following is taken from a recent study by Ernest Cohen, published in *La Technique Moderne*. The first clear case of the disease occurred in a lot of Straits tin stored in a Russian custom-house during the winter of 1868. When it was time to remove it, it had fallen into powder. This was attributed to the intense cold of that winter, the phenomenon afterward being reproduced by artificial refrigeration. According to Cohen's researches, at the temperature of 64°F. there is a change from white to gray tin, which goes on with increasing velocity until a maximum is reached at −40°F., after which the velocity decreases, the change ceasing at −172°F. The first symptoms are small swellings like warts or grains, the trouble beginning at isolated places, but quickly spreading from point to point. The tin changes from white to gray, it crumbles to powder, and undergoes partial oxidation, the volume increasing somewhat. In the early stages the reaction is reversible, in the later stages it is not, and the powdered gray tin has the property of infecting good white tin. Consequently, if any objects are attacked they should be removed from the neighborhood of uninfected pieces, and it is recommended that the temperature of cases in museums which contain tin objects should not fall below 68°F. at any time.

Economic Geology of the Philippine Islands.

By Warren D. Smith

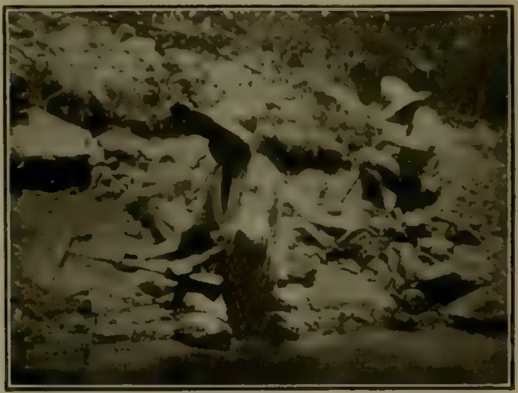
*Gold. This metal has been found in some quantity in nearly every part of the archipelago. It was mined in a crude way as long ago as there are records. I have been in ancient workings on the islands of Masbate which probably were made by Chinese years before the coming of the Spaniards. Magellan heard reports of gold in the Camarines when he reached the Islands in 1521. Although it is not the most important mineral asset of this, or, as a matter of fact, of any other country, yet gold holds the first place, for it is the easiest to mine and does not depend upon a market. The three principal districts where gold mining is now being carried on are Ambos Camarines, Benguet, and Masbate.

MAP OF THE PHILIPPINE ISLANDS.

In the first-named district, near Paracale, mining is largely confined to dredging, although vigorous development on the lodes is in progress. The country-rocks are largely schistose diorites, gneissic granite, and slaty shales. These formations are similar to those found on the islands of the Karimoun archipelago near Java. The veins, as far as we now know them, are of only moderate width, but very rich; pockets running as high as one or two thousand dollars, gold, per ton have been encountered. Some of the gold is found in the quartz filling along the contact of the diorite and granite, but several good veins are normal to this contact. Lode mining is farther advanced near Mambulao, there being 20 stamps dropping on the San Mauricio property and a Huntington mill operating on the Tumbaga. On the Paracale river there are two New Zealand dredges, while an American (Risdon) dredge is digging in the Malaguit. A large Bucyrus dredge will shortly be installed on the Gumaus river.

The dominant rocks in Benguet are diorite and andesite, and the gold is found in fairly large quartz and calcite veins in north and south, east and west, and northwest and southwest systems, cutting the formations indiscriminately; that is, they are fissure veins. Gold occurs both native and as telluride. The ore is not entirely free milling, and cyaniding is resorted to. The chief characteristics of this ore, except in one or two cases, are the general absence of manganese and the abrupt change from an all quartz gangue to all-calcite within very short distances. Altogether, there are only nine stamps dropping at the present time, two mills having been badly crippled in the fall of 1909. However, two new mills are about to begin operations.

In the mining district of Masbate the country-rock is largely andesite, in old, worn-down volcanic stocks. The andesite is cut by a system of northwest and southeast quartz veins, one of which is over 20 metres wide. The ore is oxidized to a much greater extent than is the case in Benguet, but is only partly free milling. This ore also contains large amounts of manganese oxide. There are four principal companies in this district, but not one in the producing stage at the present time. Some dredging was attempted in this district, but for various causes it was unsuccessful.



NATIVES BREAKING ROCK, SAN MAURICIO.

Other promising regions are near Cabua and in Nueva Ecija, Luzon; the Cagayan-Muniqui-Pigtao district, Mindanao; the Surigao peninsula, Mindanao; the island of Catanduanes; Pangasinan province, Luzon; and Mindoro island. The gold mined in 1909 amounted to ₱495,194.*

Silver.—Some silver is found in all the gold districts, usually alloyed with gold. Native silver has been encountered in Benguet in small quantities. Practically all the lead is argentiferous. The production in 1908 was ₱2750. That for 1909 was not estimated separately.

Copper.—Copper has been found in the form of arsenates and sulphides in the Mancayan-Suyoc district of the Mountain province, Luzon, as native copper in Masbate, the Camarines, and the island of Jolo. The best known deposit is that in the Mancayan-Suyoc district. Eveland writes as follows concerning this deposit: "In view of the fact that the entire region, with the exception of the one orebody of the Mancayan mine, is in an early stage of development, it is impracticable to treat the ore deposits in detail. It seems to be fairly conclusive, however, that the general type of vein in the district is a narrow quartz lead, carrying metallic sulphides, in some cases of copper, and generally with gold associated in a free state. These veins are in the Mancayan diorite which underlies the entire district. With the advent of the 'trachyte' flow, metamorphic changes have taken place, and the nature of the country-rock is altered to a considerable degree." Recent development work has shown this deposit to be rather in the nature of a stockwork, and it appears to me to be more extensive than was thought to be the case.

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*Abstract from the *Philippine Journal of Science.*

*The Philippine peso = 50c. gold.

Lead and Zinc.—Lead and zinc are associated in some of the Camarines deposits. Argentiferous lead occurs in many localities, principally in Cebu and the island of Marinduque. In Cebu it is of the nature of a stockwork in an andesite flow.

Iron.—Iron ore in the form of hematite, magnetite, and limonite, with varying percentages of iron, has been found in several localities. However, there is a fairly well defined belt which follows the east coast of Luzon for a short distance, beginning in the Camarines and then swinging into the interior, where it reaches, as far as our knowledge now goes, its greatest development near the town of Angat in Bulacan province. Three small blast-furnaces of crude design are now operated by a Filipino woman.

The following is an analysis of the ore from this place:

Constituent.	Per cent.	Constituent.	Per cent.
SiO_2	2.24	CaO	0.12
Al_2O_3	6.52	K_2O, Na_2O	...
FeO	1.92	H_2O	0.04
Fe_2O_3	88.22	CO_2	0.01
MgO	0.18	TiO_2	0.77

Manganese.—Manganese oxide occurs in Ilocos Norte in nodules concentrated in shallow beds. The origin of this substance has been traced by Smith to small stringers in a recent andesite flow. Manganese occurs in small pockets in the quartz veins in the gold districts of Benguet, Masbate, and Camarines.

Coal.—Coal is found on nearly every island of the archipelago. The principal localities are Batan island, Albay province, Luzon; near Compostela and Danao, Cebu; near Cataingan, Masbate; near Bulalacao, Mindoro; near Sibuguey bay, Mindanao, and near Burdeos, Polillo. The coal measures belong to the Tertiary period. The coal is subbituminous, and an analysis (by Fox) from Batan island gives the following figures:

	Per cent.
Volatile combustible	39.98
Fixed carbon	48.80
Ash	5.70
Moisture	5.74
Sulphur	0.66

A sample from Cebu gave the following analysis (by Cox):

	Per cent.
Volatile combustible	36.44
Fixed carbon	54.48
Ash	4.12
Moisture	4.86
Sulphur	1.88

The production in 1909 was 31,000 metric tons. There is only one producing mine at present: the East Batan Coal Co. on the little island of Batan.

Petroleum.—Oil seeps have been noted at two places on the island of Cebu, two in Leyte, four on Tayabas peninsula, and one in the Cotabato valley in Mindanao. Three oil wells have been drilled, but no appreciable flow has as yet been obtained. One well in Cebu reaches a depth of 1100 feet. The oil occurs in Tertiary sandstone and shales. The oil from Tayabas gives these results:

	I.	II.
Specific gravity of filtered oil at 15.5°C.	0.845	0.831
Initial boiling point	80°C.	70°C.
	Percentage.	
First fraction, light oils 70° to 150°C.	27.0	36.5
Second fraction, burning oil 150° to 300°C.	56.75	48.75
Residuum above 300°C. by differences	16.25	14.76
Total	100.00	100.00

Phosphate.—Small deposits of guano have been found in limestone caves, but no rock phosphate. One small deposit of apatite crystals has been found in Ilocos Norte.

Sulphur.—Small deposits, scarcely large enough to be of commercial value, occur in Leyte on the island of Biliran, Mount Apó in Mindanao, and a few other scattered localities. Ferguson found a fair deposit on the island of Camiguin in the Babuyanes group.

Salt.—No large natural salt beds are yet known in the Philippines. Some very salty springs occur in several provinces, principally in the mountain province of Luzon.

Asbestos.—Asbestos of the anthophyllite and baltimorite varieties occurs in Ilocos Norte, but as yet only occasional veinlets of chrysolite have been seen. There is no production and but little development work.

Mineral Waters.—The two principal springs are at Sibul, Bulacan, and Los Baños, Laguna. During 1908, 268,440 litres were bottled and sold.

Clay.—Crude ware, *pilones*, cooking pots, brick, and tile, all burning red, and unglazed, are made throughout the islands. Some glazed ware has been manufactured, using common salt glazing, but little fine faïence has been attempted. In Laguna province some deposits of kaolin occur, but they are not extensively worked. Orthoclase feldspar and sand suitable for glass making have been found in a very few places. Good glass sand has recently been discovered in Ambos Camarines.

The Glycerine Supply

LONDON CORRESPONDENCE

Much has been heard recently of the serious rise threatened in the price of dynamite and allied explosives, owing to the enhanced cost of glycerine, which is the base of nitroglycerine manufacture. As most of the glycerine used throughout the world for this purpose is made in England, the cause for this increase in price is more readily studied here. Glycerine is a by-product in soap manufacture; when animal and vegetable oils are treated with alkali, soap and glycerine are formed. Except for its use in pharmaceutical preparations, glycerine was of no commercial value until nitro-glycerine was invented, and nowadays, owing to the restricted circle of explosive-makers, little is heard of it as an ordinary market commodity. The 'spent lye' left behind in soap manufacture contains about 9% of glycerine. The relative amount of glycerine and soap produced by the reaction varies widely, according to the nature of the raw material and the kind of soap produced. Most of the soap-makers boil the lye down to produce a crude 80% glycerine. Only a few of the large houses make a refined product; the others either sell it to the bigger firms, to the limited number of explosive manufacturers who undertake refining, Nobels being the chief, or to merchants who buy for the American demand. The British Government cordite works do not refine glycerine, but buy it mostly from Nobels. At the beginning of 1907 crude glycerine was worth £28 10s. per ton, and refined £50 per ton. By the end of the year crude had advanced to £68 and refined to £105 per ton. The cause is to be found in the advance in the price of oils and fats. The soap-maker has found it impossible, or at least injudicious, to recoup himself by increasing the price of soap, owing to its being a national commodity necessary to the poorest classes, so has had to turn his attention to the other outlet of his commodities. It is also interesting to note that the chief reason for the advance in the price of fats and oils is their increasing use in the manufacture of oleomargarine. Some of the largest soap-makers have found it necessary to protect themselves by becoming their own producers of vegetable oils. Taking all these facts into consideration, it is obvious that the fear that explosives will continue to advance in price is only too well founded. It may seem remarkable that an article of circumscribed application such as dynamite should not be able to get as much raw material as required, produced in connection with so universal a commodity as soap. Is it permissible to suggest that the proposed compulsory baths for miners will cause, by the increased use of soap, an increased supply in glycerine, with a resulting reduction in its price? In this way the mining fraternity would benefit not only in health but by a decrease in the cost of explosives.

North Washington Power & Reduction Mill

By M. H. Joseph

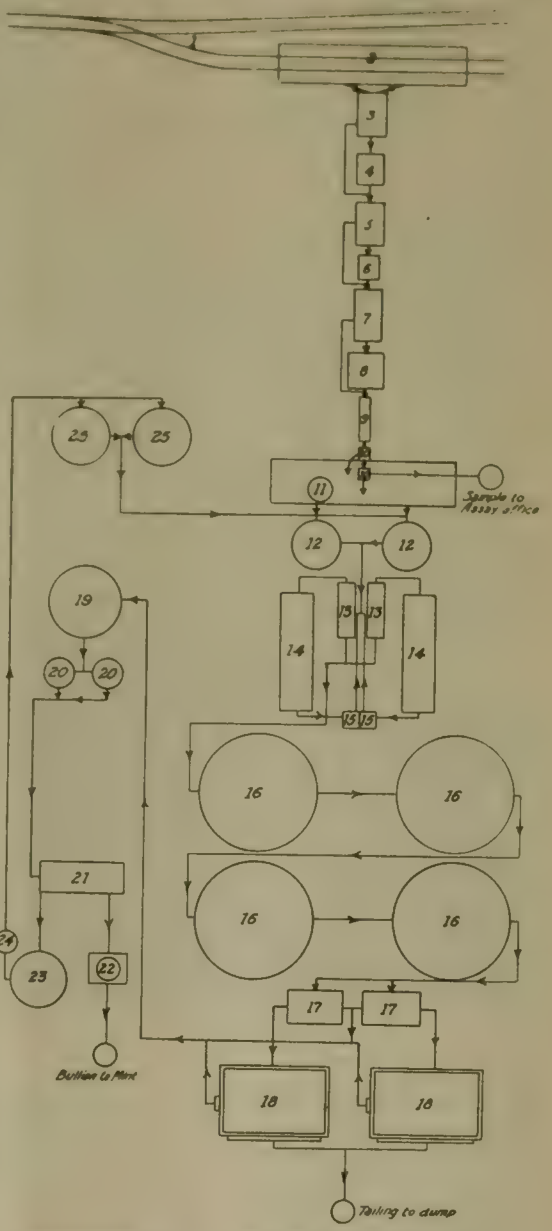
The mines at Republic have previously had but a small and precarious outlet for their ores, dependent on the demands of distant smelters for highly siliceous materials, especially for use in converter linings. Of late the smelters have used the Republic ores in fluxing the lead ores of the Coeur d'Alene and other districts, but as no ore containing less than $11 in gold and silver per ton will pay a profit over the cost of mining, transportation, and treatment at distant reduction centres, a less expensive treatment for lower grades of ore by local milling processes has become a necessity. In the milling practice formerly in vogue in Republic the mechanical limitations of fine grinding and the subsequent treatment of finely ground pulp, caused great difficulty. The gold in the ores of the camp, though mechanically free in a dense matrix, is ordinarily so finely divided as to be invisible, except by microscopic examination. Silver occurs in some of the high-grade ores in the form of selenide of silver. Native silver is occasionally found in medium-grade ore, and it occurs throughout the ore as a sub-sulphide of silver and also alloyed with gold. Various analyses and metallurgical tests have proved that the incomplete recovery of gold and silver by cyanidation at Republic is due, not to the presence of rebellious minerals, but to the density of the ore which would not permit permeation by the cyanide solution.

The new mill, designed by H. W. Newton, will treat 1000 tons of ore per day and will be constructed in eight units of 125 tons each, two of which were expected to begin operation about June 1. In addition to the main building, there will be a crushing plant, refinery, assay office, pumping station, warehouse, and business office. The machinery will be electric-driven, with power generated at the company's plant, at Similkameen Falls, near Oroville, Washington, to supply power and light for the mines and mill, and to light the town of Republic. An auxiliary plant will be included in the mill equipment, with 325 kw. of electric power available for use, in case of interruption of power along the transmission line.

A spur of the Spokane Falls & Northern railway crosses the millsite, and over it the ore will be conveyed from the mines to the storage-bins of the crusher plant, from which it will go through the following stages of treatment: From the storage-bins the ore is fed to Blake crushers by a shaking-screen, the undersize, together with the product from the crushers, falling to grizzly bars spaced to one inch. The oversize from the grizzlies is fed to Dodge crushers, and the product, joining the grizzly oversize, gravitates to trommels. In the trommels, all the material passing a ¼-in. ring is removed, the oversize passing to rolls set to crush ¼ in. The product of the rolls, with the undersize from the screens, is carried by a conveyor-belt to the mill-bins, where an automatic sampler removes a cut for assay, the reject falling to a second conveyor-belt, which automatically distributes the ore to the bins.

From the mill-bins the ore is fed by plunger feeders to Trent Chilean mills, where it is ground in cyanide solution to pass 20-mesh screens. The product of these mills flows to Akins classifiers, where all the material fine enough for cyanide treatment overflows to Trent agitators, the classified sands dropping to the feed-box of the tube-mill, where these sands are reground so that 85% will pass 200 mesh, after which they flow to the elevator sumps. From the elevator sumps bucket-elevators return the pulp to the Akins classifiers, where any remaining unfinished product is removed, the finished pulp going directly to the Trent agitators, connected in series, where the pulp is agitated, passing through the series of tanks by displacement to disc-thickeners.

In the disc-thickeners the pulp is relieved of a portion of its enriched solution, which passes to the precipitation department, the thickened pulp flowing to Oliver filters, which separate the remaining solution from the ore by vacuum filtration, the solution passing to the precipitation department, and the ore to the tailing dump. In the precipitation department the solution is mixed with the quantity of zinc-dust necessary for the precipitation of the gold and silver, and is pumped to the refinery, where the gold and silver precipitate is removed in a filter press, the barren solution again entering the mill circulation. The precipitate is periodically removed from the press, melted, and cast into bars.



FLOW-SHEET, NORTH WASHINGTON P. & R. CO. MILL.

Only about 10 per cent of the world's output of graphite is used in the manufacture of 'lead' pencils. Graphite is not fusible and is therefore employed, either pure or mixed with clay, for making crucibles for use in the steel, brass, and bronze industries. It has no equal as a lubricant, and is used extensively in electrotyping and electroplating, for it is a better conductor of electricity than most other forms of carbon. It is also a constituent of a paint used to preserve iron and steel.

Factors in Cost of Oil Production

By William R. Jewell

A question of vital importance to the oil industry of today, and one which is invariably a subject of inquiry by the prospective investor in oil property, is the cost of production. The question, 'What does it cost to produce oil?' in general cannot be answered. First of all, what does the inquirer mean? If he is a novice in the oil business, it is likely that he wishes to know what it costs to pump oil and maintain production after the wells have been completed. If he intends to purchase oil property for the purpose of development, his inquiry assumes proportions of such magnitude that it can be answered through only a detailed exposition and correlation of many factors, every one of which must be, as nearly as possible, determined before the problem can be worked out. Failure to proceed along these lines has ruined many companies, and brought keen disappointment to a multitude of stockholders, who have been led to expect magnificent dividends through the misrepresentation of the promoter; misrepresentations often due to his ignorance rather than to intention. On the other hand, accurate determination of all the factors attendant on cost of production and operation would place the oil business in the investment class rather than in that of speculation.

If all the oil produced in California up to January 1911, amounting to about 379,743,268 barrels, were balanced against the total amount of money spent in producing it, taking into account the immense cost of all the wells which produced no oil, the cost of production would be found to be many dollars per barrel. It is a fact that the great oil companies of today have produced their oil during the first five years or so of their existence at a cost of at least $5 per barrel. Data have been gathered by H. B. Guthrie showing that from 1888 to 1908, of a total of 5611 wells drilled, 1017 were failures. Thanks to the 'wild-catter', who has spent millions in drilling in unproved territory, we have our wonderful California oil fields. But while it is interesting, it would avail nothing in a practical way to determine the average cost of oil production throughout the State. It is my purpose to enumerate in this article the factors determining cost of production, deduced through a study of conditions in the various fields, and to present representative examples showing how the costs work out.

Acreage and capacity of production are of fundamental importance, for upon these depend the purchase price of the land, the number of wells that may be drilled thereon, and the maintenance of production over a long range of years. It is more economical to produce from two wells than from one, and manifestly the cost of operating on a large scale may be reduced to a minimum. Capacity for production may be approximated through a knowledge of the thickness and degree of saturation of the oil sands. This is a matter for the geologist to determine from an examination of the formations. The value of the land depends almost entirely upon capacity; but is modified by the character of the formation, depth, accessibility for supplies, fuel, and water, upon which depend the length of time and cost to drill.

The next problem to be considered is the determination of the time necessary to redeem the capital expended, for the interest accumulating upon this invested capital will be large and must be charged to cost of production. The extent of initial development in the majority of instances is restricted by the available capital. And, knowing the time required to drill a well, the cost of the well, and the cost to maintain production, the number of wells that can be simultaneously drilled may be estimated. This having been done, time of redemption of capital may be expressed in this theoretical equation:

$$X = \frac{C + c + (C + c + O) \times .1}{Y.P.p.}$$

where X = time required to redeem capital
Y = number of wells
P = selling price per barrel
p = production in barrels
C = capital invested
c = cost of wells, pumps, accessories
O = operating expenses.

Thereafter development may be carried on within the limits of the earnings of the company. As can be seen from the above equation, the purchase price of the land is an important factor in the determination of the cost of production. Many of the successful oil companies acquired land at as low a figure as $2.50 per acre; land which later was easily worth $2500 per acre. I have in mind a certain tract of land in the Kern River field which cost its present owners $2.50 per acre. Shortly thereafter, adjacent property of precisely similar character was purchased by the Claremont Oil Co. at $4500 per acre. Notwithstanding the high purchase price, the company paid its first dividend of $40,307 four years later, and has paid in total dividends to date $427,324.

The fact that initial development is limited to available capital is a reason why the large companies have opportunity to develop and produce oil at a minimum cost. Notwithstanding this, they have not done so, and very largely for the reason that operations are subject to too much system, red tape, and regulation. Drilling a well involves the solution of many and various difficulties which can be surmounted only through the prompt action and ingenuity of the driller. Consider a well drilled to a depth of 2000 or 3000 feet—often a half mile or more—and from six to three inches in diameter, with a string of casing weighing many tons, suspended, and which must be kept free to move up or down. In addition to this, a string of tools often more than fifty feet in length and weighing several thousand pounds must be kept in working order. If they are lost through a break in the cable, or a cave, they must be recovered through 'fishing'. Probably no other engineering operation requires more constant attention, skill, and ingenuity than drilling a deep well. No well can be drilled according to formulae. It is the energy and direct management of the smaller companies that has made it possible to sell oil at a profit through all the vicissitudes of the market, and has gained for the oil industry its credit of many millions in dividends.

The life of a property depends to a considerable degree upon capacity for production. Depletion of the oil in a property is a factor which must be considered in arriving at cost of production. It is obvious that the ratio of rate of depletion to rate of dividend must be less than unity in order that capital may be redeemed together with interest on the investment. M. L. Requa has pointed out, in an address before the University of California Mining Association, that if a company earns 10% per annum on a property which is reduced to zero value in ten years, the net result will be the return of the capital without interest. Theoretically, the more rapidly a property is exploited and the mineral exhausted, the greater will be the return upon the investment. This is manifested from the fact that petroleum or any other valuable mineral unrecovered from property which is being operated, represents dollars and cents of invested capital to regulate the rate of production so that the markets may not become congested and prices suffer. The Independent Producers Agency is at the present time working out this feature and has recently passed resolutions to the end that each of the companies shall have its capacity for production determined and its monthly runs pro rated therewith in accordance with market capacity.

Correlative to depreciation of property is the trouble caused through the agency of underground waters. Water is the natural enemy to oil and oil property, and the encroachment of water throughout the oil zones is an uncertain factor in determining the life of a property. Water encountered above the petroliferous formation may be cased off in drilling, and water underlying the oil-bearing stratum may be plugged off if drilled into. But it is the water occurring in lenses upon the strike of the oil sand which is the real menace, and in the majority of cases it is inevitable that at some uncertain future date it will displace the oil in the sands, driving it upward along the flanks of the anticline or monocline from property to property until it is exhausted.

In the December 10, 1910 issue of the *Mining and Scientific Press* I presented figures, as representative as possible, showing the cost of drilling. For a first well the material alone will cost $12,540. For drilling to 1000 ft., add to this from $4000 to $7500, for 2000 ft., add from $7500 to $15,000, for 2500 ft., add from $10,000 to $20,000. Figures representing the cost of drilling vary widely, according to economic conditions, methods of work, and the character of the formation. Some instances of variation in actual cost of drilling are shown below.

Field	Depth (feet)	No. of wells.	Av. time taken (days)	Average cost.
North Midway	1440	1	27	$ 8,750.00
do	1000	5	56	11,188.89
do	2650	4	180	32,000.00
South Midway	3000*	4	270	45,000.00
Kern River	1200	62	40	6,000.00
do	850	17	30	4,500.00
do	1200	16	35	5,000.00
do	1200	67	35	6,000.00
Coalinga	2700‡	2	120	25,000.00
do	3300	1	548	90,000.00
do	700	3	30	4,500.00
Sunset	1000	5	50	5,000.00
do	1000	4	46	7,965.00
Pennsylvania	5575†	1	..	40,000.00

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*Rotary.

‡Combination, rotary and standard.

†Third deepest well in the world; deepest drilled with cable tools.

Modern practice has greatly reduced the expense of pumping or lifting. First came the system of jacking the wells, that is, several wells were pumped through the agency of one engine transmitting its power by means of cables. This method admits counterbalancing the down-stroke of the pump in one well against the up-stroke in another. While this practice is applicable in some of the Eastern fields, it has not, as a rule, met with success in California for the reason that to get the best results from a well, different speeds of pumping are required. With the jack, all of the wells must necessarily be pumped at the same rate. Next, gas-engines were employed, utilizing the gas from the wells they pumped, gas which had before gone to waste, eliminating the consumption of fuel and water. The gas-engine is now extensively used throughout the Coalinga and Midway fields.

With the advent of electric power in the oilfields came the motor-driven pump. Twenty-two motors are now pumping in the Coalinga field and proving themselves efficient. They are designed for wells ranging in depth from 750 to 2500 ft. and are rated at from 20 to 30 hp. ½-hour rating, with from 6⅔ to 10-hp. continuous service. The lower powers are used for pumping, while the higher power is used for operations such as pulling tubing, sucker rods, pump, and bailing. With time as a factor, the motor possesses an advantage over steam or gas in pulling a well. Aside from a saving in labor, this is especially important for the reason that time lost, during a shut-down for cleaning a well, is against low cost of production. From a comparison of figures showing the consumption of fuel oil in pumping as against electric power consumed, and, not taking into consideration the cost of boiler water, which in itself is an important factor of expense, the price of oil at the well must be as low as 19.9c., in order to be equivalent to electric power at 1.5c. per kilowatt-hour, which is the maximum cost of the power. The following figures show the cost of pumping by steam and by electricity under equal conditions as regards gravity of oil and amount pumped in 24 hours:

Depth (feet)	Oil burned (bbl.)	No. of wells	Fuel per well (bbl.)	Cost
1000	16	4	4	$1.40
1000	18	5	3.6	1.26
1000	20	5	4	1.40

Depth (feet)	Power kw., 24 hr.	Cost per day	Kw. per foot per day	Cost per foot
1000	53.3	$0.80	0.0533	0.08c
1080	69.6	1.044	0.0644	0.10c
1500	100.8	1.512	0.0672	0.10c
1950	133.3	2.00	0.0682	0.10c
2200	105.0	1.575	0.0477	0.07c
2200*	88.6	1.33	0.0403	0.06c
3000	192.0	2.88	0.064	0.10c

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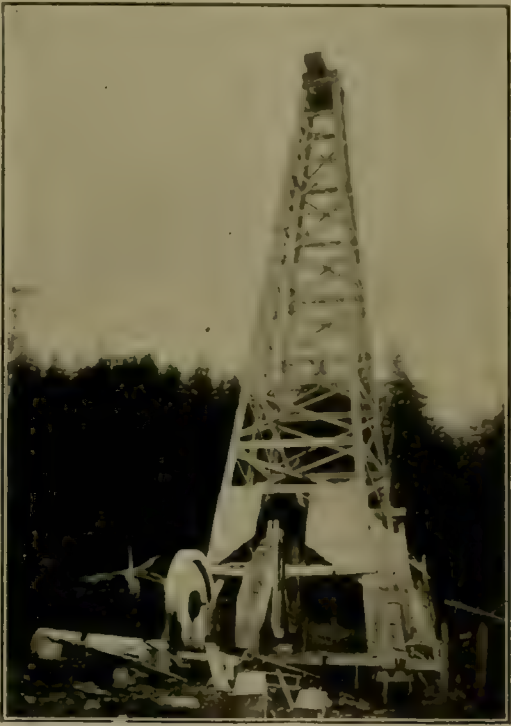
*Same as the preceding, but with walking beam counter balanced.

In pumping by means of the walking-beam, which is the method employed to raise oil from deep wells, a saving of 15½% in power consumption has been effected through the use of a counterbalance. Wear and tear on the machinery and engine are diminished because of the steadier action of the beam. With the counterbalanced walking-beam depth is the only factor in power-consumption, because of the friction and viscosity of the petroleum, which varies as the length of the column. Consider now the mechanics of the walking-beam, one end of which is cranked to the band-wheel and the other end supports the sucker-rods which lift the oil. The engine must lift by means of the beam, the weight of the rods (¾-in. rods weigh 1½ lb. per linear foot) plus the weight of the oil (which varies from 2.97 lb. per linear foot of 3-in. column for 14° gravity Beaumé, to 2.76 lb. for 25° gravity), and also take care of the friction and viscosity of the oil in the tubing. On the down-stroke the work done by the engine is negative, consisting of the gravity action of the rods minus their buoyancy minus the friction of the fluid on the rods. Upon determining the coefficients of friction and viscosity of the fluid, the difference in the up-stroke and down-stroke of the beam may be exactly counterbalanced. It is remarkable that throughout the fields very little counterbalancing has been attempted.



DRILL RIG AT KATALLA, ALASKA.

Another factor in the economy of oil production is the water-heater. Simple in construction, consisting of a piece of casing and a coil of pipe, it should be used in connection with every boiler in the fields. Through close observation of many experiments, it has been found that a saving of 20% in fuel-consumption may be made.

Pumping or lifting expenses should be so posted and tabulated that they may not only serve as a comparative guide to the superintendent, but also indicate to the foreman where to concentrate his efforts to cut expense. I have selected for recommendation the following forms used by a successful West Virginia company. Form No. 1 is given to each foreman of the company, so that he can make comparison of his receipts and expenditures each month and see how much it is costing to lift each barrel of oil from his property. This monthly sheet is posted in Form No. 2 for the use and guidance of the superintendent. At a glance he can see the decrease or increase in the various items month for month, and can take proper action to the end that the oil may be produced at the least possible cost.

..............District.
..............Foreman.

Items of Expense	January 1911 Production 5180.00 barrels 100 wells		February 1911 Production 4872.65 barrels 100 wells		Since Jan.1,1911 Production 10,053.65 barrels Aver. wells 100
	No. Men	Expense	No. Men	Expense	Expense
Labor (operating)	----	$952.19	12	$899.97	$1852.16
Teaming	----	152.50	¼	55.00	207.50
Repairs (general)	----	780.19	2½	350.09	1130.28
Repairs to wells	----	80.00	--	----	80.00
Supplies	----	270.05	--	19.06	289.11
Fuel	----	319.50	--	326.50	645.00
Water	----	----	--	----	----
Total lift expense ---		2554.13	14¾	1649.63	4205.05
Average cost per well		25.54		16.50	21.02
Average cost per barrel		0.493		0.338	0.418
Remarks					

FORM NO. 1. LIFTING EXPENSE.

..............District.
..............Foreman

1911	No. Men	Lifting Expense								No. Wells	Cost per Well	Gross Production Bbl.	Cost per Bbl.
		Labor	Team	Gen. Repairs	Repairs to Wells	Supplies	Fuel	Water	Total				
Jan.	21	952.19	152.50	780.19	80.00	270.05	319.50	-----	2554.43	100	25.54	5180.00	0.493
Feb.	12	899.97	55.00	350.09	-----	19.06	325.50	-----	1649.62	100	16.50	4872.65	0.338
Mar.													
Apr.													
Etc.													

FORM NO. 2.

	Improvements	Operating Expenses		Miscellaneous	Investment	Intrest	Taxes	Royalty	Depreciation	Total Disbursement	Total Receipts
		Drilling	Pumping								
Cost of Property					✓	✓	✓		✓	✓	
Buildings	✓				✓	✓	✓			✓	
Drilling Equipment		✓			✓	✓	✓		✓	✓	
Pumping Equipment			✓		✓	✓	✓		✓	✓	
Power Plant		✓	✓		✓	✓	✓		✓	✓	
Storage and Pipe Lines	✓				✓	✓	✓		✓	✓	
Teaming		✓	✓	✓							
Labor	✓	✓	✓	✓							
Material and Supplies		✓	✓	✓							
Fuel		✓	✓	✓							
Water		✓	✓	✓							
Incidental Expenses	✓	✓	✓	✓							
Management	✓	✓	✓	✓							
Totals											

	Wells Drilling	Completed			Abandoned	Production			Market Value			Gross Receipts	Cost to Produce	Earnings	Cost per barrel
		Oil	Gas	Water		Oil Bbls	Water Bbls	Cu Feet Gas	Oil $	Water $	Gas $	$	$	$	$
Jan															
Feb															
Mar															
Apr															
May															
June															
July															
Aug															
Sept															
Oct															
Nov															
Dec															

FORM NO. 3.

I have arranged the third form to incorporate the features of forms No. 1 and 2, and at the same time to set forth every item of expense and outlay in the production of oil from the time the original investment is made. With this form posted monthly, the cost of production is constantly in view. In estimating cost of production, time is the greatest factor of all. As development work proceeds, cost of production becomes less and less, and, when development has been completed, cost of production should be at a minimum. Companies that have completely developed their property are producing oil at a present cost of about 8c. per barrel. Other companies having large properties with from 40 to 60 wells producing about 3000 barrels of oil daily, but with development work still in progress, are producing oil at a cost of about 14c. per barrel, and so up to companies that are producing at a cost of $4 or $5 per barrel. So cost of production means but little when applied to all the producing companies, and for a like reason it is useless to attempt to determine an average cost of production.

The Federal Tax as Applied to Mining Corporations

We have received inquiries regarding the operation of the special Federal excise corporation tax and its bearing on corporations engaged in mining, and especially the right to charge off as depreciation the ore taken out of the mine. At the present writing there have been few decisions on the question, but litigation is now pending in the Federal courts which will clear away some of the difficulties. The subject is of sufficient interest to many of our readers to warrant publishing in full that portion of the regulations issued by the Commissioner of Internal Revenue which has a special bearing on corporations owning and operating mines. The following recent pertinent comment on this phase of the subject by an official in authority will also be of interest:

"Relative to an allowance of depreciation in the value of the mining property because of the depletion of the deposits of ores, thus exhausting the capital assets of the corporation, it is believed that the regulations adopted can be applied with results entirely just both to the taxpayer and the Government. Of course, claims of corporations based on the theory that the value of the mineral in the ground is exactly the value of such minerals as placed in the commercial channels, minus the cost of production, thus divesting the corporation of the attributes of a going concern and placing it in the attitude of simply liquidating profits already earned, is not acceded to. * * *

"The position of (the Federal officials) does not admit of constructive loss in the conduct of a business, such as the removal of the products of nature, when in fact such business is carried on at an actual profit."

Many of our readers will doubtless wish that the regulations might be translated into twentieth-century language, making them intelligible to the man of average mentality. The energy of a legislative body should not be largely absorbed in devising a law which the courts cannot upset, nor the wisdom of judges be concentrated upon the detection of misplaced commas and overlooked formalities of procedure.

REGULATIONS

72. Cost of drilling new wells by oil corporations is considered betterments and additions to the capital assets of the corporation. The expense of drilling dry wells may, however, be charged to profit and loss.

76. Deduction on account of depreciation must be based on lifetime of property, its cost, value, and use.

DEPRECIATION IN MINERALS, OILS, ETC.

80. In case of corporations whose business consists in part or wholly of mining, producing, and disposing of deposits of nature (ores, coals, gas, petroleum, and sundry minerals) the conduct of such business will be understood to comprehend two classes of gains or losses, viz:

(*a*) The gain or loss resulting from the sale of capital assets, *i.e.*, either the increment, or the loss, arising through possessing over a period of time the investment in the same.

(*b*) The trading or commercial gain attached to the conduct of the industry, the employment of working capital, the effort and risk involved.

81. In the ascertainment of net income deduction will be allowed for depreciation arising from exhaustion of deposits of ore, mineral, etc., and for depreciation and obsolescence of improvements, in accordance with general regulations respecting depreciation allowances, on the basis of the original capital investment cost of the properties concerned to the company reporting.

82. A further deduction will also be allowed, through not including the same at all in the item of gross income (item 3, Form 637), for the unearned increment represented in such properties as at January 1, 1909, which will be determined in general as follows:

83. An estimate should be made as of January 1, 1909, of the fair market value at that date of the minerals, etc., in deposit. This estimate should be formed on the basis of the disposal value of the minerals in total and exclusive of value of improvements and development work. This valuation should also be reduced to a unit value, per ton, barrel, etc.

Note.—Values as aforesaid should not be estimated on the basis of the assumed salable value of the output under current operative conditions, less the actual cost of production, because, as heretofore stated, the selling price under such conditions comprehends a profit both for carrying the investment in minerals, improvements, and working capital and for conducting operations in respect of production and disposal of product. The value to be determined as stated must be on the basis of the salable value of the entire deposit of the aggregate units of minerals considered *en bloc* if disposed of in that form. Nor must such valuation comprehend any speculative value which might attach to a sale of the minerals *en bloc*, *i.e.*, a value which might be obtained on the ground that the future would develop a much greater reserve of mineral deposits than were believed to exist at the time estimate as of January 1, 1909, was formed. Any value of this latter character would attach obviously to such additional reserves when developed in future.

84. The unit value as of January 1, 1909, ascertained as above outlined, would indicate the value to be attached at that date to the capital assets disposed of during any calendar year succeeding, and should be used in determining the unearned increment at January 1, 1909, which may be excluded entirely from the item of gross income, as before explained, in following manner, viz:

Value at January 1, 1909, determined in manner outlined, of minerals, etc., which may be removed and disposed of in any year subsequent thereto.......$ ——
Less the following:
(*a*) Proportion of depreciation charge applying to exhaustion of minerals disposed of, ascertained as first explained herein on basis of original cost.....$——
(*b*) Royalty paid, if any, on minerals disposed of ....$——
—— $ ——

Balance, being unearned increment at January 1, 1909, to be excluded from gross-income item .... $——

85. The precise detailed manner in which the estimate of value of minerals, etc., as at January 1, 1909, shall be formed, must naturally be determined upon by each corporation interested, but formal record of such estimates, together with all sustaining information, should be carefully filed so as to be readily accessible for reference. Values as stated, as determined at January 1, 1909, should be used in compilation in all subsequent years' excise-tax returns. The question as to whether it subsequently develops the property possessed a greater quantity of mineral, etc., reserve than was in the aggregate estimated as of January 1, 1909, is immaterial. Any excess which may be developed will be considered as possessing the same value at January 1, 1909, as that which then may have been known to be in the property.

86. Each excise-tax return (Form 637) should be accompanied with the memorandum setting forth the extent in amount of the exclusion made from the item gross income for unearned increment realized during the year, as above outlined.

87. As the amount to be deducted for depreciation (paragraph 2 preceding) is to be formed on basis of the estimated reserve of minerals, etc., it follows that if it develops such estimate is understated, the cost investment in the capital asset may be wholly extinguished before all mineral reserves are removed. When this is reached, further deductions for exhaustion of minerals should be discontinued, but, in such event, it will be noted, the allowance for unearned increment which is to be excluded entirely from gross income will be correspondingly increased.

88. In case of corporations leasing mines and paying royalties on minerals, etc., removed, the royalties paid are to be treated as expenses and deducted in ascertaining net income, as provided in general regulations. Any leasehold investment which the operating corporation may have in such properties, either through a payment originally made for acquirement thereof or for improvements made upon the property, to be accounted for in accordance with regulations governing depreciation allowances and disposition of capital assets.

89. In respect to properties of the character in question which may be acquired by a corporation after January 1, 1909, a deduction will be allowed only as to depreciation arising from exhaustion based on original cost; no exclusion from gross income can be made for unearned increment, as profit arising in sale of such capital assets applies wholly to the period subsequent to January 1, 1909.

Iodide Method of Copper Determinations

By L. D. McClure

As my experience in using this method has been so satisfactory and the results obtained, during a period of several years, have been so uniformly exact, it is my desire to give, in detail, to those who may be interested, a simple and rapid-working scheme which I have employed in my work where a large number of copper determinations are made daily from churn-drill and mine samples, at the Live Oak mine, Globe, Arizona. The scheme, with a little practice, will be found more rapid than the permanganate or electrolytic methods, and the results are exact within very narrow limits of experimental error.

I will endeavor to explain in a lucid and concise manner just how I carry out my daily work in the laboratory, so that no difficulty will be found in following and working out each successive step of the process, as it is employed in actual practice in handling a large number of samples each day. The Live Oak ore has a copper content ranging from 2 to 5%, in the form of disseminated chalcocite in silicious schist. In handling more complex ores and furnace products, modification of the process would be advisable.

Method of Standardizing.—Prepare a solution of sodium thiosulphate, containing 40 gm. of pure crystals to 2 litres of distilled water, and proceed as follows: accurately weigh three portions of 0.10 gm. each of pure copper foil into beakers of 300 c.c. capacity; add about 1 c.c. of strong nitric acid to each beaker; place upon the hot plate, and evaporate off the excess of nitric acid until almost neutral copper nitrate is obtained, which will be indicated when by tilting the beaker the solution will flow rather sluggishly over the bottom. The evaporation must not be carried beyond this point, as there is danger of producing some insoluble basic copper nitrate. Remove the beakers from the hot plate, dilute with about 25 c.c. of distilled water; stir in enough of a saturated solution of sodium carbonate to cause a slight precipitate; add 2 c.c. glacial acetic acid and then 3 or 4 grams of potassium iodide in crystals. By gently shaking the beaker the potassium iodide will dissolve almost instantly. Cuprous iodide will be precipitated and iodine, exactly proportional to the amount of copper present, will be liberated, and be held in solution in the excess of potassium iodide, imparting to the solution a reddish brown color, according to the reaction:

$$2Cu(C_2H_3O_2)_2 + 4KI = Cu_2I_2 + 4KC_2H_3O_2 + 2I$$

Proceed at once to titrate. Run the sodium thiosulphate solution into the beaker, constantly stirring until the iodine solution changes to a faint yellow color, and then add sufficient starch solution to produce a deep-blue coloration. Continue the titration cautiously, drop by drop, with constant stirring. Stop when the solution assumes a violet color and continue stirring for a few seconds. If the violet color does not rapidly change to a creamy white tint at this point, another drop from the burette will be required.

It will be found from the burette readings that about 20 c.c. of the thiosulphate solution has been required for each of the three beakers, or 1 c.c. equals 0.005 copper, approximately. If, however, there should appear a slight variation in the three readings, I use the average of the three readings to calculate my standard.

Treatment of Ores.—Weigh out 3 grams of low-grade ore, or proportionately less for ores of higher grade, into a 300-c.c. beaker. Add from dispensing burettes 10 c.c. strong nitric acid and 5 c.c. sulphuric acid. Put the beaker on the hot plate and boil nearly to dryness. Remove the beaker; cool somewhat; add 2½ c.c. sulphuric acid, which produces a very satisfactory degree of acidity for the copper precipitation; dilute with 25 c.c. distilled water; stir with a rubber-tipped glass rod to loosen any cake that may have formed on the bottom of the beaker. Place the beaker again on a warm part of the hot plate, and digest for about 10 minutes to bring the sulphates into perfect solution; then filter through a 15 cm. filter paper into a 150-c.c. beaker. Wash the insoluble residue on the filter twice with boiling water. Then pour filtrate back into the original beaker and rinse the filtrate beaker with a little water.

The filtrate should now measure about 75 c.c. and should fill the beaker to about one-fourth its capacity. Next place in the bottom of the beaker a piece of aluminum 3 in. long, 1 to 1½ in. wide, and bent at right angles at or near the middle, so that one-half lies in the bottom of the beaker and the top of the other half extends a little above the surface of the solution. Cover the beaker and boil for about 10 minutes, when the copper will be precipitated; the solution will be perfectly colorless; and the aluminum will appear clear and bright. During the last few minutes of boiling, the sulphuric acid attacks the aluminum vigorously, and the minute bubbles of hydrogen gas which are given off have a tendency to free the aluminum of all small adhering particles of copper.

Now take the beaker from the hot plate, and remove the aluminum from the solution with the forefinger and thumb of the left hand, at the same time playing a small jet of cold water upon it to cool and wash off any adhering particles of copper. Carefully decant the solution, leaving the copper on the bottom of the beaker, and wash twice by decantation with cold water. Dissolve the copper in about ½ c.c. of strong nitric acid, and place the beaker again upon the hot plate to evaporate the excess of nitric acid, and then proceed in the same manner as described for standardizing. The starch solution is made by rubbing 1 gm. of cornstarch into a smooth paste with a little distilled water, diluting with distilled water to 200 c.c., and boiling the solution for a minute. Cool before using. The paste may be kept for some time if a small quantity of lysol or other antiseptic be added to prevent the growth of mold.

The Murex Plant at Broken Hill

The Murex plant installed at the Broken Hill Block 14 Mine is reported to have secured a recovery of 80% of the metallic content of the ore. To this stage the process has worked well. The problem that now has to be solved is whether the de-oiling and the de-magnetizing of the product obtained can be done efficiently and cheaply. Whatever may be the outlook in this direction, the work done with the process on low-grade copper ores is so satisfactory that a unit is to be erected on one of the biggest mines in Australia that has large supplies of such ore, to see whether the process can be profitably used by it. News from London is to the effect that 2½% copper ore from the Cordova mine in Spain was treated with a recovery of 92%. Then 2000 tons of mixed tailing, with a full quota of slime, the whole assaying 1¾% copper, was treated, and an extraction of 86% obtained. The total recovery from the ore is reported to have been 93½%. It is understood that a 200-ton plant will be put up at Whim Well claim, in West Australia, so that mining men on this side of the world will soon have several units demonstrating the merits of the process on a working scale.—*The Australasian.*

Rawhide Queen Mill

The milling plant of the Queen and Coalition mines, Rawhide, Nevada, which was completed and put in operation several weeks ago, has the capacity of 50 tons of ore per day, and an extraction of 90% of the gold and silver is being made. The ore treated is well oxidized, and is being mined by lessees, there being nine producing leases in the property. Mining on company account, also, is expected to begin in a short time. The ore is passed through a Dodge rock breaker and elevated to the ore bin, above the ten 1050 lb. stamps, having 16 to 20-mesh screens. The pulp passes next to an Akins classifier, the sand from which goes to the tube-mill, and is then elevated by a Frenier pump to another classifier, the sand from which is returned to the tube-mill. The whole product now passes to the amalgamating pans, in which all of the metallics, both gold and silver, are recovered. The pulp then passes through an automatic sampler to the first Dorr thickener, thence to two successive Trent agitators. It is pumped from the last agitating-tank to the second Dorr thickener, the pulp being drawn out at the bottom of the latter to a short elevator, by which it is raised to an Oliver filter. The precipitation takes place in three 9-compartment zinc-boxes. The tube-mill used is of the 6-ft. Hardinge conical type. Two tanks fitted with Dorr thickeners are each 20 ft. diam., 12 ft. deep; the two tanks having Trent agitators are each 20 ft. diam., 16 ft. deep; two gold-storage tanks, 12 ft. diam., 6 ft. deep; two sump tanks, 20 ft. diam., 6 ft. deep; and one storage tank for solution, above the stamps, 16 by 12 ft. The power at present is supplied by two Fairbanks, Morse & Co. gasoline engines, 50 and 32 hp., respectively, in which distillate is used as fuel. The intention is, however, to equip the mill, using electric power, in the near future, securing power from the electric line which is within half a mile of the plant.

RAWHIDE QUEEN MILL.

Refining and Smelting at Port Kembla

Operations at the works of the Electrolytic Refining & Smelting Co. of Australia, Ltd., at Port Kembla have assumed large proportions, the electrolytic copper produced by this company having already established a wide reputation for purity (says the *Sydney Morning Herald*). For the year ended December 1910, the company produced metals as follows: gold, 112,485 oz., valued at £476,653; silver, 65,821 oz., valued at £7130; copper, 9952 tons, valued at £583,027. The total value was £1,066,810. The greater portion of the output came from the blister copper produced at the Mount Morgan mine, Queensland, but the refining also proved of useful service to a number of small producers in the State. The metals obtained from the ores mined in New South Wales and treated at these works, are estimated at: gold, 808 oz., fine; silver, 3994 oz.; copper, 929 tons—of a total value of £57,700. In August a contract was entered into between the Mount Lyell company and the Electrolytic company, under which the refining of the blister copper output of the former company will be carried out at Port Kembla instead of America as formerly. To carry it out the present works, which cost some £137,000, are being duplicated. The present capacity is 14,500 tons per year of refined copper. This will be increased to 23,000 tons per annum, which means employment of some 500 men, as compared with about half that number at the present time. With the works in full swing, the coal consumption of the company will amount to 60,000 tons per annum, and the consumption of water to 40,000,000 gal. The shipment of Mount Lyell blister to Port Kembla means that the electrolytic works will receive steamers regularly from every State in the Commonwealth, and the blister copper produced at Mount Lyell will be sent to Port Kembla to be refined, and the product despatched to European and other markets for sale. The hope is now expressed locally that the Works Department will have the railway carried into Port Kembla.—*Queensland Government Mining Journal.*

Southern Appalachian Gold Production

When the early Spanish explorers came to America they were shown by the Indians rich nuggets and ornaments of gold which came from the southern Appalachian region. Later, in the seventeenth century, the Spanish mined for gold in Georgia. During the eighteenth century very little attention was given to mining anywhere in the Appalachians, although it is supposed by some that gold was found in North Carolina before the Revolutionary War.

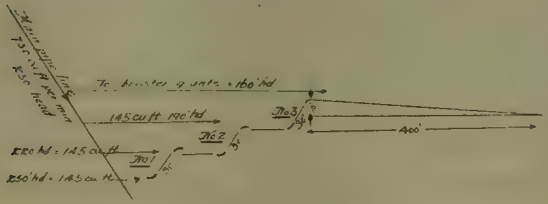
Just at the close of that century placer gold was discovered in Cabarrus county, North Carolina, and, after that, prospecting was energetically carried on. The first reported production from South Carolina mines was in 1829, and the gold produced was said to be worth $3500. From that time until the Civil War, mining was an important industry of the region, and although the rich fields of California lured many from these deposits of lower grade, the indirect result of the California excitement was a stimulation of mining activity in the East. During the war, and for several years after, little gold mining was done in this section, but in the seventies, eighties, and nineties the condition of the industry improved. At the present time gold mining in the central portion of the Carolinas is not flourishing on account of the decreasing supply of free-milling ore and the inability to extract the gold from the lower-grade sulphide ore at a profit. Production will probably continue, nevertheless, for many years.

Waldemar Lindgren, in his 'Notes on the Dahlonega Mines', published as a portion of Bulletin 293 of the U. S. Geological Survey, states that the total production of gold and silver in Georgia, from the discovery of gold near Dahlonega in 1828 to 1900, was between 16 and 17 million dollars, and of this amount the largest portion was produced by the mines of Lumpkin county, in which Dahlonega is situated. The total production of gold in the Appalachian States from 1800 to 1900 is estimated at $47,000,000. For the last few years the total annual production has been about $300,000, while the production of Georgia has varied from $60,000 to $130,000, the former figure being recorded in 1903. The value of gold and silver mined in Georgia in 1910 was about $26,000.

It is an interesting historical fact that the earlier stamp-mills of the Rockies and the Sierra Nevada were modeled after the successful mill first set up and perfected in the Southern States. The best gold miners of the country, a that time, were also those of the Southern States, and the success in mining and milling gold in the far West in these earlier days is largely to be credited to these pioneers from the South. The first gold miners in the Appalachians had received their training in Europe and they passed on their knowledge and experience to those who brought into being the 'Golden West.' The value of the gold deposits attracted so much attention that fertile minds were soon at work, and milling methods were greatly improved within a short while after the discovery of gold in California.

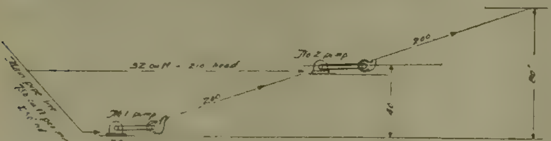
Elevating Sand

A practical problem in elevating wet sand is furnished by a recent case where it was necessary to elevate 10 tons per hour of wet sand against a vertical (static) head of 80 ft., the length of the pipe-line or ditch, whichever was used, being 400 ft., the particles not exceeding ⅛-in. diameter. For this purpose 500 miner's inches of water was available, working under an effective head of 250 ft. The question to decide was whether to use hydraulic elevators or centrifugal sand-pumps.



HYDRAULIC ELEVATORS.

In the first place, hydraulic elevators have an efficiency of about 16⅔%; in other words, they are capable of lifting water and gravel to a height not to exceed 16⅔% of the effective head of the supply water. Under these circumstances it is at once seen that the total lift possible applying a head of 250 ft. at one point is only a little more than 41 ft. To use hydraulic elevators at all for this purpose it would be necessary to handle the sand and water in three stages, each stage taking care of a lift of 30 ft. As the duty of a miner's inch is ordinarily considered to be 2 cu. yd. per day of 24 hr., for the first stage 90 miner's inches of water would be required to handle 10 tons per hour under a head of 250 ft. against a total lift of 30 ft. In the second stage the same volume of material would be handled with the same quantity of water under a head of 220 ft. In the third and last stage the same quantity of material would be lifted with the same quantity of water under a head of 190 ft., making three outlet branches at different points from the main pipe-line. Then the problem becomes one of sluicing the water and sand for 400 ft. with a total fall in 400 ft. of 10 ft. As the natural velocity due to gravity would not be sufficient to move this volume of material at a sufficient speed to prevent the sand from depositing on the bottom of the sluice or flume, it would be necessary to install two booster giants, which would be placed in the flume, using the main water supply for accelerating the speed of the discharge. The first cost of such outfit would be high, as the three elevators, together with the necessary suction attachments, up-raise pipe, and two booster giants, would cost approximately $3000.



CENTRIFUGAL PUMPS.

It would be better to use specially constructed and designed centrifugal sand-pumps operated by means of water-wheels and do the lifting in two stages, figuring upon a dilution of 4 to 1. The quantity of pulp that each pump would be required to handle would be approximately 200 gallons per minute. The static head being 80 ft., the friction head would be 30 ft. through 400 ft. of 4-in. O. D. casing, making a total head to pump against of 110 ft., which would be divided between two pumps working against a total head of 55 ft. each. For this purpose two 10-in. diam. specially-designed split-casing pumps with manganese steel runners and manganese steel lining would be required. These pumps would operate at 1500 r.p.m. and each pump would be belted to an 18-in. enclosed-type tangential water-wheel, the first one developing 10 hp. with 25 cu. ft. of water per minute under 250-ft. head, and the second one developing 10 hp. with 31 cu. ft. of water per minute under 200-ft. head. The two specially-designed centrifugal pumps would cost about $250 each and the water-wheels about $150 each. In making comparisons between the two propositions you will note that the main pipe-line will require but two branch outlets for the pumping proposition, as compared with three for the elevator proposition. Without a sketch showing the lay of the land, it cannot be known how either of the schemes will adapt themselves to the conditions on the ground. But of the two the pumping scheme is the more flexible, as the discharge from the No. 1 pump can empty into a small sump leading directly into the suction of the No. 2 pump. The accompanying illustrations will serve to explain the two ideas. It is obvious that the pumps will be far more satisfactory, will use less water, cost less money, and will have much greater efficiency.

Industrial Lighting

The lighting of ore-dressing plants and smelters, as well as the interior of mines, brings up problems that require considerable thought and skill to secure the maximum results at minimum expense. The following from the *Journal of Electricity, Power and Gas* is of interest in this connection and may serve to direct the attention of superintendents to the desirability of attention to the matter of the proper placing of lights.

The National Association of Manufacturers' committee on ventilation, heat, and light finds that the effect of varying character of artificial light on the quantity and quality of product produced may be and frequently is great, and, consequently, affects the cost of production to a very considerable extent; and feels that it is a matter of ordinary observation to those at all expert in the question of artificial lighting that factory lighting, generally speaking, is not at all what it ought to be. The following statement is a brief summary of the principal defects which are ordinarily to be found.

In very many cases there is insufficient illumination. This condition, however, is rapidly improving as the result of the advent of lamps of various kinds of much higher efficiency than anything that has been available in the past. It is a fact, however, that in a great many cases where the absolute amount of illumination is sufficient, the light is nevertheless exceedingly unsatisfactory for various reasons. If the light falls on the work from the wrong direction, not only is there great liability that awkward shadows of the machinery or of the operative's body will interfere with the work, but, in addition, if light is reflected from polished portions of the machinery or from the work itself directly into the eyes of the operative, the results will be anything but satisfactory. Failure of light to come in the right direction is often distressing to the eyesight, and it follows that, since it may cause the operative to work in an unnatural position, it may result in unnecessary bodily fatigue as well. Such unfortunate results are often obtained if an attempt is made to light a workroom with too few sources of light. Under these conditions, although some operatives may receive a satisfactory light, others are extremely likely to get the light in the wrong direction, with the unsatisfactory results above enumerated.

Another most common defect in factory lighting is the exposure of the eyes of the workers to the direct beams of very brilliant lamps. The use of bare incandescent lamps is almost invariably not only insufficient, but also dangerous. Generally, however, there is no difficulty in avoiding this trouble if proper care is taken. Still another defect often seen is either too great or too little contrast in the illumination of rooms. The former of these is by far the most common, and as an example might be given work on sewing machines, where individual lamps with opaque reflectors are supplied which brilliantly illuminate the machines, but leave the rest of the room in comparative darkness.

Discussion

Readers of the Mining and Scientific Press are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Concrete Mortar Blocks

The Editor:

Sir—In the matter of the best type of concrete mortar blocks to be adopted, brought up by 'Puzzled Engineer' in your last issue, it would seem probable that each of the three types he describes would give entirely satisfactory results, and unless a comparison of the types built side by side and operating under identical conditions could be made, it would be more a matter of personal preference than actually demonstrated superiority which one was "the best." The evolution of foundations from the wooden block capped with a blanket to the massive, highly dense concrete pier, has been brought about by the acceptance of the fact that the greater the inertia and density of the anvil under the dies the higher the efficiency of the stamps; prejudice as to inability to construct concrete which would not disintegrate, and that excessive breakage of battery parts would result, having been overcome. It would seem, then, better to adhere to a type which fulfills the condition of greatest inertia and density under the dies. This is found in Form 1.

The objection that the anchor bolts are not as accessible for renewal and replacement as in the other forms shown should not be given such serious consideration. The writer's experience has been that these bolts when made of 1½-in. Norway iron upset to 1¾ in. for the threaded ends, do not break; at least their life can be counted on for a period of years, and if it becomes necessary to replace them, the mortar can be cleared and pushed back and the change made with very little loss of time for the battery. It would seem an unnecessary refinement to provide for a condition which may never arise, and which amounts to so little when it does. The impression your inquirer has about the mortars in Form 1 not being tied to the main body of the block is, in two of the mills quoted, in error. This type of foundation has individual pockets for the lower end of the anchor bolt, and individual straining blocks of wood. A description with detailed drawings showing foundations of this type designed by me during 1905 for one of the mills of the Oriental Consolidated Mining Company of Korea appeared in the *Mining and Scientific Press* of May 11, 1907. At the time J. B. Fleming designed the Goldfield Consolidated mill he informed me of his intention to make use of the same type of foundation, reinforcing the web between the pockets. I believe he has duplicated the Goldfield foundation in the Nevada Hills plant.

San Francisco, July 2. CHARLES D. KAEDING.

The Editor:

Sir—In my opinion it is desirable to so place anchor-bolts in foundations of all kinds, that in case of breakage of a bolt the broken ends may be at once removed and a new bolt substituted, and this should be possible, in the case of stamp-mill mortars, without the removal of the mortar from its place, or even the loosening of any of the other bolts holding that mortar. To render this possible the bolts must be so placed with reference to the mortar, that the broken ends, or if necessary, the entire bolt, can be removed; therefore the direction of the bolt in the foundation should be such that the bolt will clear the mortar when withdrawn. It is a good idea to place the bolts in pipes, as this facilitates repairs and renewals. In my experience the breakage of anchor-bolts of stamp-mill mortars is due usually to the use of an inferior steel, or, more commonly, to using bolts of too small diameter. These bolts should not be less than 1½ in. diam: and 2 in. is better, for a rod of this size admits cutting a heavy, deep thread, one which will not readily strip, and at the same time [illegible] of breakage under the heavy pounding and the constant vibration to which these bolts are subjected, more, perhaps, than any other bolts around machinery foundations. I think the bolts should be placed vertically, and under no circumstances at an angle. If they extend vertically downward from the mortar base they will have plenty of clearance, and will be at least 30 in. apart, transversely, and about 14 in. longitudinally, thus affording abundant concrete for holding. The employment of a piece of timber at the lower end of the bolt, to give it a certain amount of resiliency, is no doubt good practice, but I think the use of spring washers, similar to those in use on the bolts holding the fish plates on some railroads, will give as good results, while not taking up one tenth of the room required by the insertion of the block of timber.

Berkeley, July 3. WILLIAM H. STORMS.

Errors in Mine Sampling

The Editor:

Sir—In your issue of June 24 you make editorial comment upon the fact brought out by Morton Webber, that in sampling a mine the error is usually a positive one, giving higher results than the actual facts. According to the theory of probability it is to be expected that the resultant error of a series of errors—a series of assays, for example—would as often be negative as positive. Since this seems not to be the case it must either be because the negative errors are fewer, or smaller than the positive errors. A frequent suggestion is that the rich ore is softer than the barren gangue, hence a super-normal proportion of it is included in the sample. But every engineer knows of this, and it is only to be expected that sometimes, in the endeavor to prevent it, too small a proportion of the valuable mineral would be included. And, on the other hand, it is not always true that the valuable mineral is softer. In gold quartz veins, just the very case where the greatest difficulty is met in the attempt to secure accurate results, the rich quartz is often no softer than the barren. Another possible explanation is the optimism of human nature, shown in the common experience of underestimating the cost of a journey. Of course, allowance must be made for the waste rock broken in stoping, but I am referring to Mr. Webber's case (3), where sampling indicates a fictitious high value. There do not exist, so far as I know, any good reasons why careful sampling work should indicate a fictitious value. Perhaps valuing engineers can give me some.

Los Angeles, June 26. A NEAR-GEOLOGIST.

Titrating Cyanide Solution in the Presence of Silver

The Editor:

Sir—The publication of the interesting article by E. M. Hamilton, dealing with the sulphocyanate determinations in the presence of silver, prompts me to send you extracts from some notes that I made at the time of starting up a high-grade silver-ore cyanide plant in Mexico some little time ago. Daily titrations showed that the solution entering the zinc-boxes was invariably 30% lower in total cyanide than the effluent. Free cyanide titrations, on the other hand, showed no difference at either end.

The explanation was simple, and I accounted for the difference by the fact that the incoming solution carried large quantities of silver in the form of the double cyanide of silver and sodium. The cyanide in this compound would not appear in an ordinary estimation for total cyanide made with the aid of alkaline iodide indicator. During passage through the boxes, however, the silver was liberated and the double cyanide of zinc and sodium formed. The available cyanide in the latter could then be titrated for by ordinary means. The absence of copper made it possible, by a comparison of total cyanide titrations of incoming and outgoing solutions, to estimate, with fair accuracy, the amount of silver which was being deposited in the boxes.

Uruguay, South America, May 25. A. W. ALLEN.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

STEEL TOOLS may be kept from rust by placing a lump of freshly-slaked lime in the drawer or case where they are kept. The lime will absorb a great deal of moisture.

TO PRESERVE iron against rust, immerse it for a few minutes in a solution of blue vitriol, then in a solution of hyposulphite of soda acidulated with hydrochloric acid. This gives a blue-black coating which neither air nor water will affect.

CREOSOTE is the most effective preservative for wood which is buried in the earth. Experiments with telegraph poles have shown that it is much more effective than other chemicals used as corrosive sublimate, copper sulphate, and zinc chloride.

OIL LANDS in the public domain can be located as ordinary placer claims, and the laws governing both are the same. Large areas of oil lands have been withdrawn from entry, and Congress is likely to impose restrictions upon the location of remaining oil land.

CONCRETE floors can be given a smooth surface like wood but non-inflammable by coating them with a mixture of magnesite, asbestos, talc, and sawdust, with a binder of chloro-magnesium, etc. The materials are mixed just before using; after the floor is dry it can be waxed.

WHERE water springs up and sinks again within the boundaries of a valid mining location, the owner of the claim is entitled to said water, provided it does not flow in a well defined underground channel and has not previously been made the subject of a valid appropriation.

PRESSURE GAUGES are valuable in detecting abnormal conditions in compressed-air pipe-lines. An accurate gauge placed at the air-receiver and another close to the machine where the air is applied will detect large losses of pressure, which can be remedied by increasing the size of the mains.

STEEL TOOLS may be tempered by using a mixture of one pound of mutton fat, or whale oil and one pound each of beeswax and resin. Put into a kettle and heat up to a boiling point, stirring it once in a while. When thoroughly mixed it is ready for use. Heat the steel till the scale rises a little, then immerse in the oil. When cool, heat over a slow fire till cherry red in the dark.

KAOLIN finds little market on the Pacific Coast, as it is used largely in porcelain manufacture and but little of this is done west of the Mississippi. At times there is a demand for [illegible] in the manufacture of alum, and for this purpose it commands $6 to $8 per ton of kaolin or $4 to $5 per ton of ordinary kaolin. Unless a deposit has an exceptionally favorable situation for working, it can not be profitably exploited.

A GOOD cement for fastening tools into handles, or setting small parts of metal or other material, is [illegible] to a paste. [illegible] When fastening [illegible] handles it is [illegible] by pressing it into the handle. This method is strong and durable.

THE PROPER preparation [illegible] nitric acid. Mix [illegible] the mixture, and it is ready for use. Cover the parts that are to be [illegible] with melted beeswax; when cold write the [illegible] on the wax down to the metal with a sharp instrument, then apply the mixed acids with a feather, carefully filling each letter. Let it remain from one to ten minutes, according to appearance desired, then throw on water, which stops the process, and remove the wax.

ALUMINUM will put an edge on fine cutting steel work. It acts exactly like a razor-hone of the finest quality. When steel is rubbed on the aluminum, as, for instance, in honing a knife blade, the metal disintegrates, forming an infinitely minute powder of a greasy, unctuous quality that clings to steel with great tenacity and thus assists in cutting away the surface of the harder metal. So fine is the edge produced that it cannot be made finer by a strop, which, if used in the ordinary way, merely tends to round the edge.

CHANGES can be made in drawings by the following method. From the original drawing make a brown print, using a thin, tough paper. This gives a print with clear white lines on a brown background, the brown being impervious to light. Paint out on this print, with ordinary drawing ink, the lines not desired on the changed drawing, after which make a second brown print from the first. The print thus obtained has dark brown lines on a white background. Draw in on this print the changes, and the desired new drawing results, from which blue-prints can be made.

GRAPHITE is graded largely on the carbon content, but also on the amount of iron and silica present, the texture, the color, and the brightness of the material. Different grades contain from 75 to 95% carbon, and the price of domestic amorphous graphite ranges from $5 to $25 per ton. Domestic crystalline graphite brings 1 to 9c. per pound. The United States consumes about one-third of the world's supply and considerable quantities are imported from Ceylon, Austria, Bavaria, and Mexico. Provided grade and shipping facilities are satisfactory there should be opportunity to market additional material.

HYDROCHLORIC ACID is usually made from sodium chloride and sulphuric acid according to the following formula: $2NaCl + H_2SO_4 = 2HCl + Na_2SO_4$. The HCl gas evolved is absorbed in water forming a solution, when concentrated at 15°C. containing about 40% HCl. The sodium sulphate formed at the same time is a by-product, but has a commercial value and is used extensively in the manufacture of glass. Hydrochloric acid can also be made synthetically from chlorine and hydrogen, and its production in this way is now being made to a limited extent as a by-product in connection with the electrolytic production of caustic potash.

MICA is used for a great variety of purposes in the form of sheet mica and ground mica. The former is the more valuable and sheets four inches or over in dimension are available. Sheet mica is used by manufacturers of electrical machinery and by stove makers. The larger companies own or control their own mines. Ground mica is used in the manufacture of wall-paper, paints, lubricants, fire-proofing, in manufacture of electrical equipment. The markets are mainly in the East, and the supply comes principally from North Carolina, South Dakota, and Georgia. To get in touch with prospective buyers write to some of the mineral and metal brokers listed in our advertising pages.

A METHOD of reclaiming dross tin or lead is to introduce a stick of green wood into the kettle and allow the gases that are driven off from the wood to bubble up through the molten metal. The metal must be heated to a red heat, as the affinity is very great at such a temperature. It would be impossible to reduce the oxide under these conditions as fast as it is formed. The right heat for the operation is somewhat over the actual melting point of the metal, but below a red heat. The stick of green wood is used because gases are given off which aid considerably in the reduction of the oxide. Dry wood does not give as good results. The operation usually takes several hours for ordinary thick lead or tin.

Special Correspondence

KALGOORLIE, WESTERN AUSTRALIA

Progress Notes for the Month — Total Output — Royal Commission on Miners' Diseases — Production of Principal Mines for April.

Nothing of note occurred during the past month, except that the Horse-Shoe continued drilling across its property at 2800 ft.; the Kalgurli company has reduced the grade of its ore as a result of poorer showing in the bottom levels; at 150 ft. in the main shaft of the Bullfinch, 48 in. of ore worth $29 was cut in sinking; the vein on No. 7 level in the Lancefield is 216 in. wide, $10 per ton; on the evening of April 24 the head-gear and breaker-bin at the main shaft of the Lake View Consols was somewhat damaged by fire, although work was continued next day as usual; the Lake View & Star mines' reserves are announced as 156,555 tons, worth $6.78, and 246,763 tons, worth $7.08 per ton, respectively; and the gold output from the State totaled $2,480,000.

The Government has enlarged the Royal Commission to go into details of miners' diseases in Western Australia by further appointing Messrs. Montgomery, Mann, Heitmann, and Varden. Presumably, the Commission's investigations will be principally in the direction of ascertaining the best means of minimizing or eradicating the disease. On Dr. Cumpston's finding of 24.5% of dry-treatment hands suffering from early fibrosis, he collected samples of raw and roasted dust, which rose from the ball-mills and furnaces at the Associated Northern. Mr. Larcombe, of the School of Mines, mounted portions for the microscope; and the amount of sharp silica particles in both samples of this dust, which was exceedingly fine, was astonishing. Of course, dust produced by machine-drills underground is coarse and sharp, and would affect a worker's lungs far quicker than one who inhaled dust in a dry-crushing mill. It is to be hoped that some useful suggestions will emanate from the Commission.

During the month the principal mines reported yields as follows:

Name.	Tons.	Yield.	Profit.	Dividend.
Associated	6,909	$ 51,000	....	....
Associated Northern Blocks	1,466	15,500	....	....
Bullfinch Proprietary	186	27,500	....	....
Burbanks Main Lode	1,506	28,000	....	....
Chaffers	3,390	22,500	$ 600	....
Golden Horse-Shoe	25,579	177,000	17,500	....
Golden Ridge	2,773	31,000	14,000	[2]$ 34,500
Great Boulder Perseverance	20,003	119,500	21,000	....
Great Boulder Proprietary	17,126	240,000	135,000	[2]328,000
Great Fingall	10,467	77,000	15,000	....
Hainault	4,440	30,000	200	....
Ivanhoe	20,124	201,000	90,000	350,000
Kalgurli	10,805	115,000	52,500	187,000
Lake View Consols	[1]8,339	8,500	2,500	....
Lake View & Star	13,042	80,500	4,800	....
Oroya Black Range	4,200	42,000	11,000	....
Oroya Exploration	[1]22,000	23,000	10,500	....
Oroya Links	7,527	44,500	4,700	....
Sons of Gwalia	13,650	116,000	46,000	[2]101,500
Sons of Gwalia South	2,105	15,500	3,700	[2]17,500
South Kalgurli	9,362	60,500	12,000	....

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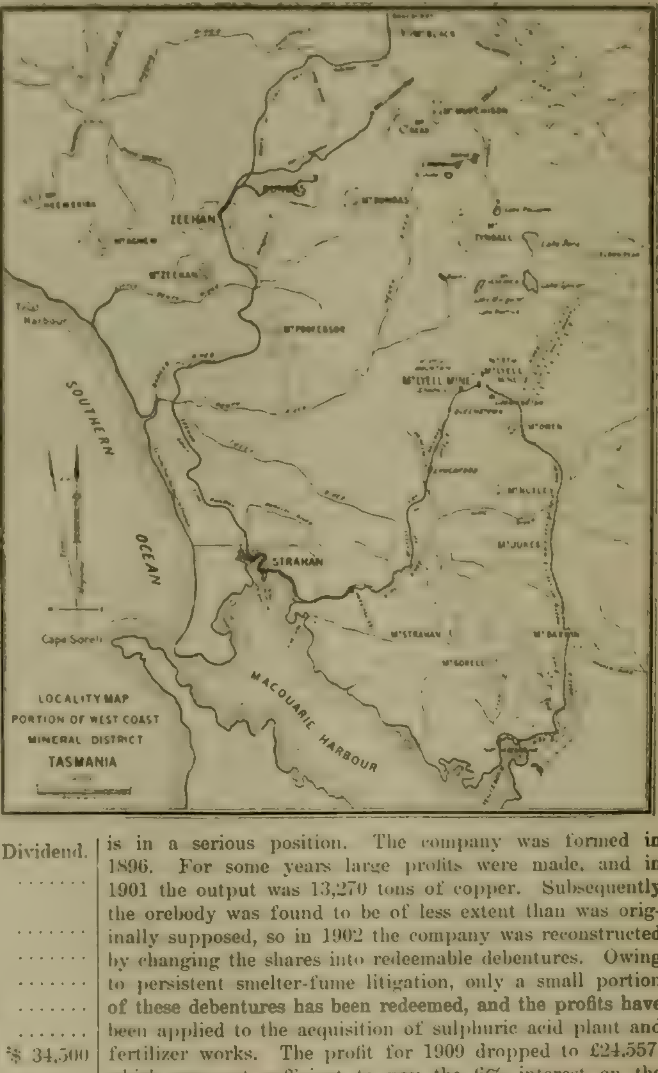
[1] Residue treatment. [2] March.

LONDON

Mountain Copper Co. — Closing of Acid Plant — Zeehan Mines Enterprise — Production for the Year. — Progress at Briseis.

It has always been difficult to obtain exact information either in London or in California about the doings of the Mountain Copper Co., owning mines in Shasta county, and works at Keswick and on San Francisco bay, owing to the policy of secrecy pursued by the Rio Tinto people, who are the London controllers. From the bare statement now issued by the directors it would appear that the company is in a serious position. The company was formed in 1896. For some years large profits were made, and in 1901 the output was 13,270 tons of copper. Subsequently the orebody was found to be of less extent than was originally supposed, so in 1902 the company was reconstructed by changing the shares into redeemable debentures. Owing to persistent smelter-fume litigation, only a small portion of these debentures has been redeemed, and the profits have been applied to the acquisition of sulphuric acid plant and fertilizer works. The profit for 1909 dropped to £24,557, which was not sufficient to pay the 6% interest on the £750,000 of outstanding debentures, while the results for 1910 are a deficit of £3041. This loss is attributed to the fall in the price of copper, the necessity for writing down the value of the stock in hand, the high cost of production, and the unfavorable course of business in California generally. The board has made special enquiries into the state of affairs on the spot, and has in consequence decided to close one of the acid works. C. W. Fielding, who originally introduced the property here, has left the board, and Lewis T. Wright has resigned as manager. People in California are probably better judges of what is to happen to this company than those in London. It is to be hoped that they are more optimistic than the English holders of the debentures.



That adverse circumstances should not be allowed to damp his ardor is one of the prime necessities for a mine manager. A good example is to be found in the case of the Zeehan-Montana silver-lead mine in Tasmania. This mine was floated in London in 1892 as a subsidiary of the Mount Zeehan (Tasmania) Silver-Lead Mines Co., and for many years did well. In 1908, however, all the available ore appeared to have been exhausted, but the manager, John Craze, and the Government geologists were of opinion that further exploration work was warranted, so developments were vigorously carried on. Success rewarded Mr. Craze's efforts and the results have since been encouraging. New orebodies, one with a rich shoot, have been found, and it has been possible to pay a dividend once more, though only a small one, at the rate of 2½% on a capital of £80,000 for the year 1910. During the year 1910, 2908 tons of shipping ore was raised, together with 10,316 tons of concentrating ore averaging 11% lead and 11 oz. silver per ton; of the total marketable product, 2603 tons of ore and concentrate were shipped to Antwerp, averaging 65% lead and 88 oz. silver, and 333 tons was sold to the Tasmanian Smelting Co. averaging 62% lead and 53½ oz. silver per ton. A year ago a tin property was bought cheaply for cash in the adjoining Dundas tin district. Much exploration work has since been done, and it is reported that the lode is large. Unfortunately, though there are rich patches here and there, the average grade is low. Mr. Craze estimates the developed ore at 200,000 tons averaging 0.4% metallic tin, but he doubts its profitableness.

Another Tasmanian mine, the fortunes of which are followed keenly in London, is the Briseis, the tin-gravel property in the northeastern part of the island. It was introduced in England in 1899. Shortly afterward a part share was acquired in the adjoining New Brothers Home No. 1, the Briseis company working the property in return for 58% of the net produce. In 1909, as these properties were approaching exhaustion, the name of the company was changed to the Briseis Tin & General Mining, and gold-gravel properties in Victoria were acquired. In June last the No. 1 property and the southern part of the Briseis were finally exhausted. During 1909 the monthly production was 92 tons of black tin. This fell to 67 tons during the first half of 1910, and to 47 tons during the second half. On December 31 it was estimated that the Briseis still contained enough gravel to yield 45 to 50 tons per month for three years. Work has proceeded steadily with the removal of overburden at the Ringarooma property which was formerly considered unprofitable, but no further information has been obtained relative to the tin content of the underlying gravel. The total production of black tin during 1910 was 684 tons, compared with 1102 tons in 1909, and the corresponding figures for metallic tin were 491 tons and 808 tons. Of the 491 tons, 9 was the share of the No. 1 company, and 428 that of the Briseis. The revenue from the sale was £77,982 or £161 15s. per ton, as compared with £105,953, or £138 per ton, in 1909. As regards the Wallace gold-gravel properties in Victoria, the old dredges are just paying their way with a very small output, and of the two new dredges one is already at work and the other should be ready shortly. During 1910 the company made a profit of £32,125 and distributed £30,000 as dividend.

JOPLIN, MISSOURI

Miami, Okla., Camp Takes New Lease on Life.—How Water Problems are Overcome.—Back to the Soft-Ground Mines at Duenweg.—Big Production from Small Plants.—Notes of the Zinc and Lead Mines.

A deeper and richer formation, almost exclusively zinc-blende, has been discovered in a drill-hole put down by the Miami Royalty Co. on its lease of the Wat-tah-no-zhe land. While previous operations have been confined to the zone lying between 100 and 130 ft. deep, the new strike is at a depth of 204 to 231 ft., and an assay of the clippings shows the blende content to be almost 50%. One mile north of Miami the L. C. Church Mining Co. made a similar find last year and a shaft has been sunk to the ore; but this was thought merely a continuation of the shallow ores of the main camp, which dip to the north. But the new drill discovery shows the ore to be a separate formation. Not only is the dirt rich in ore, but the quality of the blende is much higher than that found in the shallower deposits. The zinc content of the cleaned blende will be 60 to 61%, while in the shallower deposits a high percentage of iron pyrite is found, for which a deduction of $1 per unit is made. The Miami Royalty Co. will sink a shaft at once to the deep run.

The Little Jewel mine, west of Joplin, originally faced a serious pumping problem, the flow being so heavy the pumps could scarcely handle it, but when the Chicago-Joplin mine, 1000 ft. to the south, started work on a deeper level, all the water was drained from the Little Jewel, and it is now pumping water for its mill use from the abandoned Mandarin mine, on the Riseling land, 2000 ft. to the west. The water is taken from a depth of 180 ft., is pumped into a 35-bbl. tank on a tailing heap, 40 ft. above the ground, and from there flows by gravity to the sludge-pond of the Little Jewel. The company has driven around caved ground and gone into good blende at a depth of 140 ft. Heavy timbering was required to keep the loose dirt from coming in.

In the Duenweg camp, operators are showing a tendency to return to the early methods of mining, and the rush of prospectors is back to the tracts where the shallow ores are found. Turn-ins may not be quite so large from the soft-ground mines, but the margin of profit will be decidedly greater. Lead ore is again being taken from the old Log Cabin land, the new lessees, Martin & Co., having taken from old drifts more than 2,000,000 lb. of free lead in the past few weeks, and in their new ground rich pockets of galena are being found. Three sub-leasing companies are also hard at work, and in two instances, where shafts have been put down beneath the lead, which occurs at 100 ft., good blende is found. Hand-jigs, horse or steam hoists, and in one instance a hand windlass, complete the crude equipment requisite for the successful handling of the ores.

In 'Possum Hollow, at Chitwood, northwest of Joplin, similar conditions prevail, and deeper operations are being conducted on the Granby land. Mines which have long been idle are once again in the production lists. The Jack 'Possum mine is being developed at a depth of 126 ft., the dirt, which is treated on three hand-jigs, running 15% blende and lead. From these three hand-jigs a production of 60,000 lb. of blende and 2000 lb. of lead is being made weekly. It will be necessary to install crusher and rolls, as some of the material is 'chatty' and cannot be treated on the hand-jigs without being pulverized. Clarke Marshall, James Roller, and Newt Doty are operators of the mine.

Modern pumping equipment has solved a difficult problem in the Zincite camp, west of Joplin, where successful operations are being conducted by the Urbana Mining Co. An 8-in. centrifugal pump is kept going continuously night and day, to drain the workings of this single mine. The ore occurs in muck at a depth of 145 ft. Near this mine the old Keystone property was worked a number of years ago, but was forced to close down because of the heavy water. Hand-jigs have been installed to clean the output.

The stockholders of the Falls City Lead & Zinc Co. have rebuilt a plant which burned down recently, and operations have been resumed. The 500-ton mill is of galvanized iron, and as nearly fireproof as possible. The mine is on a 26-acre lease of the Liberty Mining Co. Two shafts are into ore, the pay-dirt being found in one shaft at 165 ft. and extending down to 200 ft., while in the other shaft it is found at 180 ft. and continues down to 225 feet.

A prospect drill is at work at the Wilcox mines at Chitwood, perched high on top of the John Jackson tailing pile that was turned out from the district's most famous mining plant. The tailing pile, which covers more than an acre, lies directly above a tract of land that has never been mined nor drilled. To determine the nature of the ground beneath this heap it was necessary to sink the drill-hole directly through the pile. In spite of this, little difficulty has been experienced.

GOLDFIELD, NEVADA

June Production of Goldfield Cons.—Concentration Discontinued at Florence Goldfield Mill.—Less Working Costs.—Progress on the Polverde.—Progress Notes.

Preliminary estimates of production of the Consolidated Mines Co. in June, obtained from the general superintendent, J. F. Thorn, place the gold recovery, after allowing for all metallurgical losses, at $880,000, from 28,540 tons, or an average of over 950 tons daily, or $30.84 per ton. Total operating costs were $230,000 and net profits approximately $650,000. The superintendent reports that the mines are in excellent condition in all departments. Both the Consolidated and Florence companies advanced their monthly pay-days and paid their employees on the third, in order that they might celebrate the Fourth and attend the aviation meet, participated in by two professionals, with monoplane and biplane, and the first exhibition of birdmen to be given in a mining camp. The greater part of the hoisting is accomplished on the day shift, and the mines, with the exception of the Clermont, are practically closed on Sundays. Another shipment of bullion was made late last month, the value of the 12 gold bars being $300,000, the bullion being above 900 fine.

FLORENCE GOLDFIELD MILL.

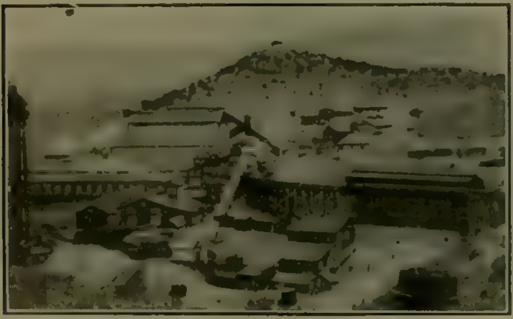
Further economies in the cost of ore treatment are being effected by the Florence Goldfield company as a result of changes that have been made in the processes employed in the mill. Hereafter the milling will be confined to amalgamation and cyanidation. The resulting improvement has been demonstrated by Willett Barton, superintendent of the mill. Additional equipment has been provided at a cost of about $1600, and it is estimated that $25 per day will be saved in labor alone. One part of the equipment consists of an Akins classifier and a Dorr pulp thickener, and the intention is to dispense with the use of the Deister tables, Frue vanners, Callow classifiers, and a number of settling-tanks; thus the necessity for much of the elevating and pumping heretofore done will be eliminated. Upon leaving the stamp batteries the ore will pass over amalgamated plates to the Akins classifier, the fine being diverted to the Dorr thickener, and the oversize to the tube-mills, the entire product being carried finally to the cyanide tanks after the reground ore has been returned to and has passed over the amalgamated plates. Lately the mill has been treating 160 tons daily, the total cost having been reduced to a little less than $5 per ton. This process of treatment is expected to raise materially the percentage of gold recovery, which has varied in the past from 93 to 95%. The plant is being operated in an economical manner, and at a cost per ton of ore lower than that achieved by any company operating in this part of the State. The results of operations under the management of Willis Lawrence have been gratifying, as the losses in mill work are much less than had been anticipated before the mill was built. The main shaft is being sunk without interruption and has reached a depth of nearly 800 ft. A station has been cut at the 800-ft. level, and from it lateral work will begin at once. Drifts and cross-cuts are being driven to the east, north, and south from the 400 and 650-ft. stations, and ore of excellent grade is being broken in new workings on the 500-ft. level and on the 750-ft. level in the Reilly ore-shoot, at the northern extremity of the Florence claim. The ore now exposed in the mine is probably sufficient to supply the mill.

On the Polverde claim of the Jumbo Extension Co. some good ore has been opened in the new drift on the 600-ft. level where a station has lately been cut. In the company workings on the 1030-ft. level a change in the formation is apparent, which affords ground for the belief that the main vein is being approached. The Annex company, which has been operating a lease on the central part of the Polverde claim, has shipped much ore from the 760, 800, and 850-ft. levels, will soon resume work on a larger scale, according to recent advices from the Eastern heads of the company. This company has expended about $100,000 in development. On the Spearhead, lessees are now raising from the cross-cut on the 300-ft. level to reach the orebody exposed on the 250-ft. level. A lot of tailing from the old Kinkead mill, near the foot of Columbia mountain, is being treated by cyaniding at the chlorination mill, north of town. The Sandstorm-Kendall is developing from the old Kendall shaft and has some fairly good ore on hand. Lessees on the Sandstorm are saving some shipping ore. Another lease has begun work on the Hat claim of the Blue Bull. Three lessees are working on the claims of the C. O. D. Consolidated, in addition to the work of the company, from the 600-ft. Sills shaft.

MEXICO

Mexican Eagle Oil Co.—Semi-official Character of Pearson Company.—Relations with Standard Oil.—Cost of Production at Cananea.—Profits for Year.

The Mexican Eagle Oil Co., the marketing concern of the Pearson oil interests, which has been warring with the Waters-Pierce Oil Co. (Standard Oil) for control of the Mexican field, is at present in the limelight, due to an unofficial investigation started by the Maderos. It is a matter of common knowledge that the Pearson interests, of which Lord Cowdray, formerly Sir Weetman Pearson, is the head, were very close to the Diaz government, and were paid many millions for the rebuilding of the Tehuantepec National railroad and the construction of harbor works at the isthmian ports of Coatzacoalcos and Salina Cruz. When they decided to engage in oil exploration and development in Mexico they were granted valuable concessions by the Diaz administration. In 1908 the Pearsons started the sale of oils in competition with the Waters-Pierce company, and the following year the Mexican Eagle Oil Co. was organized to take over some of the Pearson oil lands and concessions and to handle the marketing of the Pearson products. Guillermo Landa y Escandon, then governor of the Federal District, was elected president of the new company, and Enrique C. Creel, the former minister of foreign affairs, and Lieut.-Col. Porfirio Diaz, son of the president, were among those who joined him in the directorate. Since the organization of the Mexican Eagle company a strong fight has been made for control of the oil market in Mexico, and the Mexican concern now is credited with having about 40% of the business. The fact that men prominently connected with the Diaz administration appeared as the principal figures in the new company gave it something of an official character, and their participation is responsible for the present inquiries into its affairs. What is alleged to be a photographic copy of the minutes of a meeting held April 11, 1910, showing the free distribution of 1333 preferred shares, par value ₱1000, among the men forming the directorate, has been published. However, denial that the shares were free has been made by several directors. An inspection of the Pearson and Mexican Eagle holdings has been made by officials of the Texas Oil Co. and the Gulf Refining Co., and this has started the report that the Pearsons contemplate selling out to Standard interests. In an interview, J. B. Body, head of the Pearson interests in Mexico, stated that the inspection was with the object of determining the probable productiveness of the Pearson fields, but not with a view to the purchase of the properties. It is intimated that the American interests plan to purchase crude oil in Mexico for shipment to the United States. Mr. Body denies that the concessions granted the Pearsons are monopolistic in character, stating that they do not differ materially from those granted other oil interests. He declares that the Standard interests are using the press in an attempt to injure the Pearsons. In connection with the publicity being given the Pearson affairs, the report that the Standard Oil gave financial aid to the Madero revolution has been recalled. A formal denial of this report was made some time ago by the Standard Oil Co., and Francisco I. Madero has taken occasion to deny it several times.



GREENE-CANANEA CONCENTRATOR.

The 1910 report of the Greene-Cananea Copper Co. shows that the cost of producing copper at Cananea, not counting construction, was 9.66c. per pound. Construction charges increased this to 11.51c., as against 11.64c. in 1909. The last of the heavy expenditures called for by the company's extensive program of betterments has been made, and during the remainder of this year it is expected to produce copper at 9c. or less per pound. The average price received for Cananea copper in 1910 was 12.62c. per pound. The total copper produced in the year was 45,680,145 lb., and the total revenue $5,592,050. The deduction of total expenditures of $4,407,301 left an operating surplus for the year of $1,184,749, and this was reduced to a net profit of $459,202 by construction charges of $684,097, and a profit and loss charge of $41,451. The average recovery from domestic ores was 2.32% copper and 1.03 oz. silver, as against 2.206% copper and 0.75 oz. of silver in 1909. The report shows a saving of $5000 monthly as a result of the use of fuel oil.

MIAMI, ARIZONA

PROGRESS AT THE MIAMI.—INSPIRATION POWER-PLANT.—RECORD WORK AT LIVE OAK SHAFT.—REOPENING OF NEW KEYSTONE.—PROSPECTING THE ARIZONA COMMERCIAL.

The Miami Copper Co. is now producing about 65 tons of concentrate per day. The grade of the concentrate is still about 40%, and the mill saving remains at or slightly above 75%. Unit No. 4 has been under test for a few weeks, but propably will not be operating at its full capacity until certain minor portions of its equipment have been changed. The bearings of the rolls are being altered in order to make them detachable when repairs are necessary. It is not yet definitely known when units No. 5 and 6 will begin operations. A tramway leading up the hill from the railway terminus at Miami to the mining and reduction plant on the hill has been in operation for several days and will convey all supplies formerly moved by wagons. The power-house is receiving its final test, Frank Zlatink and Louis Lenz, of the Nordberg company, being here for that purpose. Thus far the machinery of the power-plant has been satisfactory. The timber that will be interposed between the orebody and the overburden is being put in place as fast as miners open the ground.

The Inspiration power-plant, consisting mainly of a generator and a Ball high-speed engine to operate it, is almost installed, and much of the surface and underground machinery has arrived. The main haulage level has been laid with heavy track and that section of it connecting the Jo Bush and Colorado shafts has been widened. The drills have been meeting with uniform success. At 600 ft. northeast of the Jo Bush shaft a drill recently found 100 ft. of 2.8% ore, and 2.4% ore was cut in a hole 600 ft. north and 300 ft. east of the same shaft. Underground work at present is confined to development, and the force probably will not be increased until the site and date of beginning of the mill is decided on. It still seems uncertain whether the latter will be erected at Wheatfields, 11 miles below the mine, or some point upon the property. W. H. Aldridge, managing director, has said that the Miami people have made an offer to share the ownership of their reduction works and power-plant with the Inspiration, and that the latter suggested consolidation of properties. No agreement having been reached, he says that the Inspiration will immediately proceed to build a 5000-ton mill. Live Oak shaft No. 2 is now more than 400 ft. deep. The sinking of this shaft has been a record-breaking performance, one month's work breaking the former world's record. Moreover, it was sunk 12 ft. in one day. Oil burners have been substituted for the coal formerly used. Three churn-drills are operating near the southwestern corner of the property. At the old shaft considerable work in the nature of preliminary steps to blocking out are under way at the old shaft (No. 1) at the 445-ft. level. A telephone system connecting the various portions of the property's workings with the main office has been installed. A new office building is being erected. The New Keystone will begin work soon, the last meeting of the directors at New York having resulted in an agreement to open the property again. It contains about 2,000,000 tons of developed and partly developed ore, which is 400 ft. above the Miami mill, so that it can be conveyed to the concentrator by an aerial tramway.

Superior & Boston has now driven the southwest drift from the McGaw shaft on the 1000-ft. level about 160 ft. along the foot-wall of the Great Eastern vein and is still in ore. The vein has not yet been cross-cut to ascertain its breadth, but where the drift crossed the vein at their point of contact near the shaft it seemed about 18 to 20 ft. wide. The ore is chalcopyrite, contains glance, and has a heavy iron content. It is better than the ore found in higher levels, in that it is less silicious. Although of obvious value its worth will not be known until after a smelter run. Some of it must soon be smelted, for the ore taken out of the drift is already crowding the capacity of the bins. The Arizona Commercial's Eureka shaft is now 1000 ft. deep. Just below the 1000-ft. level the diabase altered to a more broken formation. Driving along the foot-wall of the Black Hawk vein on the Great Eastern vein and cross-cutting shows the vein to be about 40 ft. wide. Whether the Black Hawk vein will yield much ore of commercial value will not be known until it has been more completely developed. The cross-cut being driven north at the 1000-ft. level to cut the Old Dominion fault is being pushed forward at an even gait through the quartzite that lies north of the Black Hawk vein. In the Superior & Boston (adjoining the Arizona Commercial on the east) a cross-cut being driven at the same depth to cut the Old Dominion fault is now supposed to be near the fault (vein) and is in broken quartzite heavily stained with iron, but neither of the companies knows just how far it must be driven to reach it, as its dip at this point has not heretofore been ascertained. The Summit Copper Co. is confining its operations now to development work solely. The parallel Pasquale and Summit veins each have been explored a distance of 1500 ft. from north to south. The rich chalcopyrite ore that has characterized the work on the Pasquale vein still obtains. In the depth from the 200 to the 400 the central streak of 30% chalcopyrite widened from 10 in. to a shoot that varies from 2 to 4 ft., and the 400 drift south is still in good ore at 460 ft. from the shaft.

NEW YORK

Dullness of Market. Denial of Injunction. Live Oak Issue. Ray Central Merger. Gold Roads Sale. Lead Ore Contracts. Wettlaufer Dividend. Railroad at Porcupine. Exaggerated Claims.

The market for the week has been of a distinctly preholiday character with a steady daily decline in the volume of business, as traders prepared for absence over the week-end, to celebrate Independence Day. A more contradictory, leaderless market could hardly be imagined. The dismissal of the Government's suit to dissolve the Harriman merger was made much of as an item of good news, and was immediately followed by the indictment by the Federal Grand Jury of the leading factors in some of the United States Steel wire pools. It is probable that every Government move from this time forward will have political significance, but, on the other hand, the corporations and combinations, and the people at large, refuse to give way to any less disagreeable question.

Coppers are the leaders of the New York and Boston mining-share market, and there is not enough in the slightly improved condition of the metal to induce any increase in activity in the leading issues. Favorable annual reports and statements of improved conditions, as in the case of Greene-Cananea and Giroux, had no perceptible effect. Judge Swan of the United States Supreme Court in Michigan, has rendered a decision denying the injunction asked for by G. M. Hyams to prevent the Calumet & Hecla merger. While this suit was the most important one in Michigan, there are other suits pending in that and other jurisdictions, so that the Lake merger is likely to be long delayed. The Live Oak Copper Mining & Smelting Co. is to issue 31,250 shares of stock at $20 per share. Stockholders have the right to subscribe on the basis of one share of stock for each two now held. Live Oak, Inspiration, and Miami will probably amalgamate when the Live Oak gets ready to begin production. The engineers are busy with the Ray Central-Arizona Hercules merger. Frank H. Probert left New York this week for Kelvin in connection with the work. The long-pending suit of some of the minority holders in the Greene Consolidated Copper Co. for an accounting has been dismissed. The suit was in the nature of a bill of discovery, and an examination of the officers of the Greene Consolidated, had before trial, evidently convinced the attacking parties that they could not make out a case, and dismissal followed.

The purchase of the Gold Roads property, at Kingman, Arizona, by the United States Smelting, Refining & Mining Co. has just been completed in Paris. The examinations were made by Sidney J. Jennings of the Smelting company's regular staff, and Ferdinand Robellaz, a prominent mining engineer of France. The price paid for the property is announced to be $1,435,000. Mr. Jennings' estimate of the ore reserves was $2,700,000 gross, with $700,000 net in the developed reserve. The estimated tonnage was 300,000, of which one-third is broken in the stopes; average value, $9 per ton. The Tonopah-Belmont Development Co. is to hold a special stockholders' meeting, July 15, to vote on the question of reducing the capital stock of the company from $2,000,000 to $1,500,000, by canceling the quarter of a million of unissued stock in the treasury. The step is recommended by the directors to avoid taxation.

The Chino Copper Co. shareholders have ratified the $2,400,000 bond issue and Chino is now active in the open market. The public takes a great deal of interest in convertible mining bonds, and the standard issues, such as Braden, Miami, Ray Consolidated, Utah Copper, and Mason Valley, all sell above par, at figures ranging from 105 to 125. Some of the original holders of the Nevada Consolidated bonds made very handsome profits through conversion of the bonds into stock. A recent report on the Inspiration gives the ore reserve at 24,403,500 tons, averaging better than 2% copper. Among the lead contracts recently secured by the International Smelting & Refining Co. is that of Coeur d'Alene North Fork Mining & Smelting Co., whereby the Tooele smelter will handle all of the output of the Monarch mine, east of Murray, Idaho. The property is expected to provide 900 tons of lead concentrate monthly, running about 55% in lead with some silver.

The Wettlaufer Lorrain is claiming a place as a regular dividend payer, having just declared its second quarterly dividend of 2½% of regular and 2½ of extra. Wettlaufer is said to be much stronger in ore reserves than the average of the Cobalt dividend payers. Fred Hellmann, of Leggett & Hellmann, recently appointed consulting engineer, is now at the property in active charge of the development and operations of the mine. The railroad into Porcupine from Kelso is said to have cost $2,000,000. An extension of 3½ miles from the southern end of Porcupine lake across to the Hollinger mine is to be immediately built and will be financed by a loan of $150,000 to the railroad commission by the Hollinger company at 5%; principal to be repaid by the Hollinger in paying 30% of its freight bills in cash and 70% being applied to the reduction of the loan. The extension will give transportation to some of the very important properties of the district, including the Dome, North Dome, and the Dome Extension.

CHINO CONCENTRATOR FROM TOP OF POWER-HOUSE.

Henry Krumb, one of the best known engineers of the country, is inclined to take a very conservative view of Porcupine. Referring to some of the ridiculous values placed on raw claims, he says: "Forty acres in the swamp is valued at $100,000, which figure is doubled if a quartz outcrop can be found, $50,000 added if a speck of free gold is located, and thereafter the price advances $50,000 per speck." This is sarcastic, but not without some foundation in fact. Porcupine has been without the publicity required to make a boom mining camp, and the interests centred there are turning to means other than the press to get the possibilities of the district before the people. The latter part of July is to see some large excursions into the new goldfield. Plans are being perfected to carry 800 Chicago people to Porcupine by special train, to be followed later by 200 more from Detroit and Cleveland. If there is not a world of business in the gold-mining shares of the new camp, it will not be for lack of exchanges. Toronto has two now, and a third one, organized by New York Curb brokers and ex-Goldfield, Nevada, promoters, is to open on July 15. It is not improbable, however, that Porcupine will eventually be demonstrated to be a camp of large low-grade producers, with little of the highly speculative features so earnestly desired by boomers, promoters, and share brokers.

General Mining News

ALASKA

Copper River

Shipments of ore from the Bonanza mine over the Copper River & Northwestern railroad to Cordova amount to about 350 tons per week. This is ore of high grade, which is shipped thence to the smelter at Tacoma.

Juneau District

The report of the Alaska United Gold M. Co., for the month ended May 15, 1911, shows that its two 100-stamp mills operated practically full time; that there was crushed in the two mills 35,323 tons of ore, and 743 tons of concentrate was saved. The estimated gross value of free gold recovered in both mills was $40,158; estimated gross value of concentrate, $35,907; total, $76,066. Estimated realizable value of product, $75,343. Operating expenses, $55,136; operating profit, $20,212. Construction expenses, $6375. Yield of ore milled, $2.41 at Ready Bullion mill, and $1.84 at 700-Ft. Claim mill. Development work consisted of 432 ft. on Ready Bullion, and 593 ft. on 700-Ft. Claim mine.

Prince William Sound

The Beatson mine, situated at Latouche, is owned by the Beatson Copper Co., for which Stephen Birch of New York is president and general manager. W. H. Seagrave is in direct charge. The property was located in 1897 by A. K. Beatson and five associates. Regular mining operations were commenced by Mr. Beatson in 1901, after he had bought the interests of his associates. In the purchase of those interests, patenting the 17 claims, developing, and building there was expended $105,981, besides work done with profits from the mine. Up to 1910 all of the business relating to the property was done in the name of A. K. Beatson. After June 1904 the proceeds of ore shipped to Tacoma more than paid expenses. In May 1907 profits amounting to $50,000 were divided, and there was another dividend of $65,000 in January 1908. During 1909 there was shipped 5092 tons of ore, from which was produced 1,264,053 lb. copper and 8820 oz. silver. The net profit for that year was $53,713, or 4½c. per pound of copper. As the price of copper that year averaged 13c., the cost of production was 8¾c. per pound, and included in this expense was the cost of 1051 ft. of development work. Soon after the mine was purchased by the Guggenheims in 1910, the latter incorporated the Beatson Copper Co., to which the property was transferred in June of that year, when Mr. Beatson turned over the management to Mr. Seagrave. It is understood that this year shipments are being increased as transportation facilities can be obtained.

ARIZONA

Gila County

(Special Correspondence.)—The Southwestern Development Co. is the name of a new organization that has bonded four claims adjoining the Live Oak group. They will soon have a churn-drill operating on the property. The company is composed of New York and Boston capitalists, probably brokers. They have issued a statement to the effect that the stock issue has already been oversubscribed. The German Copper Co., formerly the Arizona Colorado Copper Belt & Gold Mining & Milling Co., is driving on the 800-ft. level. The mine superintendent, Sell Tar, reports favorable indications to date. The property is 2½ miles north of Globe and formerly was the scene of much activity.

Miami, July 3.

Yuma County

(Special Correspondence.)—The 700-ton smelting furnace of the Clara Con. Gold & Copper Mining Co. was blown-in on June 19. Some construction work in the way of improving facilities for handling and treating ores is still going on. A spur track from the Arizona & Swansea railroad is being extended by means of a switch-back to a point above the reduction works, which will allow custom ores, coke, and fuel to be handled by gravity direct to the points of consumption at a minimum cost. A No. 11 Roots blower is being put in position which will give additional blast to the furnace and considerably increase its capacity. A 44-ft. structural-steel extension to the converter building has recently been completed. The sampling plant for handling custom ores has been finished and is now in operation. This will give the small producers of this section an opportunity of disposing of their ores, and will, no doubt, greatly increase mining activity in this vicinity. Development of orebodies in the company's mines at Swansea is being pushed, particularly on the 400 and 500-ft. levels. Considerable exploration work with churn-drills is also being conducted with good results.

Swansea, July 1.

CALIFORNIA

Amador County

Work was started on the Amador Queen mine in Hunt's gulch, adjoining the Doyle mine, south of Jackson, last week. A shaft was sunk on the property some years ago to a depth of 1000 ft., when it was owned by an English company. It is proposed to reopen the mine and give the ground a thorough prospecting. It is confidently believed that a pay-shoot exists within the boundaries of the claim.

Butte County

(Special Correspondence.)—The Granite Basin Mining & Milling Co., at Buck Ranch, Butte county, has begun operations on a large scale to open the tunnel and block out ore. The mine was proved in former days, and the present owners will extend the work commenced by the old-timers. Twenty men have been put to work during the month. E. A. Robinson is superintendent. George E. Sparks and A. Lawton have started development on their quartz and gravel drift mines at Lumkin, with a view to proving the amount of ore available before figuring on the building of a mill. The work is in charge of E. R. Sears. The Phoenix Mining Co. of Hurldon is sinking on its lode, on which good ore has been found. H. W. Latimer and associates of Los Angeles are owners, for whom R. Kellett is in charge. A number of miners are employed at the Enterprise mine, at Enterprise, sinking on the vein. This property was formerly owned by E. E. Burke of Santa Rosa. Clark and Bohaman of Oroville have opened a vein of gold-bearing quartz. Their claims are about 3 miles from town on the west branch of the Feather river.

Oroville, July 1.

Inyo County

A serious cave-in caused a temporary suspension of operations at the property of the Golden Star Mines Co., in the Argus mountains. Sixty-five men have been at work, the daily output being about 80 tons of ore, which is treated in a cyanide plant. While cleaning out an old shaft on the King Solomon, Frank Buys discovered a seam of ore dipping into the hanging wall. The new discovery is on the 100-ft. level and is 12 in. wide. Preparations are being made to sink the shaft. The Keane Wonder mine, in the Death Valley district, has been bonded to George Wingfield, of Goldfield, Nevada. Investigations are in progress.

Nevada County

The Champion group of mines near Nevada City, a famous group that has produced some twenty million dollars in past years, was sold recently to J. M. O'Brien of San Francisco. Six months ago Mr. O'Brien took an option on the property, and has had 20 men at work exploring the property. The workings are now down 2400 ft. on the incline, and it is probable that a central shaft will be sunk, and nearly a half million dollars will be spent on new equipment. Recent statements to the effect that this mine has been taken over by the North Star Mines are incorrect, but it is not impossible that the control of this group will finally be acquired by the North Star Mines. Recently the mine has been working 60 men on production and 20 on development work. There is a 20-stamp mill on the property. The Delhi mine has temporarily suspended operations, due to a scarcity of water. A good record for shaft sinking was made [illegible] by the six men who are sinking the new shaft [illegible]. A depth of 40 ft. was obtained in [illegible] days. The shaft is a

MILL AT CHAMPION MINES.

compartment one and is 18 ft. long and 10 ft. wide. A hoist and skips are to be installed soon and even a better record is then expected.

SHASTA COUNTY

Three furnaces have been banked at the Mammoth smelter to allow a rearrangement of the cooling-pipes leading to the bag-house. The present number of pipes is the minimum possible for operation of the furnaces. More pipes have been added, and the series rearranged so that the temperature can be materially reduced. The life of the bags under present working conditions is very satisfactory. At the Balaklala, experimental work is still in progress to perfect the method of removing dust from the smelter fume.

Work on one of the greatest power development projects in the State, if not in the West, is going on quietly in the Big Bend of Pit river, near the towns of Wengler and Henderson. One quarter of a mile of heading is completed. The tunnel when finished will be nearly seven miles in length. The Mt. Shasta Power Co. is the corporation that has the project in hand. H. V. Gates, residing at Hillsborough, Ore., who is interested in half a dozen or more power companies in Oregon and Idaho, is the moving spirit. R. E. Johnson is the chief engineer. Several years ago 150,000 in. of water in Pit river was located. The surveys are practically completed and crews of men are working at each end of the 7-mile tunnel. Machine-drills are used and the tunnel is driven 150 ft. per month.

SIERRA COUNTY

Henry Goering is reported to have made a find of rich nuggets at the Haskell Peak mine.

Good progress is being made at the Tightner mine. The machinery for the 10-stamp mill is being shipped to the property and the 4-drill compressor is now running. C. C. Derby and L. N. Wagner, of Nevada City, are superintending the construction and development work for J. M. O'Brien, who recently took up the option on the property. H. L. Johnson, the owner, has taken out, it is stated, a million dollars from the upper workings on the vein. The adit recently driven on the 1400-ft. level has cut the ore-shoot where it is equally as good as above. This gives 650 ft. of new ground, and some $100,000 worth of ore has been taken out of the adit during development work.

YUBA COUNTY

J. P. Lyon, Robert Buckley, and Russell Wright, of Vacaville, have taken a lease on a piece of placer property near Comptonville and plan to start working it next month.

COLORADO

The total production of gold in Colorado up to December 31, 1910, is estimated at $487,491,998. The production of gold in Colorado during 1910 was $20,297,535.

CLEAR CREEK COUNTY

(Special Correspondence.)—A body of ore 5 ft. wide was opened last week on the eleventh level of the Gem mine, 800 ft. east of the main shaft. A shipment of 100 tons of ore from this mine brought [illegible], making the average value [illegible] per ton. A. H. [illegible] & Co. are operating the mine as lessees. The East [illegible] M. Co. has been incorporated to operate the [illegible] mine. [illegible] is manager. The operations will be carried on through the Central adit. The Seaton Mountain E. Co. has a contract to furnish the Big Five M. Co. with power for its transportation system. The Centennial mine of the Two Kings G. M. Co. is to be provided with a 60-hp. boiler, 30-hp. hoist, and a Blaisdell 5-drill air-compressor. At the annual meeting of the Hoosac T. & M. Co. the board of directors was re-elected. E. D. Quigley will remain as manager.

Idaho Springs, June 27.

(Special Correspondence.)—Development has been put under way on the Baker mine, situated on Kelso mountain. A cross-cut has been started to get the ore below the upper workings. Coggswell brothers are operating under a lease. The Clinton M. Co., controlling property on Wood mountain, has purchased an air-compressor, which is now being placed in position. It is proposed to extend the adit 4000 ft. A carload of galena ore was shipped last week from the East Griffith mine to the smelter at Salida. The ore sampled $45 per ton in silver and lead. Ericson & Co. are operating the property as lessees. Work is to be resumed in driving the Vidler adit through Argentine pass. It has been decided to drive from the west side.

Georgetown, June 26.

GUNNISON COUNTY

It is reported that molybdenite in large quantities has been discovered near Crested Butte. Molybdenite is used in the manufacture of molybdenum steel. The sale of the old Walrod properties on Cement creek to Boston interests is reported. F. Austin Wilson has started work on the Washington mine, at Irwin, and has a gang busy repairing the pumping plant. As soon as the wagon-road to the Sapp mines is in shape, ten 4-horse teams will start hauling ore to the railroad. It is expected that a post-office will be established at the mine soon.

LAKE COUNTY (LEADVILLE)

Exploratory work during the last six months has resulted in the finding of zinc, lead, and iron ores, often in places where it was supposed that the ores had long since been extracted. The output from the Yak tunnel is greater than for years past; 25 sets of lessees are now at work, and most of them are shipping. The Valley shaft, the Little Jonny, and the Garbutt are notable producers. The Siwatch adit is expected to cut the first of the veins it was driven to intersect in the near future. At the Helena, in Iowa gulch, a good vein of lead ore has been found. Now that the snow is gone from the higher mountains, results may be expected from prospecting work.

OURAY COUNTY

It is expected that the Humboldt mine will be sold to French interests, as Fred G. Farish, representing the owners, and Hy Knoertzer and L. Chevrillon, for the purchasers, have just made an examination of the property. The property was sampled last fall, and the present visit was merely to check the previous work. The rumor that $50 ore had been cut by a diamond-drill in the workings of the Camp Bird proves to have been without foundation. The Altoona, Ruby Trust, and Yankee Boy have recently been examined in the interest of Philadelphia investors, and the report is said to have been favorable. G. H. Barnhardt has resigned as manager of the Wanakah Mining Co., and J. T. Roberts, Jr., is now manager. The company has 40 men at work.

SAN JUAN COUNTY

(Special Correspondence.)—The Silver Lake mine has been opened on company account, and 15 men started breaking ore June 20. It was persistently claimed by the agents of the Garfield Smelting Co., owner of the property, that work would not be resumed on company account, so that the present operations come as a decided surprise to this district. It is hoped that the work will be carried on as outlined. The plan is to start on a small scale and mine the ore in sight, starting the mill at the end of 30 days. If the result of this month's work is encouraging, development will be started and an effort made to bring the property back to the normal tonnage of 300 tons per day. The property has been idle since 1908, except for small leases, and the announcement that the company intends to restore this mine to its old position as the largest producer of the district is welcome news. The Highland Mary mine has been leased to George Hill and Dan McLean, well known local operators, and the lessees announce that mining will start at once. This mine has produced some good ore, and will, no doubt, again join the shippers. Several smaller leases are reported, but none have begun work. The owners of the King mine are in Silverton, and plans are being completed for the operation of this property, which has shipped large amounts of crude lead and zinc ore.

Silverton, June 24.

TELLER COUNTY (CRIPPLE CREEK)

The June production of the Cripple Creek mines was 76,798 tons, of an average value of $17.82 per ton, corresponding to a gross content of $1,355,040. The low average per ton is due to the large amount of low-grade ore now being treated. The Isabella mill, operated by the Western Reduction Co., is treating old tailing, and the average recovery is given as $1.20 per ton. The ore from the Stratton's Independence dump also shows a slight decrease in grade. The figures as to the ore treated at the principal mills and smelters during the month are given below:

	Tons.	Average Value.	Gross Bullion Value.
Colorado City—			
Golden Cycle	26,000	$20.00	$520,000
U. S. R. & R.	13,815	22.00	303,930
Portland	9,800	21.50	210,700
Cripple Creek—			
Portland	8,770	3.00	26,310
Stratton's Independence..	10,500	2.74	28,770
Isabella	3,900	1.20	4,680
Smelters—			
Denver and Pueblo......	4,010	65.00	260,650
Totals	76,795	$17.828	$1,355,040

The figures for July will probably show an increase, as the Little Giant mill in Pony gulch is expected to begin work, and the Wild Horse will resume operation, having been remodeled. The Blue Bird mill was closed during June. Good ore has recently been found on three properties, the Laura Lee on Mineral hill, the Conundrum, and the Gold Sovereign on Gold hill.

IDAHO

SHOSHONE COUNTY

The Coeur d'Alene North Fork M. & S. Co., owner and operator of the Monarch mine and mill on Pritchard creek, near Murray, has arranged to ship its lead-silver concentrate to the Tooele plant of the International Smelting & Refining Co., and its zinc concentrate to an Oklahoma smelter. Now that its Monarch mill has been increased in capacity to 200 tons per day the company probably will be able to ship 900 tons of concentrate per month to Tooele. This product is expected to sample 55 to 60% lead, and 10 to 12 oz. silver per ton; the zinc concentrate will probably amount to 100 tons per month, and this will carry 45 to 50% zinc, 3 to 5% lead, and 10 to 12 oz. silver per ton. As has been noted before, the Monarch mine's lowest level consists of a 3200-ft. cross-cut that taps the vein at a vertical depth of 1400 ft. It is now announced by E. P. Spalding, the manager, that sinking is to be commenced this month on the ore-shoot where it is exposed on the lowest level. This shoot has a length of 300 ft. and a width of 3 to 16 ft. The great vein is opened from the 1400-ft. level to the surface by raises and shafts.

The Paragon Con. M. Co., having extensive holdings on Paragon gulch, above the Monarch, has been developing at two places on its group, and has exposed considerable of galena and zinc ore, the shipment of which has been commenced. The first car of ore was shipped to Salt Lake City last month. L. W. Steadman, of Murray, is manager.

The operations of these properties, the Black Horse, Jack Waite, and Bear Top mines make the Murray side of the Coeur d'Alene more active than it has been for many years.

(Special Correspondence).—On Monday, July 3, 1911, the Bunker Hill & Sullivan M. & C. Co. paid dividend No. 166, of $65,400. This makes the total amount of dividends paid $12,832,650.

San Francisco, July 4.

MONTANA

SILVERBOW COUNTY.

Work has been started at the Pilot Butte mine, and after the water has all been removed from the shaft, sinking will be commenced. Cross-cutting from the 1200-ft. level of the Black Rock mine of the Butte & Superior to the Pilot ground is progressing favorably. The East Copper Mining Co. has filed its report to the assessor for taxation purposes, showing the operations for the year ended May 31. The net proceeds are reported as $118,986. The ore mined was 89,888 tons; value per ton, $15.31; gross value, $1,376,253; cost per ton for mining, $3.79; total cost of mining, $340,400; cost per ton for treatment, $5.33; total cost of treatment, $478,829; smelter deductions, $184,202; paid for freight, selling, etc., $226,983; cost of improvements, $26,850.

The Butte & Superior Co. shows net proceeds of $3722. There were 131,038 tons of ore mined, the yield per ton being $5.26. The cost of mining per ton was $2.50 and the cost of reduction per ton $1.65. The Butte-Alex Scott during the six months it was in operation showed a loss of $2818. The previous six months extensive development work was carried on, there being paid for labor and supplies $103,097. During the last six months during active mining operations there, 107,358 tons of ore extracted yielded $15.28 per ton.

NEVADA

NYE COUNTY

(Special Correspondence.)—On the 265-ft. level of Midway No. 4, the south vein has been driven on about 200 ft. It averages 12 in. wide, the ore running into milling grade. On the 345-ft. level a promising vein running 4 to 8 ft. wide was recently found. The control of the Manhattan Dexter Mining Co. passed into new hands as the result of the election at the annual meeting, held in this city. R. C. Moore was elected president; W. B. Pittman, vice-president; Eugene Howell, treasurer; Fred Brown, secretary; William Keith and Percival Nash, directors. The contest developed considerable spirit. It was decided that only the secretary should be a salaried officer, and that every endeavor be made to operate the property along most economical lines. Recent devlopments in the mine were reported encouraging. The Blue Jacket mine at Round Mountain is sending out steady shipments of fair-grade ore, mostly from the lease operations. Several consignments of ore ranging $20 to $40 per ton have been treated at the Daisy mill.

Tonopah, June 17.

(Special Correspondence.)—The new vertical shaft at the Big Four has attained a depth of 300 ft., and the showing is said to be good on the new level. The vein is 3 to 10 ft. wide, and assays $50 to $150 per ton in gold. Sixty tons of $50 ore are being extracted daily from the 300-ft. level. The new shaft was sunk on the Poak-Steen-Chapman lease, on blocks 11 and 12. It is estimated that the value of the ore blocked out between the 210 and 300-ft. level will aggregate $100,000. An Ingersoll-Rand 12-drill compressor, 75-hp. electric hoist, pump, and other equipment was recently installed. The pump has a rated capacity of 150,000 gal. per day and is at present handling 140,000 gal. The flow of water on the 300-ft. level continues heavy. Two other leasing companies are active on Big Four estate. Bath brothers' lease on Union No. 2, belonging to the Litigation Hill Merger Mining Co., continues to send out rich ore, a recent shipment to the War Eagle mill yielding $4487. A 25-hp. electric hoist is being installed, and another shift is about to go on. The shaft will be sunk deeper and stoping conducted at the 100-ft. point where 60 ft. of milling ore is exposed. It is announced that the Mineral Hill Co. will immediately commence the driving of an adit to intersect the vein opened by the Mineral Hill and St. Paul leases on the East Side M. & L. Co. on the Mineral Hill estate. San Francisco people are principally interested. Leasing is active throughout the district, and the camp is showing great improvement.

Manhattan, June 30.

WHITE PINE COUNTY

(Special Correspondence.)—The Nevada Consolidated company is shipping some ore from the Liberty workings, but only a sufficient quantity to clear the way for further development. The Nevada Consolidated has obtained an option on the Los Angeles group, adjoining the Cumberland Ely on the east, and has commenced prospecting with churn drills. Ely Centennial has commenced the sinking of a 100 ft. winze on the southwest lateral. The lateral is about 1160 ft. in from the adit portal, and the winze is at a point 475 ft. from the mouth of the lateral. Boston Ely has two drills at work. The jasperoid formation has been found 280 ft. west of the 1245-ft. level. The Ely Consolidated reports the discovery of two new orebodies in the Zack shaft. The first vein shows a thickness of 9 ft. and was encountered 40 ft. below the 500-ft. level. Assays of the ore run 5.4 to 8.7% copper and $1.07 to $307 in gold and silver. The second orebody was found about 30 ft. lower, but its extent and value are not yet known. It is expected to attain the 600-ft. level soon. James Quinn is superintendent.

Ely, June 22.

OREGON

JOSEPHINE COUNTY

The Sterling Gold Quartz M. Co. is operating at Mineral Hill, 9 miles southwest of Medford, where two veins of gold and silver ore have been developed by a series of cross-cuts. The work is in charge of R. L. Ray, and the company is composed of Medford people. Some of the ore is high grade.

The three claims owned by W. H. Ramsey are at the head of Slate creek, 20 miles south of Grants Pass. Adolph Maier recently examined the property and reports, according to the *Rogue River Courier*, that there are two veins, one 20-ft. wide, carrying heavy sulphide and some oxidized ore, and one 8-ft. wide carrying oxidized ore, the first being on the contact of serpentine with slate, while the latter is a fissure vein. The development work consists of a 50-ft. adit and a 20-ft. prospecting shaft. The general average of amalgamation tests was $24.80. The property is 1½ miles from a good wagon-road.

WASHINGTON

FERRY COUNTY

The winze below the 300-ft. level of the Lone Pine mine is down about 115 ft. in a body of ore 12 ft. in width, which is reported to assay from $14 to $40 per ton.

The smelter returns have been received from 47½ tons of ore from the Knob Hill mine, which assayed 6.36 oz. gold and 12.55 oz. silver, bearing a market value of $133 per ton. The total gross value of the shipment was $6058 and the net return $5524. The shoot of ore from which this carload was extracted is 4½ ft. wide. The mine is sending a carload of ore daily to the smelter. There are 14 carloads in transit and at the Trail, B. C., smelter to be heard from, and two more will go out tomorrow.

A clean-up at the Rathfon Reduction Works on tailing from the Old Republic P. & R. Co. mill is reported at $8.50.

KING COUNTY

It is reported that the Standard Oil Co. will establish a million-dollar distributing plant at Richmond Beach on Puget Sound. It is further rumored that the Shell Royal Dutch company is planning to construct a station to compete with the Standard Oil.

UTAH

BEAVER COUNTY

The Majestic Copper M. & S. Co. has been at work lowering the water in its workings. Its pumps have a capacity of 900 gal. per minute and are able to handle the water easily. The shaft has now been sunk from the 500 to the 600 ft. levels, on the latter a drift has been driven 260 ft. east, where, on June 27, 4 ft. of good ore was found. By driving 40 ft. to the west an ore-shoot found 230 ft. above should be cut. During the past year 13 cars of $19 ore have been shipped from the working on the 500 ft. level.

CARBON COUNTY

A carload of machinery has been shipped to Castle Peak to be used, it is said, in opening up the old Baxter claims of the gilsonite workings at that place. G. E. Stewart, field superintendent for the company, who has charge of the property, says that it is expected to mine 300 tons per month.

JUAB COUNTY

The directors of the Iron Blossom will meet on July 10, and there is much speculation as to whether the regular quarterly dividend of 10c. per share will be increased on account of the recent find of ore. Driving is now in progress on the 600-ft. level to cut the new orebody. The shipments from the Tintic district for the week ended June 30 were: Centennial-Eureka, 40 cars; Iron Blossom, 36; Dragon Iron, 27; Bullion Beck, 10; Gold Chain, 10; Colorado, 9; Grand Central, 9; Chief Consolidated, 6; Uncle Sam, 6; Gemini, 6; Scranton, 4; Opohongo, Mammoth, Black Jack, and May Day, 3 each; Sioux Con., Eagle & Blue Bell, and Lower Mammoth, 2 each; Yankee, Eureka Hill, and Swansea, 1 car each. Waldemar Lindgren has been in Tintic recently, but has now returned to Washington, leaving an assistant at work upon the revision of the report upon the Tintic district, issued in 1896.

CANADA

ONTARIO—PORCUPINE

The Gibbons claims have been sold to an English syndicate, and the first payment has been made by Lindsey Morton, who represents the buyers. The vein is said to be 10 to 15 ft. wide and gives high assays. At the North Dome the Dome Extension vein has been uncovered for 270 ft. along the southeast corner of the North Dome. The Portisdale has a good vein on its property, which is the most northerly in Tisdale. The 50 claims purchased from the Timmins-McMartin-Dunlap company by Bewick, Moreing & Co. have been organized as the Ontario Porcupine Goldfields Development Co., with 120,000 shares at £5 each, or a total of $3,000,000 capital; it is expected that £6 per share will be realized. The syndicate has 2000 acres of ground which will be developed under the management of Bewick, Moreing & Co. Gerrard Lovell is manager and Cyril Wanklyn is chairman of the board of directors. Some $60,000 worth of gold from Porcupine has been sent to the Ottawa mint and the first gold coins, bearing the head of George V, have been struck. The prospects at Swastika are showing up well and the outlook for the new camp is highly encouraging.

COBALT, ONTARIO

The figures for the production of the Cobalt mines for the first quarter of the present year have just been made public. During the quarter, 7,530,487 oz. of silver, valued at $3,708,544, was produced. This is less than for the corresponding quarter of 1910, but the output of silver shows an increase of 1,130,560 oz. Included in the total production is the 132,900 oz. from Gowganda and Elk Lake and 66,795 oz. from South Lorrain. The concentrate shipped amounted to 1974 tons, and 3786 tons of ore was shipped. The gold production of Ontario for the quarter was 1813 oz., or $33,990. When Porcupine gets into swing this will be largely increased. Copper and nickel showed decreases of $357,074 and $1,131,024, respectively. The following list gives the production for the quarter:

	Value.
Gold, 1813 oz.	$ 33,990
Silver, 7,530,487 oz.	3,708,544
Copper, 2121 tons	303,240
Nickel, 4124 tons	884,992
Iron ore, 11,545 tons	24,404
Pig iron, 115,454 tons	1,823,717
Cobalt and nickel oxides, 107,846 lb.	29,882

MEXICO

CHIHUAHUA

The Rio Plata Mining Co. declared a dividend of 2c. per share, payable June 30, 1911. This has been a regular quarterly disbursement. The property consists of a mine and mill, situated on the Rio Setentrion, in the Sierra Madre, southwestern Chihuahua, forty to fifty miles from the Kansas City, Mexico & Orient railroad. The mine is developed by means of a series of adit-levels by which the vein is opened to a vertical depth of 600 to 800 ft. The ores comprise quartz, carrying silver as sulphide, bromide, and metal, in iron sulphide. The 25-stamp mill is equipped with tables, Wheeler amalgamating pans, Pachuca tanks, and Moore filters. Machinery is operated by electric power, generated at the company's hydro-electric plant. The ore is conveyed from the mine to the mill over a 1400-ft. aerial tramway. The company is controlled by New York people, H. W. Miller being president. Operations were commenced here in 1907.

RIO PLATA MILL.

(Special Correspondence.)—At the El Rayo mine, ten miles from Santa Barbara, belonging to the Mines Company of America, a new ore-shoot has been opened on the new Comet vein to the north of the ore-shoot which has been under development for several months. This new vein has been tapped by a cross-cut from the upper San José tunnel, and 600 ft. south and 350 ft. lower, by cross-cut from the third level. Both cross-cuts have disclosed ore running from $15 to $20 per ton, and it is expected that the ore-shoot is continuous between the two points of exploration. By advancing the Pettit tunnel 300 ft. this level, 350 ft. lower than the lowest cross-cut, will cut the orebody. The company has been operating continuously. Its net earnings for the first four months of 1911 were $119,599. During that period there was mined and treated 18,100 tons of ore. Its regular quarterly dividend of 2¼% is payable July 25.

Santa Barbara, June 20.

(Special Correspondence.)—Operations at La Republica mine during May were as follows: Tons milled, 1167; production, ₱72,637.54; operating charges, ₱48,281.64; construction charges, ₱4562.33.

Casas Grandes, June 28.

Recent Publications

PROGRESS OF THE MINERAL INDUSTRY OF TASMANIA FOR THE QUARTER ENDING MARCH 31, 1911. By W. H. Wallace. 11 pp. Tasmania, 1911.

GEOLOGY OF THE THOUSAND ISLANDS REGION. By H. P. Cushing, H. L. Fairchild, R. Ruedemann, and C. H. Smyth, Jr. New York State Museum Bulletin 145, 1910. 193 pp.; ill., map, index.

GEOLOGY OF THE OIL AND GAS FIELDS OF THE CLARION QUADRANGLE. By M. J. Munn. Topographic and Geologic Survey of Pennsylvania, Report No. 3. 111 pp.; ill., maps, index. Harrisburg, 1910.

GEOLOGY OF THE OIL AND GAS FIELDS IN SEWICKLEY QUADRANGLE. By M. J. Munn. Topographic and Geologic Survey of Pennsylvania, Report No. 1. 171 pp.; ill., maps, index. Harrisburg, 1910.

NEOCOLEMANITE, A VARIETY OF COLEMANITE, AND HOWLITE FROM LANG, LOS ANGELES COUNTY, CALIFORNIA. By Arthur S. Eakle. University of California Publications, Bulletin of Geology, Vol. 6, No. 9, 1911. 11 pp.; ill.

THE STRATIGRAPHIC AND FAUNAL RELATIONS OF THE MARTINEZ FORMATION TO THE CHICO AND TEJON NORTH OF MOUNT DIABLO. By Roy E. Dickerson. University of California Publications, Bulletin of Geology, Vol. 6, No. 8, 1911. 7 pp.

AN EXTENSION OF THE DEWEY SYSTEM OF CLASSIFICATION. By R. M. Keeney. Colorado School of Mines Quarterly, April 1911. 108 pp. Some time ago an amplification of those parts of the Dewey decimal system of classification covering engineering was given in a bulletin of the University of Illinois, but the sections devoted to mining and metallurgy were left unexpanded. Mr. Keeney has remedied that defect so far as the group 669—Metallurgy, Metallography, and Assaying—is concerned, and his extension, published as No. 1 of Vol. 6 of the *Colorado School of Mines Quarterly*, will be of much service to engineers who index their notes, as well as to librarians.

The following publications have recently been issued by the U. S. Geological Survey:

Advance chapter from 'Contributions to Economic Geology', 1909: 'Mineral Fuels', by Marius R. Campbell, 1911, pp. 254, maps, ill., index. Advance chapters from 'Contributions to Economic Geology', 1910: 'Miscellaneous Nonmetallic Products', by J. S. Diller, Charles Butts, A. N. Winchell, N. H. Darton, and E. F. Burchard, 1911, pp. 45; 'Rare Metals', by F. L. Hess, 1911, pp. 12; 'Lead and Zinc', by R. W. Richards and Howland Bancroft, 1911, pp. 30.

Advance chapters from 'Mineral Resources', 1910: 'Production of Fuller's Earth in 1910', by Jefferson Middleton, 1911, pp. 8; 'Production of Mica in 1910', by Douglas B. Sterrett, 1911, pp. 8; 'Production of Quartz and Feldspar in 1910', by Edson S. Bastin, 1911, pp. 15; 'Summary of the Mineral Production of the United States in 1909', by W. T. Thom, 1911, pp. 59; 'Silver, Copper, Lead, and Zinc in the Central States in 1909', by B. S. Butler and C. E. Siebenthal, 1911, pp. 41; 'Production of Metals and Metallic Ores in 1908 and 1909', by Waldemar Lindgren, 1911, pp. 7; 'Gold, Silver, Copper, Lead, and Zinc in the Western States and Territories in 1909', by A. H. Brooks, C. N. Gerry, V. C. Heikes, C. W. Henderson, H. D. McCaskey, Chester Naramore, and C. G. Yale, 1911, pp. 275.

'Results of Spirit-Leveling in Missouri', 1896 to 1909, inclusive, by R. B. Marshall, 1911, pp. 48, index. 'Results of Spirit-Leveling in Oregon', 1896 to 1910, inclusive, by R. B. Marshall, 1911, pp. 82, index. 'Results of Spirit-Leveling in Iowa', 1896 to 1909, inclusive, by R. B. Marshall, 1911, pp. 29. 'Results of Spirit-Leveling in Michigan and Wisconsin', 1897 to 1909, inclusive, by R. B. Marshall, 1911, pp. 64.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

R. B. LAMB is at Toronto.

MYLES FLYNN is in London.

R. GILMAN BROWN is in Russia.

W. H. KNOX has gone to Siberia.

F. G. CORNELL was in New York.

GEORGE R. ROGERS is at Porcupine.

GEORGE E. FARISH is in New York.

PHILIP ARGALL has gone to Alaska.

C. B. LAKENAN is in San Francisco.

A. S. DWIGHT is traveling in the West.

HEINRICH RIES was in Canada last week.

A. B. WILLMOTT has returned to Toronto.

OTTO SUSSMAN has returned to New York.

COURTENAY DE KALB is returning to Mexico.

STEWART W. YOUNG is at Carmel, California.

EUGENE COSTE has moved to Calgary, Alberta.

F. J. H. MERRILL has returned to Los Angeles.

D. C. JACKLING has returned to Salt Lake City.

CHARLES E. DUTTON has returned to Goldfield.

GELASIO CAETANI has returned to San Francisco.

WALTER FITCH is at Salt Lake City for a few days.

H. H. SUTHERLAND has opened an office at Toronto.

STANLEY LECKY has returned from western Ontario.

WALDEMAR LINDGREN will be at Salt Lake City July 12.

J. B. TYRRELL has returned from the Swastika district.

LAWRENCE N. WAGNER was in San Francisco last week.

J. P. KEENE will be at Alta, Montana, for the summer.

R. B. NICKERSON has returned to Ontario from New York.

J. A. HOLMES will be in Seattle next week on his way to Alaska.

ROBERT E. CRANSTON is examining placer properties in Idaho.

J. NELSON NEVIUS was in San Francisco and has gone to Oregon.

W. G. PERKINS is visiting the Kyshtim works, in the Urals, Russia.

OWEN LETCHER will return to Johannesburg from London by way of East Africa.

KIRBY THOMAS is making mine examinations in the Cobalt and Sudbury districts, Ontario.

SUMNER S. SMITH was in San Francisco and has gone to Portland on his way to Alaska.

W. G. DROWN is manager of the Columbia mining properties at Angels Camp, California.

B. B. THAYER sailed for Europe July 1; he expects to return to New York in September.

A. J. EVELAND was in San Francisco and will go to Shasta county and to British Columbia.

WILLIAM J. COX has returned to Denver from a visit to the Santa Gertrudis mine, Pachuca, Mexico.

THOMAS H. TULLOCH is mine superintendent for the South Utah Mines & Smelters, at Newhouse, Utah.

R. H. CHAPMAN is doing topographical survey work on Vancouver Island for the Canada Geological Survey.

R. J. CANNON has left San Francisco on his way back to Philadelphia. He expects to go to Colombia next month.

ROY HOUSE, GEORGE SPIETZEN, and NIEL HARRINGTON, formerly with the First National Copper Co., have left for South America.

G. H. BLAKEMORE is investigating the various methods of handling ore in the United States, and is at present at the Utah Copper Co. mine.

Market Reports

LOCAL METAL PRICES

San Francisco, July 6.

Antimony	13 – 13½c	Quicksilver (flask)	46
Electrolytic Copper	14 – 15½c	Tin	47 – 48½c
Pig Lead	4.75 – 5.75c	Spelter	7 – 7½c

Zinc dust, 1400 lb casks, per 100 lb, small lots $9.50 – 9.75, large $7.50 – 8.00

METAL PRICES

By wire from New York

Average daily prices in cents per pound

Date	Electrolytic Copper	Lead.	Spelter.	Silver, per oz.
June 29	12.55	4.48	5.70	53⅝
" 30	12.55	4.48	5.68	53¾
July 1	12.50	4.48	5.66	53⅝
" 2	Sunday		No market.	
" 3	12.48	4.48	5.65	53⅝
" 4	Holiday.		No market	
" 5	12.48	4.48	5.65	53½

ANGLO-AMERICAN SHARES.

Cabled from London.

	June 28. £ s. d.	July 6. £ s. d.
Camp Bird	1 11 3	1 9 9
El Oro	1 5 8	1 3 6
Esperanza	1 10 7½	1 10 0
Dolores	1 5 0	1 5 0
Oroville Dredging	0 6 9	0 6 9
Mexico Mines	8 1 3	7 10 0
Tomboy	0 18 1½	0 19 0

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing prices, July 6		Closing prices, July 6.
Amalgamated Copper	$ 68⅝	La Rose	$ 4¼
A. S. & R. Co.	79⅝	Mason Valley	9⅛
Braden Copper	4¾	Miami Copper	21⅝
B. C. Copper Co	6⅛	Mines Co. of America	5¼
Butte Coalition	19	Nevada Con	19¼
Chino	23	Nevada Utah	¾
Davis Daly	⅞	Nipissing	10⅝
Doble	2⅜	Ohio Copper	1¾
Dolores	5	Ray Central	1⅝
First National	1¼	Ray Con	17¼
Foley O'Brien	1⅞	South Utah	¾
Giroux	6¼	Superior & Pittsburg	16⅝
Goldfield Con	5⅝	Tenn. Copper	40⅞
Greene-Cananea	7⅜	Trinity	4¼
Guanajuato Con	¾	Tuolumne Copper	4⅝
Hollinger	13¾	United Copper	2⅛
Inspiration	8⅝	Utah Copper	49⅝
Kerr Lake	5	Yukon Gold	4

COPPER SHARES—BOSTON.

	Closing prices, July 6.		Closing prices, July 6.
Adventure	$ 6	Mohawk	$ 49
Allouez	30	North Butte	32⅛
Atlantic	6	Old Dominion	47
Calumet & Arizona	58½	Osceola	103
Calumet & Hecla	465	Parrot	11
Centennial	11	Santa Fe	1⅝
Copper Range	60	Shannon	11
Daly West	5⅝	Superior & Pittsburg	16⅛
Franklin	11⅛	Tamarack	35
Granby	38	Trinity	4
Greene Cananea, ctf	7⅝	Utah Con	17
Isle Royale	17	Victoria	1⅞
La Salle	3½	Winona	8⅛
Mass Copper	8¼	Wolverine	114

(By courtesy of J. C. Wilson, Mills Building.)

NEVADA STOCKS.

San Francisco, July 6.

Atlanta	$ .12	Mayflower	$ .04
Belcher	.50	Mexican	4.02
Belmont	6.20	Midway	.16
B. & B	.45	Montana Tonopah	.73
Booth	.07	Nevada Hills	3.42
Chollar	.10	Ophir	2.10
Combination Fraction	.08	Pittsburg Silver Peak	.63
Con. Virginia	1.20	Round Mountain	.57
Florence	1.32	Sandstorm Kendall	.08
Goldfield Con	5.45	Savage	.24
Gould & Curry	.20	Tonopah Extension	.95
Jim Butler	.27	Tonopah of Nevada	5.85
Jumbo Extension	.28	Union	1.12
MacNamara	.18	West End	.48

(By courtesy of San Francisco Stock Exchange.)

Decisions Relating to Mining

Specially reported for the Mining and Scientific Press.

Contract of Sale of Minerals—Damages for Breach

A contract for the sale of mineral rights in certain lands for which the seller held options, gave the purchaser the option to furnish funds to have the lands drilled, but under the option only such could be taken as were shown to contain a coal vein or under the option all the lands must be accepted without drilling. In an action for the breach of this contract by the purchaser refusing to take the lands or to furnish a certain drilling fund provided, the seller was not entitled to recover the contract price for all the lands and also the cost of drilling machinery purchased by him.

Eisleben *v.* Brooks, 179 Federal, 86.

Mechanic's Lien on Mining Claim

The statute of New Mexico requires a person claiming a lien on mining property for labor to file a statement of his demand with the statement of the terms and conditions of his contract. Under this statute a claim for a lien reciting that the claimant agreed with the owner or operator of the mine for a specified sum per day and board is sufficient. So a statement of the general nature of the materials furnished, or labor performed, with the amount claimed to be due therefor after deducting credits is sufficient. Accordingly, a statement of the claim for a lien reciting that the claimant performed labor in the construction of a mining claim on land is sufficiently definite and includes different kinds of labor, for all of which a claimant may have a lien.

Gray *v.* New Mexico Pumice Stone Co., (New Mexico) 110 Pacific, 603.

Location of Mining Claim—Declaratory Statement

An amended declaratory statement of the location of a mining claim which stated that a discovery was made of a vein of mineral-bearing rock in place, and that a shaft 4 by 8 feet and more than 10 feet deep was sunk at the point of discovery, is sufficient to show that the shaft was sunk on the vein for a depth of more than 10 feet and that it must have cut the vein at that depth. The original and declaratory statement of a mining claim made, respectively, on February 25, 1904, and May 23, 1905, cannot be affected by discovery of a conflicting claim made December 8, 1904, and where an amended declaratory statement was filed January 8, 1909, as the amended declaratory statement in each case related back to the date of the original declaratory statement.

Giberson *v.* Tuolumne Copper Mining Co., (Montana) 109 Pacific, 974.

Persons Entitled to Mechanic's Lien on Mining Property

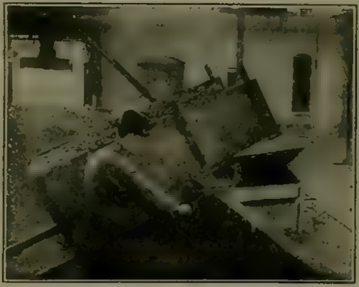
The statute of New Mexico giving a lien for labor in a mining claim, gives a lien for manual labor performed on a limestone mining claim, and this includes labor in the care of horses used in the mining operations, for labor in a lime-kiln, closing lime-bins, and gathering up tools at the lime quarry and kiln. The statute includes every person who deals directly with the owner, and who, in pursuance of a contract with him, performs labor or furnishes material, and every such person is an "original contractor" within the meaning of the statute giving every original contractor a lien. And the term "mining claim" within the meaning of this statute means in the mining country a portion of the public mineral lands of the United States to which a qualified person may first obtain the right of occupancy and possession by means of location, or to which title may be obtained by pursuing prescribed methods therefor.

Gray *v.* New Mexico Pumice Stone Co., (New Mexico) 110 Pacific, 603.

Commercial Paragraphs

On June 1, 1911, the **Sprague Electric Co.** was merged with the **General Electric Co.** of Schenectady, N. Y. Its business will be conducted under the name Sprague Electric Works of General Electric Co. The manufacture and sale of the lines of apparatus and supplies heretofore exploited by the Sprague Electric Co. will be continued by the Sprague Electric Works of General Electric Co. under the same organization, with D. C. Durland in responsible charge as general manager, and with the assurance that the characteristic high quality of product and efficiency of service to its customers will be maintained. All correspondence should be sent to the Sprague Electric Works at the same address as in the past. The offices of the Sprague Electric Works will be continued as heretofore, with main offices at 527-531 West 34th street, New York City, and branch offices in the principal cities.

The **Stephens-Adamson Mfg. Co.**, of Aurora, Ill., has recently produced an unloading car chute that is claimed to be a great saver of time and labor in unloading gondola cars. It consists of a chute or small car which has a capacity of 1½ cubic yards. This chute rests on a framework inside the car while it is being loaded. To empty it into the wagon, it is easily raised by a winch on the frame and then tipped into such a position that its contents slide into the wagon with no spill on the ground.



RAISING THE CHUTE.

The frame is entirely separate from the chute, acting merely as a supporting device to hold it first while it is being loaded, and later acting as a dumping device. This framework rests on the car across both sides, as is shown in the above cut, or, when sufficient material has been taken from the car, the frame is tipped and the rear end is allowed to rest on the bottom of the car. This permits the chute to be brought down inside, and does away with all shoveling over the edge of the car to the wagon. In either of these two positions of the frame the dumping action is the same, and the amount that the chute is tipped is always easily controlled by the operator at the winch.

DUMPING POSITION ON FULL CAR.

The construction is strong and the unloader can easily be placed in working position or moved to another car by two men. It can also be taken apart very quickly for shipment or for easier moving. It is entirely self-contained and is adapted for use on any open car.

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EDITORIAL

MR. DANIEL GUGGENHEIM must have let his imagination run away with him, according to the comment he has evoked

POLITICAL INTEREST has centred in northern Africa lately, and a recent interesting development is the proposal by a Spanish syndicate to build an 1800-mile railroad across the continent.

GOVERNMENT FINANCES show an encouraging condition of affairs. The receipts for the last fiscal year were ten million more than the estimated expenditures, which were six million less than the estimate. The Federal corporation tax has yielded over twenty-eight million dollars in revenue.

THE AMERICAN CHEMICAL SOCIETY met in Indianapolis at the beginning of this month. The seriousness of technical discussion was relieved by social functions, and practical demonstrations to the food chemists were afforded by the complimentary luncheons given by various manufacturing companies.

SYMPATHY of engineers the world around goes out to Mr. Gardner F. Williams and his family, over the loss of Mrs. Williams when the steamer *Spokane* was wrecked in Seymour narrows off the coast of British Columbia. Mr. Williams, Mr. W. W. Mein, and their families, were on their way to Treadwell and other points in Alaska at the time of the accident.

NEXT TUESDAY the Postal Commission will begin its work of investigating the cost of handling and transportation of second-class mail, and fixing the rate. It is also announced that the express companies will, on August 1, reduce rates; as much as 50 per cent in some cases. The Interstate Commerce Commission is now engaged in an investigation of the rates charged by express companies.

THE JUNE ISSUE of our London contemporary, *The Mining Magazine,* is full of interest. Mr. M. H. Burnham continues his analysis of 'The Finance of a Mine,' to which Mr. Harold E. Fern adds some interesting discussion. The veteran Cornish engineer, Mr. J. H. Collins, who is known in America both for his own attainment and that of his sons, describes the china clay industry of Cornwall. The editorial comment is at once incisive and graceful, the tribute to the late W. S. Gilbert being a notable example.

CARE OF EMPLOYEES is not the least of the responsibilities of the manager of a large enterprise. On another page we give the text of the Workmen's Compensation Act recently passed in the State of Washington. The ends such acts are designed to meet are already served, in the case of some corporations, by company regulations. At the Copper Queen for instance, the Employees Benefit Association paid $3650 in death benefits, $9565 for injuries, and $6556 for sickness, during the first five months of this year; the cost of administering the fund being 3¾ per cent.

A WELL KNOWN ENGINEER has advanced the theory that the heat generated in large cities has affected their climate. This is not a remarkable statement; it is more remarkable that the effects of large aggregations of humanity upon climate are not more noticeable. The large quantities of heat and CO_2 poured into the atmosphere of a large city might reasonably be expected to have much ill-effect, but, except for objectionable dust, the air of a city is not markedly inferior to that of country districts.

TWO PROMINENT FEATURES of interest in the mining world just now are, how may the coal resources of Alaska be developed, and how can smelters continue to exist in settled districts. The rejection of the Cunningham claims followed naturally from the law and the evidence, and public sentiment approves. But the prevention of illegal development of Alaskan mineral resources is not enough. What is urgently needed is far-sighted constructive legislation which will permit the development of industry on the Pacific coast of America. Fuel-oil has its place, which it fills excellently, but it can not meet all the needs of fuel consumers, and a cheap and copious supply of good coal will aid the development of every other industry without retarding that of oil production. The development of small claims into producing coal mines is not feasible. Legislation which will allow the development of the coal resources of Alaska is a need of the body politic, not of the Pacific coast alone, for that which benefits one part of the body benefits all. Smelting companies have, of recent years, found their difficulties external rather than internal. One smelter after another, west of the Rocky Mountains, has been obliged either to discontinue work or to move its plant, by order of court, until it has become a problem whether a smelting industry can hope to survive in many districts. It is almost impossible to accept the claims as to the damage sustained at their face value. The largest copper refinery in the world is within the city limits of New York, which include a large copper smelter as well. Copper and lead smelters operate in peace among the fertile farms of New Jersey. It is difficult to understand how the differences of climate and situation can give rise to such different effects in the West. Possibly the Bureau of Mines will speak with authority, when opportunity has been afforded for the necessary researches.

Steel Production in the Far East

On another page Mr. T. Haga, in his interesting description of the newly established Nippon Steel Works, draws attention to the connection between the iron industry and military strategy in the Far East. When China and Japan began to develop in consonance with modern progress, statesmen soon recognized the necessity for internal supplies of coal, and iron and steel, so that the nation might not be utterly dependent upon imports while engaged in war. The Japanese government established a blast-furnace and steel plant, at Wakamatsu, in the northwestern part of the island of Kyushu, which has not been very successful in operation. The strategic value of steel plants in Japan is much lessened by the fact that the domestic supply of iron ore is inadequate to form the basis of an extensive industry. Possibly the Korean ores, just beginning to be developed, may furnish the necessary supply. Dalny (Tairen) seems an excellent site for a blast-furnace plant, but since China can repurchase the town and improvements at cost price in 1939, there is comparatively little incentive to begin to develop an industry there.

The Chinese iron works have been more successful, due to an ample supply of good ore and coke, as well as efficient foreign supervision. Founded by the statesman Chang Chih-tung, and developed by Sheng Hsuan-huai, they now turn out many tons of excellent steel rails each year, and have exported pig iron to both Atlantic and Pacific ports. The low cost and efficiency of native labor forms, next to the supply of good ore and coke, the mainstay of the Chinese iron industry. A contemporary journal, in citing the high cost of the Canton-Kowloon railroad as an example of the inefficiency of cheap labor, illustrates rather the futility of attempting comment on what is not understood. The high cost of the Canton-Kowloon railroad was due to the fact that in a distance of nine miles, seven bridges of a total length of span of 3250 feet were required; nor are the Chinese the only people who have been unable to build railroads cheaply under foreign supervision, when there were contracts to be let to foreign bidders. The index of efficiency—output divided by cost—of Chinese labor is at least as high as that of British or German, and it is not at all unlikely that before the present century has passed China will have taken a place as one of the more important steel-producing countries.

Inadequacy of Language

Inadequacy of language in the expression of an idea may arise either from a lack of knowledge of words and of skill in their use, or from the inherent inadequacy of our English language; just as unsatisfactory achievement in chopping wood may be due either to the inefficiency of the wood-chopper, or to the dullness of his axe. So much has been said of the lack of skill displayed by engineers in the use of language, both spoken and written, and their lack of knowledge of good English, that we intend to speak rather of the deficiencies of the English language, as displayed in its use in technical literature. To further narrow the discussion we will speak only of the language used in the technical literature of mining. The English language has developed from its hybrid forbears with little regard to the needs of mining men who, like the conies, are but a feeble folk, unable to fix lines of progress, but perforce content to adapt, so well as they might, that which was already available to their needs. Being at first but illiterate men, they laid foundations upon which the superstructure reared through the years stands somewhat askew. None can foresee what the needs of a language will eventually be, and a plan that was most encouraging may, in the end, prove totally inadequate. Chinese is the best example of this, where the beautifully simple method of having each idea expressed by a certain sound in speech and by an ideograph in writing, early exhibited its limitations and now falls prostrate before the demands made upon it by the introduction of chemistry, physics, and their application to industrial life. The English language exhibits a similar inadequacy, though not so marked.

The mining engineer who wishes to write both accurately and pleasingly is at once upon the horns of a dilemma. Rhetoric forbids the wearisome reiteration of a word. Science demands that in accurate writing the term used shall first be defined and afterward used in the proper sense. What shall he do? There are no synonyms for many important words; and the use of so-called synonyms is but a scientific makeshift, for there are no true synonyms. If a true synonym existed, the less convenient of the two words would drop out of use, as the gold one-dollar piece has done. Usually he employs words and phrases which he conceives to be synonymous, with but indifferent success from a rhetoric standpoint and with great bewilderment to the reader. 'Broad' has not the exact meaning of 'wide', neither does 'variable' mean the same as 'varying,' nor is 'noted' exactly equivalent to 'seen' or 'heard.' Passing to more technical words, a machine may be 'installed,' a mill can only be 'constructed' or 'erected,' while a new method of working may be 'inaugurated.' The first and last of these words are so often misused that some would have us discontinue using them, perhaps on the doctrine that "If meat make my brother to offend, then will I eat no meat." But our choice of words is already so restricted that we can ill afford to relinquish any.

But worse than the fact that there are no two words in English which express exactly the same idea, is the absence of any good manner of stating some ideas. Such an expression as 'Smith has opened up the vein on the fourth level where it carries values running from eight to ten dollars per ton' introduces three such difficulties. 'Opened up' is awkward and inaccurate; he did not open it like a chest, but 'found' will not do; he knew the vein was there, having found its outcrop, perhaps years before. 'Picked up' and 'broken into' are equally as bad; they are awkward, and the former has the sense of lifting and the latter of entrance into a space, neither of which here applies. 'Intersect' should be restricted to lines, 'struck' and 'encountered' have a sense of antagonism and are totally wrong, and 'cut,' while it will do, is much overworked. 'Values' is even more puzzling. What does it mean? Presumably the minerals that are a source of profit when the ore is treated. Conceivably the 'values' have no value, for it may cost more than $10 per ton to extract them. The word is bad therefore. By reconstructing the sentence we may say that the ore 'carries gold and silver worth $8 to $10 per ton,' which is as useful as turning a glove inside out; as before, they may be worth nothing. No one can know what the actual worth or value of a ton of ore is except from the books of a company engaged in treating it. It is further conceivable that a ton of ore actually worth $5 to A may be worth $8 to B, either because the latter can extract more of its content at a lower cost, or because, if the ore be silicious, A is engaged in smelting an ore mixture that is too silicious, while B is smelting basic ores. 'Worth' and 'value' should not be used in describing ore which has not been extracted, except with the qualification 'estimated value.' Ore containing one ounce of gold per ton is not ore worth $20.67 per ton; to say it 'contains gold worth $20.67 per ton' is better, but has a tendency to shift the attention from the real point, the true value of the ore, which may be zero. When this theoretic 'value' is derived from several metals such as lead, gold, and silver, the attempt to be accurate leads to the use of awkwardly long expressions, which, if often repeated, are irritating and clumsy, and in any case are less forceful; for in using ten words to express what can be put in two the effect is like that of using a feather bolster to drive a nail. The idea 'running from eight to ten dollars per ton' casts defiance in our teeth. The ore is not engaged in a foot-race, but to say that it 'averages' eight to ten dollars per ton would be incorrect. The average, if we could determine it, might be $8.97; it could not have more than one value. Neither does the 'value' of the ore 'vary from eight to ten dollars per ton'; it might do so if the market price of the metals fluctuated, but this is not what the writer was endeavoring to say. The ideas in the sentence given are clear enough, but our language is inadequate to express them concisely and accurately.

Many other phrases might be given, but space permits of but one more. 'The directors are contemplating the erection of a mill' is the briefest and most accurate way of expressing its contained idea, yet it brings up a distracting mental image of those eminent dignitaries perched upon stumps and nail-kegs, gazing earnestly, that is neither serious nor profitable. The use of foreign words and phrases may sometimes be indulged in, either because the foreign phrase has a shade of meaning that cannot easily be expressed by any combination of English words, or because the reader or hearer will only know one meaning for the foreign word; thus giving it a preciseness which it does not possess for a native, much as Latin words are used in legal phraseology. *Chic* and *petite* have shades of meaning that defy translation, the German past participle *gefressen* requires several words to translate, and the Chinese phrase *pu yao* has much more force than the English 'I do not want it.' The disadvantage of the use of foreign words is that it is not always possible to rely upon the comprehension of the reader or hearer, when their use degenerates into mere affectation, calculated to create an impression. A radical, but unwise, method of overcoming the difficulty is that of the eminent and enthusiastic geologists who recently devised an entire new terminology, the learning of which is a task far too burdensome for most engineers. But with both care and attention much may be accomplished. The careful writer and speaker is conscious of the imperfection of his performance, hewing as close as he may to the line with that blunt axe, the English language.

The Coronation

By T. A. Rickard

Even a periodical avowedly technical must not fail to make reference to an event so commanding as the crowning of the King and Queen of England. To every country of the globe the echoes of the historic celebration have penetrated, even to the mountains and deserts in which the miner seeks for mineral. If those who live in London are weary to satiety with the subject we still owe something to our friends on the velt and on the tundra, to those who may care to receive an impression from one who like themselves has spent most of his life on the frontiers of civilization. To them and to us the ceremonial of June 22 is a pageant rich in suggestion; it breathes of old things dimly understood and of old ways long discarded. In mining we are painfully modern; hence a reversion to the feudal, mystic, and ecclesiastic spirit of the Middle Ages has the touch of the unexpected and the note of the surprising. To an industrial people the militarist idea is as uncongenial as the medieval, and to an empire broad-based on representative government the ceremony between the King and the landed aristocracy seems to ignore irrefutable facts. Moreover scientific men are concerned with realities, although not lacking in imagination; therefore to those engaged in mining the mosaic of survivals at Westminster fails to symbolize the later history of the Empire. In real life the black coats do the work of governing and the gold buttons are the emblems of service. Parliament, under the Crown, rules England; a civilian is the chief of the Government; men without rank hold high place in the estimation of the community. In the Abbey these were only spectators to a quasi-religious drama enacted by individuals whose right to do so was recorded in the College of Heralds. It seems an inexplicable perversion of political progress, and yet it was accepted good-naturedly because the Coronation was regarded as the symbol of imperial unity; to us the King is the one link that unites diverse communities under the British flag; he receives the willing homage of a free people. In their royal progress through the metropolis King George and his consort were acclaimed by men and women who not only took part in a resplendent show but participated in a serious ceremonial. By its omissions not less than by its performance the Coronation suggested the spirit underlying many a British institution, the form of which survives as an anachronism while the spirit changes in subtle harmony with the growth of the human spirit.

Ball-Mill Practice at Kalgoorlie

By M. W. von Bernewitz

So much has been written about the modern stamp-mill that other efficient pulverizers are apt to be overlooked; therefore I make no apologies in presenting this discussion of the modern ball-mill, in this case the Krupp, in the hope that it may be of use to others who have plants in operation, or contemplate their erection. It is doubtful whether the dry-crushing ball-mill is operated with greater efficiency and less cost in any other mining centre in the world than in Kalgoorlie. We have had great experience with them, and with a constant interchange of ideas, each plant is well abreast of its neighbors, until there is practically no difference of opinion as to operation.

The ores in the 'Golden Mile' do not vary much in composition, and, taken on the average, they may be said to be hard to crush. The ore in most of the mines averages 60% silica, the Great Boulder showing as high as 75%. Summary descriptions of the ore milled in the dry-crushing plants follow: the Associated has little schist, rather above average in silica; hard and highly mineralized. The Associated Northern main lode is of schistose character; west lode hard and silicious. The Chaffers ore varies from schistose to hard flinty quartz, with 3 to 5% pyrite. The Great Boulder has very hard cherty quartz with a little schist. The Kalgurli ore is quartz-diabase, varying in hardness according to depth, from schistose to highly silicious; average tough. At the Perseverance the ore is schistose in structure, and contains pyrite and magnetite throughout. South Kalgurli ore averages 60% silica, with little schist, and is considered hard.

The following analyses are from the Associated Northern and Perseverance mines:

	Per cent.	Per cent.
Insoluble	60.60	63.46
Aluminum oxide	5.75	2.06
Iron bisulphide	5.32	6.80
Carbonate of lime	11.19	13.42
Carbonate of magnesia	5.29	6.93
Carbonate of iron	10.23	6.80
Alkalies, undetermined	1.62	0.53
	100.00	100.00

The average ore from the mines is dry enough for milling, although the driest holds from 0.5 to 1% of moisture. Anything above this amount retards crushing. In a stamp-battery, or other type of crushing machine, a great deal of the efficiency depends on having massive foundations. So it is with the ball-mill. A mill on a solid block of concrete will crush better than one on a timber or steel girder, no matter how well braced. A springy support is bad for the gear, and does not allow the mill to be stiff, as it were. This has been noticed especially in the Associated plant built eleven years ago, in which 10 mills were resting on timber girders, and two on concrete piers, the latter doing far better work than any other pair in the plant. The former foundation consisted of a masonry bed, on which stood 12 by 6-in. steel girders with brackets riveted on to support two longitudinal pieces of jarrah 12 by 14 in., across which were bolted three pieces of 12 by 14 for each mill. This would appear to be stiff enough, but the vibration was still bad. Now the big mills are on concrete foundations, reinforced with old wire rope and rails. The Associated Northern, Chaffers, Great Boulder, and Perseverance ball-mills are set on massive concrete foundations; the last mentioned is especially good. Those at the Kalgurli are set on steel girders 8 by 6 in., well braced and apparently firm; while in the South Kalgurli plant they are bolted to a frame of 12 by 12-in. timbers, well braced and standing on a concrete foundation. This seems a small structure, but is free from vibration.

As soon as the foundations for a ball-mill are sufficiently set, and the four bearings for the mill-shaft and pulley-shaft are lined up, the building of the mill can be done rapidly; and with eight men who understand the work a mill may be erected in 24 hours. Everything is simple; the main walls are bolted or riveted to the cast-iron naves, and when in their proper places, are keyed to the mill-shaft. The side-liners are bolted loosely until all the mantle-plates with the grinding plates are in position, then everything may be tightened, all bolts having check-nuts, excepting those on the mantles holding on the grinding-plates, which are riveted. The fitting of the scoops, baffles, and inside and outside screens is quite a simple matter. The feed-hopper is in two pieces for bolting around the shaft, and is lined for the wear of ore dropping in from the feeder. Unless motor-driven, each mill has a fast-and-loose pulley on the pinion-shaft. There are two sizes of mills at work in Kalgoorlie, with the following dimensions:

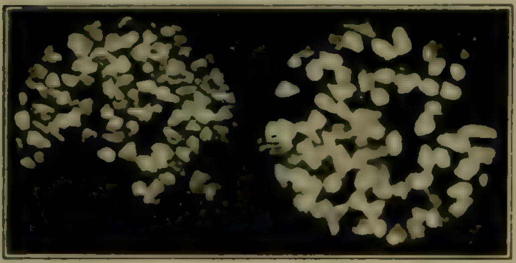
	No. 5. Inches.	No. 8. Inches.
Diameter	89	106
Width	46	54
Mantles for plates	10	12
Inside screens	5	6
Outside screens	10	12
Area of outside screens each	46x26	54x24

The latter item is the full area, not deducting that part of the screen covered by the wooden frame. Approximately, the net screening surface on each mill is 70 and 100 sq. ft. respectively.

The mantles carry four or five grinding, and one perforated plate, which are tightly bolted together. The bolts have a feather on the tapered portion which fits into the plates, thus preventing turning during tightening. Bolted to the bottom end of the mantles are the baffle and scoop plates, which return the oversize to the mill. The whole mill is enclosed in a tight-fitting casing, which is made in convenient sections for removal during repairs. The spur-wheel is keyed to the mill shaft, is usually of cast iron, and should last, if well greased, fully four years, while the pinion lasts about half that time. The loose pulley runs on a sleeve, which must be well greased to prevent seizing. At one of the new mills at the Associated, a new idea for loose pulleys has been devised, a cast-iron bracket with an extended hollow sleeve, bolted to the plumber block farthest from the mill. The pinion shaft revolves in this sleeve, and the loose pulley rests on it. When the mill is working, the pulley is at rest, thus preventing much wear at this point.

It is found that a good, stiff, light grease is best for all bearings on a ball-mill. A few turns of a grease cup twice in eight hours is generally sufficient. For the gear, old, though clean, grease from other bearings is good enough. Properly fitted gearings, when well greased, make little noise. When driven from a main driving shaft, a tight and a loose pulley are required; but when motor-driven, the former only is necessary. The Great Boulder people are fitting clutch pulleys on the main shaft with satisfactory results. An 8-in., 6-ply balata or rubber belt is strong enough for a No. 5 mill, and a 10-in., 8-ply for a No. 8. From 24 to 26 r.p.m. is the correct speed for the No. 5, and from 21 to 24 r.p.m. for the No. 8. It is generally admitted that the latter speed for the larger mill is quite safe and shows much greater efficiency, although the makers stipulate the lower speed. Mills are loaded with one to two tons of 5-in. steel balls, according to size and hardness of the ore to be crushed; there is no advantage in using several sizes of balls. Indicator diagrams at the Associated Northern and Associated have shown that the No. 5 mill takes from 18 to 23 hp. when in an average working condition, and the No. 8 consumes 60 hp. Where motor-driven, as at the Perseverance and South Kalgurli, the ammeters register 60 to 65 amp. at 550 volts.

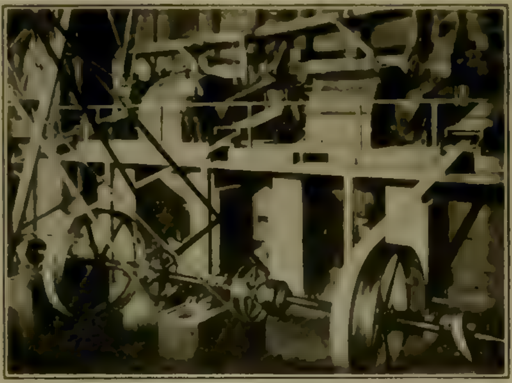
It is found advisable to have the storage-bin for coarse ore a few feet behind the ball-mills, as it allows the construction of a proper chute with a gate, and a long feeder, thus giving a steady flow of ore. When the bin is right over the mills, as at the Associated as originally erected, this can not be relied on, ore often rushing out and filling up the mills. For the protection of employees, keeping the plant free of dust, and the better working of a ball mill, a strong fan attached to the mill by large piping, is very necessary; and a plant properly arranged in this detail is a pleasure to work in. A couple of Sturtevant or similar type fans about 4 ft diam. running at 800 to 1000 r.p.m. should keep eight No. 8 mills clean, and a 3-ft fan like that at the Associated Northern, running at 800 r.p.m. is very effective for four No. 5 mills. A 4-ft motor-driven fan at the Associated takes 5 amp. The suction and delivery pipes should be fitted with sliding doors to facilitate cleaning. The draft in the suction pipe at the Associated Northern averages 0.34 in. The fan generally blows the dust into a canvas-lined house, in which it readily collects, or as at the last named mill, it is blown into the second hearth of the Merton furnaces. At the Perseverance, the dust is collected in cyclone arresters, thence into the main furnace flue. A strong draft aids in keeping the screens clean, especially when the ore is at all damp, as the steamy air is drawn away. When dry crushing with stamps at Waihi in New Zealand, in 1894 to 1899, the beneficial effect of a fan was very noticeable. The amount of dust lost in dry crushing is difficult to estimate, but from observations I should say it would total 1 per cent.



30-MESH PRODUCT × 15 DIAM. 100-MESH PRODUCT × 32 DIAM.

The ball mill feeders are usually of the grasshopper or shaking tray type, that is, a sloping tray with sides 6 in. high at an angle of about 25°, suspended at the discharge end by a chain or rod from a beam above, and the top end supported by two iron legs, fitted loosely to the under side of the tray, and to a timber support near the floor. At the back of the feeder tray is a tappet, and on a shaft is a single, double, or three-armed cam, adjustable to give up to 1 in. lift to the feeder. This pushes the feeder back, which, when released, drops forward by its own weight, discharging an even feed into the mill. It is the custom now for each mill to have its own feed-shaft driven by a 3-in. belt from a pulley fitted to an extension of the mill axle. The mills at the Perseverance are so fitted, the whole being very neat and effective. South Kalgurli mill feeders are arranged with a perforated tray, through which the fine ore passes on to a shaking tray fitted with a 27 by 27-in. screen, this in turn screening all that portion already fine enough, it passing to the conveyor beneath. One was tried for some time at the Associated Northern, but it did not increase the capacity of the mill to any extent. The arrangement requires close watching. Feed naves are arranged for left and right-hand feeding; by this means mills may be run in pairs, the feed hoppers being reasonably close together, and it may be remarked here that mills should not be too close together, as plenty of space is required for repairs, etc. The balls are fed in either through the manhole door or feed-hopper, and ore fed in until the balls are well mixed with it. A mill should not be started without feed, as the balls knock the plates about badly. Unless a mill is motor-driven, it would be difficult to arrange for an automatic feeder. I have not heard of any, but think that one could be fitted up, depending on the increase of power consumed over a set point. If a mill takes 60 amp. with a full load, and is overfed to 62 amp. then some automatic gear could shut off the feed. Like many other machines, the operation of a ball mill is governed by the sound. This is an important point to impress on mill men, as a poor attendant may easily reduce the efficiency of a mill 25% by inattention. With practice the operator of a ball mill gets expert and can detect a light feed from some distance; a mill running empty simply roars; when light there is a clear metallic sound of balls striking one another; when just right, there is simply a rumbling noise, while in a mill that is full, the balls and ore are carried high enough to fall directly on the mill axle or shaft. This is very bad work, as the shaft is liable to be damaged and worn, and crushing is reduced to a minimum. The remedy for too much feed is, of course, shutting it off until the correct sound is heard. A mill man not too sure about his feeding can easily see this by stopping the mill, and looking into it through the feed nave with a light. The mass of balls and ore should be evenly distributed, and no bare balls should be visible.

The operation of the Krupp ball-mill may be described as follows: The mill is a gear-driven, steel-lined drum, charged with one to two tons of steel balls, revolving at 24 to 26 r.p.m., according to size. The ore crushed by the balls, passes through perforated grinding plates, and is screened by the inside or coarse screen, the oversize being automatically returned to the interior of the mill; while what passes the inside screen is screened by the outside or fine-wire screen, the oversize being also returned to the mill for further grinding. The action of crushing and returning the oversize is ingenious, to say the least, and it will be seen that as soon as the ore is crushed fine enough, it must pass out of the mill. Here lies the efficiency of the ball-mill. In a 5-stamp battery, there is a great deal of unnecessary pulverizing given the ore due to its not being discharged as soon as it is fine enough. In the ball-mill there is little of this, and any machine that discharges its product when it reaches the required size will show high efficiency. As regards the action of the balls, it has been stated that crushing is done by impact; but from careful observations I am perfectly satisfied that this is not so. The only impact which might occur is when the balls drop from one grinding plate to another, a distance of 5 in. in a newly lined mill; and then only some very fine particles would be crushed by impact at this point. The action of the balls is one of pure rolling, grinding, and abrasion. They are lifted up about level with the mill shaft or axle, and then roll back, tumbling over one another, rubbing and grinding the ore fed in. Of course there is a great deal of attrition between the pieces of ore apart from the work of the balls.



NO. 5 MILLS AT THE ASSOCIATED NORTHERN.

This is not mere supposition, but fact, as I have myself seen the action. At the Associated mill, four No. 5 mills are crushing oxidized ore which carries 5% moisture, so coarse screens are used; in fact, the wire screens were removed and the inside ones only used; these being punched steel with 30 holes per square inch. In crushing this ore no dust is made, so by the aid of a portable electric lamp, placed well down in the feed hopper, the balls and ore could be seen plainly. The action observed was simply that the balls and ore were carried up nearly level with the shaft, and on reaching this point began to roll back. There was 1200 lb. weight of light-weight balls used on soft ore, rolling and tumbling about and grinding and rubbing the ore between them. It was a most interesting sight, fully proving that there is no impact grinding. To further prove this, one has only to observe the ore in a mill when it is stopped for repairs. Down to the very small particles, say 6 mesh, it is smooth and round, just as if water-worn in a river where the stones are rounded from a rolling action. Pieces of steel, which come in from the mine at times, are rounded in the mill, although they hinder good work to some extent. If impact were the action in a ball-mill, dynamite, which also finds its way in with the ore, would explode, as it does in a Griffin mill; but it does not, and I assume that it is simply rubbed away. F. B. Allen, director of technical education in this State, with G. Larcombe, instructor in geology, have kindly examined, under the microscope, some ball-mill product which was wet-screened to clean the particles from dust, to see whether they had a sharp fracture or not, with the result that they show the +30 screen product to be somewhat rounded, and the +120 to be with sharp, ragged edges. This shows that the final particles are split by the rolling of the heavy balls, not necessarily by the drop of a ball, as in a tube-mill, as described by H. Fischer in several of the leading technical journals in 1904.

This is also shown by the way the balls keep round in wearing from full size to the smallest, and also the smooth, round pieces of ore and steel. The figure shows micro-photographs of the final particles from a ball-mill, taken by G. Larcombe, of the Kalgoorlie School of Mines.

In table II below will be found the consumption of steel and the life of liners in a mill. Steel consumption is gauged by the weight of balls consumed per ton crushed, and not only by the total balls and liners used, as in a battery where shoes and dies are calculated. The average steel consumption in the ball-mill plants here is 0.55 lb. per ton, while the lunch or grinding plates last about 190 days, perforated plates the same time, and side liners about double this life. Manganese steel of the Hadfield or Krupp make is very satisfactory. As regards the capacity of ball-mills or other machines, the efficiency depends upon the quantity crushed per horse-power consumed. A No. 5 Krupp mill crushes 43 tons daily of ordinary sulphide ore, and the No. 8 100 tons; dividing this by the horse-power consumed, 18 to 23, and 60 to 65, 2.1 and 1.6 tons per horse-power respectively is obtained. In a small plant of 100 tons daily capacity, the No. 5 is a useful unit, but in a large plant the No. 8 is the best size. They have large capacity, run smoothly, and occupy little more space than the smaller unit. The quantity of ore crushed as given above is from actual weighing in some cases, and from the tonnage crushed divided by the hours run in others. On quartz the capacity of a No. 5 mill is lower, being about 36 tons per diem. Excellent opportunity of finding out the capacity was had at the Associated Northern, as all the custom ore is weighed.

It is impossible to prevent damp ore of from 1 to 3% moisture, coming into the plant. Then the ball-mill efficiency falls off greatly and the wear and tear is heavier; the feed must be light to prevent the screens clogging, as a steaming is set up, making everything sticky. When crushing dry ore, the inside of the mill gets very hot from friction, a recent test showing up to 135°F. when the outside temperature was 97°. The Kalgurli used to dry the damp ore before milling, but rotary dryers are a nuisance. The soft oxidized ore from the mines is easily crushed in ball-mills, as at the Associated and Associated Northern, by using only 1200 lb. of balls, taking off the outside screens and passing it through the inside or coarse screens. Pans reduce this product quite easily. Actual tests show that a No. 5 mill will crush 82 tons per day, but for 5% moisture the capacity would be greater. The Chaffers has one mill on this class of ore, wet-crushing 93 to 100 tons through 26 by 26-in. screens per diem, using 2400 lb. of balls.

It is advisable to open mills for inspection once a week, unless something goes wrong in the meantime, and every two months the balls should be taken out, weighed, and all balls under 1½ in. diam. discarded, as they are of little use in crushing, and the original weight made with new balls of 18 lb. each. Foreign matter, such as drill ends, bolts, nuts, spanners, etc., accumulate in mills, and as they hinder the smooth work of the balls they must be thrown out. One man at 11s. 8d. per shift of 8 hours can look after eight No. 8 mills; but in smaller plants the mill-man attends to conveyors, elevators, dust pipes, etc. Ball-mills should be fed with no larger ore than that which will pass a 3-in. ring. With fine ore the balls are apt to bed, as it were. Actual weighing has shown that a 3-in. feed is crushed faster and the wear of steel is less than when the feed is 1 in. with a quantity of fine.

Following are grading analyses from ball-mills in our different plants:

NAME	+30	+40	+60	+80	+100	+120	+150	−150
Associated		16.16	15 66	10.46	6.43	3.76	3.46	44.00
Associated Northern		11.20	20.10	8.30	11.80	2.20	2.00	43.60
Chaffers		10.25	13.19	8.60	7.25	2.70	1.71	56.30
Great Boulder	1.00	5.80	14.20	8.70	9.00	2.30	7.00	52.00
Kalgurli		8.20	18.00	13 40	9 10	2.40	2.20	45.30
Perseverance	0 20	3.80	20.60	7.80	5.40	4.00	3.80	54.20
South Kalgurli		10.20	21.20	6.00	2.60	3.10	1.00	55.90

TABLE I

With the exception of the Associated and Great Boulder, where the screens are 30 by 30, 27 by 27 is the size used. They are fairly uniform, although the −150 is low at the Associated, Associated Northern, and Kalgurli for some reason not understood. The ball-mill does not make so much −150 as the Griffin and other pulverizers. The coarse screens used to be fixed to the mill by studs, but a local improvement was introduced in fitting them on with 1½-in. angle iron, bent into a circle, and bolted. A large number of bolts are used in a mill, and their cost is high. For some reason, perhaps because of the expansion of the plates by heat, or loose plates, the bolts break and fall into the mill. Coarse ore then passes through the bolt-hole into the space between the mantle and screens, causing the mill to run out of balance. Experienced mill-men soon detect this. On account of this trouble, there is a difference of opinion as to the use of the baffle plates that are fixed to the return scoop plates in the mill.

The fine screens should be brushed once daily, if the ore is dry, and oftener if damp, with a wire brush. They last from 30 to 40 days, providing no stones escape and tear them. When the grinding plates get thin and nearly worn to the mantle plates, the mill requires re-lining. This is done in different ways; some mill-men prefer to have a spare set of mantles which are fixed to the plates at leisure. When the time comes for re-lining, these worn-out plates are taken out and the prepared plates fitted in; this requires about ten hours with six men. Others consider it best to leave the mantles in place, cutting off the old grinding plates and fitting on new ones as they proceed. This can be done in about the same time, but is awkward, heavy, and hot work inside the mill. There are several little points in ball-mill practice on which agreement will never be reached, but their effect is trifling. A No. 5 ball-mill, including foundations, may be erected for £600, and a No. 8 for £1000, bin and conveyors not included. It will usually cost about £300 per year for upkeep of a No. 5.

I have seen No. 4 size mills used in Broken Hill plants for wet-crushing jig middling that passed an 8-mm. screen; a No. 5 on the Lake View Consols crushing ore (sulphide), and the No. 5 at the Chaffers crushing the soft schistose oxidized ore. In the first instance I do not think the mills show great efficiency on such feed; in the second, the mill never had a real trial, as the grinding pans and tube-mills were already overtaxed; while at the last the ore is so soft that any comparison with stamps on hard ore can not be

Name	Number of Mills	Weight of Balls	Screens	Speed	Power	Drive	Capacity per day	Steel Consumption	Life of Grinding Plates
Associated	4 No. 8 6 " 5	4480 lb. 2240 "	30 by 30 25 " 25	27 r.p.m. 28 "	60 H.P. 25	Belt from shaft	80-85 tons 45 "	0.30 lb per ton	170 days
Associated Northern	3 " 5	2350 "	27 " 27	26 "	18 "	"	40 "	0.32 "	870 "
Chaffers	3 " 8	2800 "	27 " 27	25 "	20 "	"	40 "	0.74 "	180 "
Great Boulder	4 " 8	4480 "	30 " 30	24	60 "	" and friction clutch	80-90 "	0.64 "	105 "
Kalgurli	9 " 5	2200 "	26 " 26	25 "	25 "	Belt from shaft	40 "	0.45 "	300 "
Perseverance	8 " 8	4400 "	27 " 27	24 "	60 "	Motor & Belt	100 "	0.65 "	118 "
South Kalgurli	3 " 8 1 " 5	4480 " 2800 "	27 " 27	24 "	65 " 30	Motor & Belt	95-100 "	0.47 "	210 "

TABLE II

used. Some years ago the Eclipse mine had ten 900 lb. stamps crushing ore similar to that at the Chaffers at the rate of 10.5 tons per stamp per day through a 20-mesh screen; so the capacity of the Chaffers ball-mill of 93 100 tons through a 26 mesh is somewhat better than the 10 stamps. The wet mill product is:

Size.	Per cent.
+ 40	10.60
+ 80	16.12
+ 100	4.44
+ 120	3.56
+ 150	7.59
− 150	57.69

The ore is crushed in weak cyanide solution in the proportion of 1.6 to 1. The wear and tear in the wet mill is almost twice as heavy as in the dry, the grinding plates lasting 105 days.

Max Drott made some comparative tests on hard quartzite ores between a 5-stamp mill, and a ball-mill for the Krupp firm. The latter showed an output 40% greater than the battery, even the dry mill being better on the same ore. I am convinced that on a thorough trial, other things being equal, the ball-mill will show a greater output and efficiency than the stamp battery. Perhaps some one will take up this question and show that the modern heavy gravitation stamp is not the most economical crusher for its present work and that there are other machines that can do the work better. Some costs of ball-milling follow:

Pence per ton

Name	Wages	Power	Spares	Stores	Repairs	Sundry	Total
Associated.	6.45	13.78	6.73	2.67	0.49	---	30.11
Associated Northern	5.87	12.08	4.73	1.42	0.10	---	24.22
Chaffers.	2.09	10.64	---	0.25	6.88	1.71	21.57
Great Boulder	1.81	9.75	---	6.26	---	---	17.82
Kalgurli.	--	15.23	---	7.49	---	---	22.72
Perseverance	3.21	19.18	3.32	0.46	0.11	0.54	26.84
South Kalgurli	2.05	20.82	5.54	---	3.68	0.21	32.30

TABLE III

The methods of segregation of costs are not uniform, as will be noted at once. On some mines, spares, stores, and repairs are lumped together. Power costs are high on the Perseverance and South Kalgurli on account of the use of motor-driving. The Associated is in a state of transition from the old No. 5 mills to the cheaper run No. 8 size. The Great Boulder has lately installed a high-class steam engine, and it is expected to reduce power costs to the above figure. In table II above are given interesting details of ball-mill dry-crushing practice at Kalgoorlie.

QUARTZ can be fused in the electric furnace with coke and iron ore to produce ferrosilicon, which is employed in the manufacture of steel as a deoxidizer and to prevent the formation of blow-holes in steel ingots. Quartz may also be fused in the electric furnace to make tubes, crucibles, dishes, and other articles which can be used for certain purposes in the chemical laboratory instead of porcelain and platinum wares.

Briquetting Lignite

C. L. Wright has recently given, in Bulletin No. 14 of the Bureau of Mines, some results of experiments upon the briquetting of lignite. Three samples of lignite, one from Texas, one from North Dakota, and one from California, were made into satisfactory briquettes without the addition of a binder. It was proved that some lignites after having slacked by exposure can be made into briquettes without the use of binding material, notwithstanding a general opinion that this could not be done. Cohesion and weathering tests demonstrated that good briquettes endure handling and resist weathering much better than the lignite from which they are made.

The tests described apparently show that the cost of briquetting run-of-mine lignites with the German plant, which was used, would be from $1.35 to $1.75 per ton, according to the location of the plant. The cost per ton, loaded on cars, from a briquette plant at the mine should be, in Texas, $2.51; in North Dakota, $3.53; and in California, $5.24. It must be borne in mind that these figures are only approximate and are subject to wide changes because of local conditions. They apply to briquetting run-of-mine lignite to improve its heat value and weather-resisting properties, rather than to briquetting slack or waste coal. Since the tests have shown that at least some lignites slacked by exposure to the weather can be made into excellent briquettes, it may be possible to utilize lignite slack as well as bituminous slack and anthracite screenings for briquetting; the two latter materials having been made into briquettes on a commercial scale both in this country and abroad.

Of four samples of raw lignite, three samples contained about 40% moisture and had a fuel value of 6079 to 6241 B.t.u., while a Texas lignite, with a moisture content of 33% had a fuel value of 6840 B.t.u. The percentage of moisture removed in the process of briquetting ranged from 24 to 32%, and the heat value of the briquette was 36.5 to 54% higher than that of the raw lignites.

Excessive moisture in fuel not only causes a waste of useful heat during combustion, because the moisture is vaporized and the vapor superheated, but also is a source of expense to the consumer, who pays freight charges on useless water. For both these reasons lignite briquettes have the advantage over raw lignite. In the case of one of the North Dakota lignites the removal of 32% of moisture during briquetting permits a decided lessening of the cost of supplying a consumer with a given number of heat units. The superiority of the briquettes in this respect is of especial importance when transportation to a distant market is involved. If the briquettes possess no other advantage over raw lignite than their higher heat value, they would be worth 50% more than the raw fuel.

The Nippon Steel Works

By T. Haga

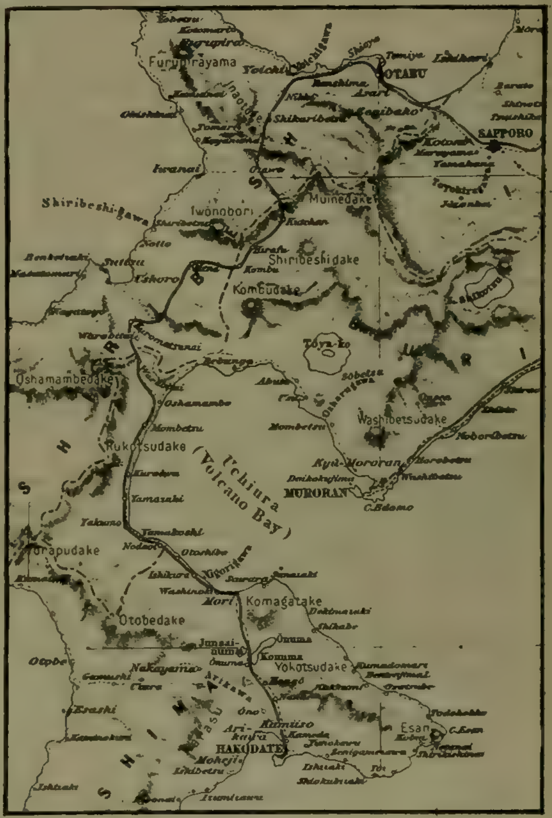
In a previous article I mentioned that the Government had introduced a bill in this session of the Diet to increase the capital of the Government steel works at Wakamatsu by 15,000,000 yen,* in order to check the importation of iron and steel. But since the people are dissatisfied with the yearly losses of the works, the bill was expected to fail to obtain the approval of the Diet. On the contrary, the Seiyukai, the leading political party, approved the bill under the pretext of a rapprochement with Government, so, contrary to expectation, the bill was passed after much discussion. As the present condition of the Government steel works was given in detail in my last article, I will now describe the newly established Nippon Steel Works, in Muroran, Hokkaido (Yezo).

To begin with, the effect of the Anglo-Japanese alliance gave rise to the establishment of the works with combined Japanese and English capital, so its establishment has international importance. When Government ownership of railways was undertaken in 1907 the whole length of railway under the control of the Hokkaido Colliery & Steamship Co. was purchased. This company, wishing to invest the funds thus received, applied for Government permission to establish an iron works. The Government was in no position to afford assistance, and the proposal was deferred. At this time Armstrong & Co., and Vickers, Son & Maxim, Ltd., were supplying the country with warships and ordnance, and had frequent consultations with the Government with regard to their inventions. These companies combined with the Hokkaido Colliery & Steamship Co. to gain Government permission to establish an iron works. As at this time the Anglo-Japanese alliance was concluded, the Government gave its consent to the starting of the enterprise upon a co-operative basis, considering that the co-operation of English and Japanese investors would realize effectually the objects of the alliance. Thereupon the representatives of the two companies met in Tokyo on March 7, 1908, and drew up a provisional contract, which was formally concluded in London on July 30 of that year, and on November 1 the first general meeting was held.

All the powers are endeavoring to improve ordnance and arms. Private individuals have also set up factories, so maintaining independence in case of war and also meeting the trade demands of other countries. Private enterprises are superior to Government enterprises in their use of capital, resulting in better equipment and plans. Nevertheless, in Japan, all war material has so far been supplied by the Government works, and private enterprises for the purpose have never been projected. Recognizing the tendency of the other powers, however, the Government has now come to recognize the necessity for private enterprise, especially in the iron industry.

The English and Japanese directors agreed upon the nomination of Vice-Admiral Yamauchi as adviser and obtained his appointment, which was afterward officially sanctioned by the Government. Thus the equipment of the foundry has come under the control of the vice-admiral. The foundry was established at Muroran, Hokkaido, for three reasons. First, this site belongs to the Hokkaido Colliery & Steamship Co. Second, it is accessible to coal mines. Third, there are ample facilities to accommodate the company and to lease the space for the navy and army departments. As Japan is not yet experienced in the iron industry, the skill of the Japanese metallurgists may be doubted, especially in view of the losses of the Government steel works at Wakamatsu. However, with the co-operation of the English there will be no cause for doubt. The army engineers have had wide experience in manufacturing of ordnance and iron-founding, have been in England and are acquainted with the English engineers. Moreover, most of the mechanics were formerly employed in the navy and were sent to England by this foundry to study the operation of iron works there. It is therefore believed that the enterprise will succeed. Some are doubtful because of the losses of the Yahata Government steel works at Wakamatsu, but the latter are under Government management and are devoid of promptness of action. As the Nippon Steel Works is under Government protection, no difficulties will be experienced. Some maintain that it would be better to engage foreign engineers and mechanics, but in this way the advantage of cheap domestic labor would be lost. It is sometimes necessary to employ foreign engineers and mechanics, but there is no need for this in daily work.

Prior to the establishment of the foundry the engineers inspected the iron works of Armstrong & Co. and Vickers, Son & Maxim, consulted with them personally, and obtained advice from the engineers in both the works, thus ensuring the newest designs. The construction work will be completed in August of this year.



MAP OF SOUTHERN HOKKAIDO.

The capital is 15,000,000 yen, fully paid, half of which is provided by each party. But as the whole works could not be completed with this amount alone, debentures amounting to 10,000,000 yen were issued. The total of 25,000,000 yen is to be spent for the whole establishment, 21,000,000 yen being expended in construction work. Besides the capital, 3,000,000 yen was advanced by the English interests until the issuing of the debentures, when the advanced money was returned. Deducting other expenditure for construction work to the value of 2,500,000 yen, there is a remainder of 4,000,000 yen which it is planned to use as working capital. In issuing the debentures, it was at first planned to entrust this to the English syndicate, but at that time, the close of the Russo-Japanese war, the money market in Japan was dull, owing to the universal business depression, which caused a panic among capitalists. It was therefore considered best to float the issue in Japan, and it was entrusted to the syndicate under the following terms: interest 5%, face value 95 yen, and the term of redemption five years.

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*1 yen = 49.8c.

Ophir, Colorado

By A. L. Swenson

The town of Ophir, situated at an altitude of 9600 ft. above sea level, lies in a narrow valley that slopes gently for two and a half miles to Ophir station, on the Denver & Rio Grande railroad, thirteen miles south of Telluride. Except at this point, the valley is surrounded by high mountains, two of which are well known because of the numerous veins which have been found in them. These are Silver mountain on the north and Yellow mountain on the south of Ophir. The annual fall of rain and snow is heavy and the abundant moisture formerly supported a heavy growth of forest. Even now spruces and aspens cover the higher slopes, yielding to white pine and cedar on the flanks as the streams sink into canyons.

In 1876 ore was found on Silver mountain, but the prospectors were obliged to pack all their necessary supplies several hundred miles and then pack the ore out again to the railroad. Only the richest ore would stand this expense, yet it has been estimated that about $50,000 worth of ore was thus taken out during the first four years of the existence of the town of Ophir. In 1881 a railroad was built from Durango to Silverton, only fourteen miles from Ophir across the mountains to the northeast. A good wagon road was constructed from Ophir to Silverton by utilizing Ophir pass and the ore was then packed, on mules and burros, to the railroad at Silverton, whence it was shipped to the smelters.

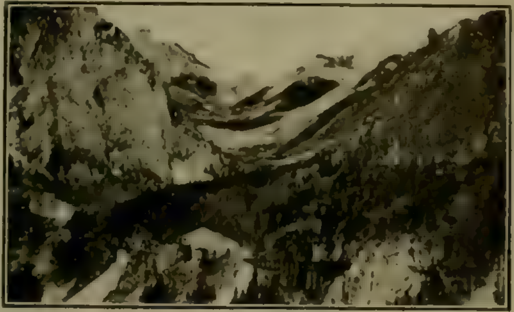
OPHIR, COLORADO.

The smelter returns for the next nine years show that ten and one-half million dollars worth of ore was shipped from Ophir; yet it was not until 1890 that the district attained real prominence. In this year the Rio Grande Southern railroad was completed to Durango and a station was built at the mouth of the Ophir valley. From this time on development of the district was very rapid, several mines were opened, mills erected, and gravity tramways constructed. In the fall of 1896 over 100 stamps were in operation in the town of Ophir, and nearly 500 men were employed in mining and milling the ore. The demonetization of silver caused almost all mining to cease in Ophir, as it did throughout the State of Colorado, and it is only lately that the district has started to recover from its slumber.

There is a striking relation between the physiography and the geology of the district. The mountains and valleys are the result of long continued erosion of a part of the San Juan volcanic plateau. The high peaks are all within the irregular diorite-monzonite stock which has been deeply scoured by the head-waters of several streams. Indisputable evidence of glacial action is found in the more elevated portions; this is especially noticeable at Howard Fork, where the rocks are finely polished and striated by the glacial movement.

The veins lie almost wholly in the diorite-monzonite stock. The fissured zones are from 3 to 6 ft. in width, the ore averaging about 2 ft. The minerals occurring in these veins besides gold and silver and classed as ores are galena, freibergite, polybasite, proustite, pyrargyrite, and stephanite. The non-metallic gangue minerals are quartz, calcite, siderite, dolomite, fluorite, barite, sericite, biotite, chlorite, apatite, orthoclase, and kaolinite. The metallic gangue minerals are pyrite, chalcopyrite, zincblende, mispickel, magnetite, stibnite, and native copper. The silver is in the galena and freibergite, while an increase in copper pyrite is often accompanied by an increase in the gold.

In places the veins swell, forming chambers of ore, which have the character of angular breccias of country rock cemented by ore. Such veins occur in many of the mines on Yellow mountain. With the silver-bearing veins there occur veins of auriferous quartz having different physical characteristics. They consist of white quartz of saccharoidal nature, with disseminated fine-grained auriferous pyrite and free gold. The Badger vein on Silver mountain is of this character, and on Yellow mountain a similar vein lies parallel to and within a few feet of a vein carrying almost silver ore alone. In several instances the veins swell or widen on the steep dips and pinch where the dip is flatter. Such occurrences are indications of a normal faulting along the fissures, that is, a downward movement of the hanging wall with reference to the foot-wall or vice versa. Had the faulting been reversed, the portions of the vein would have been on the flat dips, in the narrow places, or along the steeper dips. Lateral faulting of the veins occurs where the ore of one vein is distinctly cut by that of another.


OPHIR VALLEY.

Yellow mountain is a gabbro-diorite stock, from which andesitic and rhyolitic rocks have been denuded. On its flank the Jura-trias sedimentaries are exposed, standing at an angle of 45°, thus proving that there need be no apprehension of a change of formation in depth. This is further proved by the fact that the Carribeau mine has been worked to a depth of over 1200 ft. without finding any change. The veins on Yellow mountain are well defined fissures, varying in width from 3 to 10 ft. between the walls; the general course of the veins is N.80°W., with two exceptions, which strike nearly due east and west. The two chief mines on Yellow mountain are the Carribeau and Silver Bell, both of which have been large producers, and each possessing its own mill. That of the Silver Bell is situated within a few hundred feet of the railroad station at Ophir Loop, and is connected with the mine by a tramway. The equipment in this mill, of a capacity of 150 tons per day, consists of 50 stamps, 20 Frue vanners, 3 Wilfleys, 1 jig, and the necessary crushers. To the east, 4000 ft. away, is the 30-stamp Carribeau mill, which is operated by water-power. The Silver Bell mill was formerly run by steam, and from now on will be run by electric power generated by the Telluride Power Company.

The sedimentary rocks on Silver mountain are highly metamorphosed by the diorite-monzonite which underlies the valley, and also by the dikes which cut them. These dikes are the mineralized zones of the lower formation. There are two main sets of vein fractures, the older set strikes north and south and the younger east and west. The Belcher and Schumacher veins strike northeast and are the only two productive veins, so far discovered, which do not belong to either series. The Crown vein is the most characteristic one and has a length of 4500 ft. with a dip of 16° north. Its width varies from 2 to 12 ft. and carries good ore throughout its entire length. The Schumacher vein dips 5° northwest and intersects the Crown vein in the Osceola mine. Its general direction is N.45°E. Parallel to the Schumacher vein lies the Belcher vein, which intersects the Crown vein in the centre of the workings of the Crown mine.

The most important and persistent of the north-south veins is the Suffolk-Gold King, which has been worked through several adits on both sides of the mountain. To the west of the Suffolk vein lies the Yellow Girl, which unites with the Suffolk at a depth of 750 ft. Prospects exist on all of these veins and all have produced ore, but the steady producers on Silver mountain are the Carbonero, Suffolk, and the Calumet-Telluride mines. The Suffolk mill develops its own water-power and contains 40 stamps, 4 Wilfley tables, 2 Frue vanners, and 5 Pierce amalgamators, in addition to the crushers.

The Calumet-Telluride mill, of 30 stamps, is the only mill at Ophir developing its own water-power. The electric equipment consists of one Allis-Chalmers generator, three single-phase transformers that reduce the original 6600 volts to 440, and one transformer that reduces the 440 volts to 220 and 110 volts for lighting purposes. There are two 30-hp. Allis-Chalmers induction motors and one 7½-hp. Bullock motor.

In addition to the mines already mentioned there are the Favorite, Gold Crown, Badger, Red Jacket, Montezuma, Nevada, and many other prospects in various stages of development. During the past winter the Carbonero and the Carribeau mines have been the steadiest shippers, but nearly all the mines are now working and several improvements are being made that will materially increase the production of the camp. All the mines have large bodies of ore that vary in value from $2.50 to $60 per ton, not to mention the large tonnage of ore on the dumps of the old workings that averages $8 per ton. Experiments recently conducted by the management of the Carbonero and Suffolk mines show that by the use of modern methods of ore-handling, all of this ore can be landed at the station at a cost of about $2 per ton, which will leave a good margin of profit, and undoubtedly the next few years will see the town of Ophir again a thriving mining camp with a large daily production.

Miners Phthisis on the Rand

After making several futile attempts to deal with the miners' phthisis question in the Union Parliament, temporary measures have at last been adopted, and a commission has been appointed to enquire into and report upon the extent to which the disease exists, the degree to which miners become incapacitatd when suffering from the disease, and the number that may annually become incapacitated. With this information before them, the members of the Union Parliament should be in a better position to deal with the matter than appeared to be the case during the recent parliamentary debates. So urgent does it appear to the Union Parliament that some compensation should become immediately available to those suffering from the disease, that the Government also has appointed a Board to distribute the necessary allowances. The maximum allowance for any individual sufferer is fixed at £250, or an annuity can be granted for a period not exceeding two years which may be paid weekly or monthly, but must not exceed £105 per year. A list of mines to which the Act applies is also published, and it is interesting to notice that only the mines on the Rand and in the Heidelberg district are included. Those in Klerksdorp, Lydenburg, Barberton, and other parts of the Transvaal, as well as the coal and base-metal mines do not come under the Act. The Board is authorized to call upon the mines appearing in the *Gazette*, as previously mentioned, for payment of £25,000; each mine to pay in proportion to the number of white persons employed during the past two years, the numbers being furnished to the Board by the Government Mines Department.

Fluorspar in New Mexico

By Ernest F. Burchard

[*]The occurrence of fluorspar in southern New Mexico has been known for some years, several specimens of the mineral having been sent from Silver City to the mineralogical museum of the New Mexico School of Mines at Socorro, within the last ten years. Only recently, however, has fluorspar been found in quantities sufficient for exploitation. The American Fireman's Mining Co., of Kansas City, Missouri, in prospecting for metallic ores on property situated 10 miles northeast of Deming, Luna county, New Mexico, has opened a number of veins of fluorspar, which give promise of containing nearly, if not quite, sufficient spar to supply the Western market for several years.

The fluorspar here occurs on the flanks of a hill called 'Fluorite Ridge,' one of the foothills of Cooks range, that rises about 1350 ft. above the plain at Deming. The most promising prospects have been opened in two places about 1¼ miles apart. One of these is at the extreme southwestern base of the ridge on a gentle rise about 400 ft. above the plain; the other well up the south slope of the ridge about 900 ft. above the plain. Two railways pass through Deming, the Deming & Silver City branch of the Atchison, Topeka & Santa Fé railway, and the San Francisco and New Orleans line of the Southern Pacific. A third road, the El Paso & Southwestern, makes Deming a terminal point.

Wagon-roads radiate in all directions from Deming, which has of late become an important business centre, largely on account of the development of the underground waters of the Mimbres valley and their utilization in agriculture. Deming lies in a nearly flat valley covered by desert deposits, with Cooks range 10 to 15 miles northeast and the Florida mountains 10 miles or more to the southeast. The fluorspar deposits are most easily reached by a 10-mile drive from Deming, but the product is shipped from a siding on the Atchison, Topeka & Santa Fé railway, called Mirage, 5½ miles southeast of the prospects.

Fluorite ridge consists of a central mass of monzonite-porphyry which has intruded strata of Paleozoic and Mesozoic age, chiefly Ordovician limestone and Carboniferous and Cretaceous sandstone, quartzite, and conglomerate. The dip of the sedimentary strata on the south and west sides, where the fluorspar is found, is very steep, even vertical, and masses of the strata have not only been tilted up by the intrusive action but folded into the igneous rock. The base of the ridge is surrounded by an agglomerate, consisting of angular masses of andesite imbedded in tuff. Some thin dikes of basalt cut the agglomerate, and unconsolidated 'desert fill' overlies it at a short distance from the base of the ridge.

The fluorspar occurs in veins cutting altered monzonite-porphyry. Certain of the veins fill fractures in the rock along which there has been movement in both a vertical and horizontal direction, but between the walls of other fissures there has not been any noticeable displacement. The rock at the southwest base of the ridge is cut by two or more groups of approximately parallel veins. As shown by the prospect openings, there appear to be at least 5 or 6 distinct veins in each group. One group of veins strikes N. 17° E. to N. 27° E., and the other strikes N. 6° E. to N. 18° W., while other veins were observed to strike at various angles between these limits. The veins are nearly vertical or dip steeply in a southeast or northeast direction. The vein material is mainly fluorite, mixed with a little quartz. Where the veins are partly silicious they resist weathering slightly better than the surrounding porphyry, and therefore leave broken traces on the surface. At the surface the fluorspar is altered in places to calcium carbonate. The thickness of the veins as shown by surface cuts and by prospect pits and shafts, ranges from a few inches up to 12 ft. or more, but it is generally from 2 to

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[*] Published by permission of the Director, U. S. Geological Survey.

4 or 5 ft. The structure of the veins is in places distinctly banded, in other places the vein may appear to consist mainly of a mass of crystalline spar, showing no banding but carrying pockets of quartz, and brecciation of the vein, by which large fragments of the wall rock have been included, is by no means uncommon. The walls of the veins, where open to any depth, are found to be smooth in places, but are rarely smooth or regular for many feet, and the wall rock is generally much decomposed.

At the locality on the south slope of the ridge only one set of veins, striking in a northwest direction, was observed. They stand nearly vertical, or dip steeply toward the northeast. These veins had been opened in only two or three places in 1910, and the maximum width observed was only about 4 ft., not all of which was spar. The veins cut monzonite porphyry, as at the first locality, and were observed to outcrop at intervals in the direction of the strike for a distance of one-quarter mile.

At the place first described the American Fireman's Mining Co. opened in 1909 a number of the veins by means of shallow cuts, and has sunk several test pits to depths of 6 to 12 ft. and two shafts to depths of about 80 ft. In all about 20 openings had been made up to August 1910. A triangular area about one-fourth mile wide at base from northwest to southeast, and about one-third mile from northeast to southwest has been shown to carry productive veins of fluorspar. The surface of the area slopes gently toward the southeast. At the main opening the vein strikes N. 17½° E. to N. 22½° E., and dips 65 to 70° toward the southeast. The vein had been opened to 75 or 80 ft. in August 1910, and had been worked underground to a distance of about 100 ft. on the strike. The thickness between the walls of the vein measures 4 to 12½ ft., the irregularities being due to pinching together of the walls in places. The strike of the vein is apparently slightly sinuous according to the irregularities in the walls, but there are no evidences of movement between the walls. The rock inclosing the vein is altered to a reddish color, so far as observed, and although the vein walls are smooth and clean in places, in others there is interpenetration of the vein and wall material.

The fluorspar is usually of a light-green shade, but there is some purple spar present, especially near the margins of the vein, and some quartz is present in pockets and thin stringers scattered throughout the mass of spar. The spar is mined from several levels, and milled down through chutes to the lowest level, from which it is hoisted in buckets up the shaft to the surface. A steam hoist was being installed in August 1910. On the strike of the opening, less than 100 yards to the north of the shaft, an open-cut and shallow burrow showed a promising vein of spar with a fork extending in a northwest direction. These veins, and one other a few yards to the west, are the nearest to the limestone mass, which lies 35 yards or more to the west. None of the veins was observed to extend into the limestone. The greater part of the spar that has been produced in this region has been taken from the shaft just mentioned.

The other veins that have been opened here lie 250 to 325 yards west of and at a lower level than the principal shaft. Eight or ten shallow trenches and one test-pit about 30 ft. deep have been dug, exposing veins 6 in. to 4 ft. thick, containing good fluorspar in places and running into barren or highly silicious material in others. Some of these veins strike a little west of north, and others strike N. 30° W. to N. 42° W. Nothing sufficiently promising seems to have been found here except at a point about ¼ mile north of the company store, where a good vein of spar has been developed by a series of trenches, pits, and a shaft. There appear to be two or three veins here nearly parallel and only a few yards apart. The main vein seems to follow a fault-plane as indicated by openings extending 100 yards or more. At the deepest place the workings are about 75 ft. below the surface. The surface cuts are extensive and show the structure fairly well. The foot-wall of the vein is a cherty conglomerate, resembling the material capping the ridge ¾ mile west. The hanging wall is so covered with spar that it is difficult to determine its nature. When the spar has been removed, the wall is shown to be surfaced by soft clay so that a thin layer of spar is generally left to prevent caving. The indications at the surface are, however, that the hanging wall is of agglomerate. In places west of the fault, or beyond the foot wall, loose fragments of reddish granitic and porphyritic rock were noted on the surface. The fault hades toward the hanging wall, which is on the upthrow side. Just to the north of the shaft the strike of the vein has been so bent that for 3 or 4 ft. the fluorspar has been offset and cut out entirely. At this point the walls are much slickensided in a nearly horizontal direction. There is general evidence of faulting here since the vein material was deposited. The outcrop of the vein has been repeated, and a small section of it that had been shoved over to the west 10 ft. or more was at first thought by the miners to be another vein, but it was soon discovered that it played out at shallow depth. In the main vein here the opening showed from 1 to 7 or 8 ft. of good quality fluorspar, and a considerable tonnage has been mined and some shipments have been made.

MAP OF NEW MEXICO.

At these prospects the fluorspar is not subjected to any mechanical concentration, but is simply cobbed and stacked up in piles of lump and gravel spar from which shipments are made. The spar is hauled by wagons 5½ miles to Mirage, a station on the Atchison, Topeka & Santa Fé railway, over a road that is down-grade for a mile or more and then nearly flat. At the base of the grade is a platform scale on which all the shipments are weighed. For several miles the road is rather sandy, making the hauling of heavy loads difficult. In 1910 G. M. Sadler, of Deming, succeeded the American Fireman's Mining Co. in the operation of the prospects. A series of analyses is given below which shows the general excellence of the spar that has been mined from this district.

At the second locality mentioned, about 1¼ miles northwest of the locality just described, Mr. Sadler has opened by surface cuts a few veins of fluorspar. The openings are within 200 to 250 ft. of the summit of the ridge, and are on rather a steep slope facing south. The principal opening is on a nearly vertical vein that strikes north to northwest, bending toward the west as it is driven farther. In August 1910, this opening extended about 100 ft. and reached a depth of about 15 ft. at the extreme end. As opened, the vein ranges in thickness from less than 1 ft. to more than 4 ft., but the maximum thickness is sold as fluorspar. The spar is streaked with silica and iron oxide, and shows quartz druses and geodes, and some crushed brown [illegible] seams and pockets, but in places there are quite pure masses of apple-green colored spar. The spar on the dump was [illegible] green, and pockets [illegible] mineral with hard clay and ferruginous material. Another [illegible], whose [illegible] varies [illegible] the vein at a slightly lower level, has exposed for 200 ft. or more a vein showing [illegible] at 12 to 18 ft. thick, which is largely [illegible]. The spar where the surface is [illegible], but the [illegible] is [illegible]. No spar had been shipped from this vein up to August 1909, although preparations were being made to ship some material from the largest [illegible]. A [illegible] at which spar is weighed in wagons has been built along the wagon-road to facilitate the loading of wagons.

Fluorspar or fluorite, chemically calcium fluoride (CaF_2), consists of calcium and fluorine in the proportions of 51.1 to 48.9. The mineral is crystalline, and slightly harder than calcite. It crystallizes in the isometric system and is found commonly in cubical crystals. In color the spar ranges, according to purity, from a clear, slightly tinted or green glass-like substance through various other tints and colors to dark purple, although most of it is white and [illegible]. Fluorspar, associated with other minerals, has a wide distribution geographically and a wide range geologically. The deposits thus far exploited in the United States are, however, confined to the following Territories and States: Arizona, New Mexico, Colorado, Illinois, Kentucky, and Tennessee. It is used in making glass, enameled and sanitary ware, in the electrolytic refining of antimony and lead, the production of aluminum, the manufacture of hydrofluoric acid, and in the iron and steel industries, in which it is used as a flux in blast furnaces and in basic open-hearth steel furnaces. It is estimated that about 80% of the American fluorspar output, largely in the form of gravel spar, is consumed in the manufacture of basic open-hearth steel. The use of fluorspar is increasing in practically all of these industries. The Western market for fluorspar is more limited than that of the Central and Eastern States, but it is nevertheless increasing. During the last year new iron and steel works have been opened at Irondale, Washington.

Supplies of spar mined in the West have not heretofore been sufficient to supply the Western market for more than a few months at a time. This has been due to several conditions, the most important of which is that the Western spar thus far produced has not been of as high a grade as that produced in the Illinois-Kentucky district. Fluorspar for iron and steel making should carry at least 85% calcium fluoride and preferably it should be purer. For most other chemical uses it should contain from 95 to 98% calcium fluoride.

None of the spar mined in Colorado and New Mexico has been cleaned in any way except by hand. Mechanical concentration would improve the grade of the Colorado spar greatly, but none of the fluorspar producers in Colorado have proved it sufficiently profitable to warrant the erection of washing plants. In certain cases water is available, but in others the problem of finding water would be difficult. The Colorado product has been [illegible] high enough in grade to make [illegible] to producers.[1] In the case of the deposits near Deming there is little necessity for washing the spar on account of the natural purity of the raw material. Doubtless a considerable saving of spar might be accomplished by washing, but such a process would not be at all feasible on account of the scarcity of water. The supply of water for men, teams, and the hoisting engine has to be hauled from a well more than four miles distant on the road to Deming. There is little probability that a well could be obtained by drilling anywhere near the fluorspar deposits on account of the nature and structure of the underlying rocks.

The following table gives analyses of gravel fluorspar from Mirage, New Mexico, in carload lots used in basic open-hearth steel furnaces, and analyses of spar from Colorado, Illinois, and Kentucky, made on a similar basis, are given for comparison. These analyses were all made by the Colorado Fuel & Iron Co. except the last, made by the Carnegie Steel Co., and the two preceding this, by the Lackawanna Steel Co. These two samples contain 1.08 and 1.22% of $MgCO_3$, respectively; the others have but a trace.

Locality	CaF_2	SiO_2	Al_2O_3 + Fe_2O_3	$CaCO_3$
Mirage, N. M.	93.68	4.68	0.74	0.76
	93.53	4.97	0.60	0.62
	91.68	6.60	1.00	0.67
	88.60	7.83	1.10	0.48
	86.30	9.85	1.66	0.98
	89.52	8.62	0.62	0.79
	91.82	6.60	0.74	0.74
	90.13	7.88	0.70	0.74
	92.19	6.05	0.68	0.83
	91.90	6.96	0.86	0.88
	88.59	9.66	0.96	0.83
	93.00	3.84	1.12	1.12
	89.70	8.60	0.92	0.80
Rosita, Colo.	81.55	13.6	5.1	....
	86.75	4.3	4.2	....
	82.25	12.6	5.0	
	84.3	12.6	nil.	
	66.9	27.0	nil.	..
Jamestown, Colo.	76.65	19.8	4.2	....
	83.76	12.2	4.0	....
	85.9	10.5	3.75	..
	79.66	15.24	5.26	.
	86.75	8.60	4.46	....
Marion, Ky.	84.25	2.98	1.28	10.28
	87.8	3.10	2.06	..
	90.62	4.72	1.5	.
	92.7	2.5	0.64	.
	96.97	1.9	1.88	..
	94.72	1.22	0.98	1.82
	95.63	1.82	0.93	0.38
Fairview, Ill.	88.85	5.4	1.45	..

From these analyses it may be seen that the spar shipped from Mirage is of an exceptionally high grade, considering the fact that it has not been washed and cleaned as has the Illinois-Kentucky product. Mining is here done almost wholly by contract. Mexican labor is employed, and miners can earn about $1.50 per day. Mining the spar costs $1.75 per ton, plus 25c. for incidental expenses, and haulage to the railroad costs $1.50, making a total cost of $3.50 per ton loaded on cars. The spar in 1909 sold for $5.25 per ton on the cars, based on at least 90% calcium fluoride, the freight from Mirage to Pueblo paid by the purchaser was $2 per ton. According to contract, a penalty of 20c. per ton is deducted for each per cent that the spar falls below 90% calcium fluoride, but no premium is paid unless it carries more than 95% calcium fluoride, when each unit brings 20c. more per ton. The equipment for mining the spar is simple, the largest item of expense being a small steam-hoist stationed at the deepest working. Several teams are necessary to haul the output. Small stone buildings and machine-shops have been constructed at both mines where the spar is being developed. The laborers live in tents, and work can be carried on the year round. From the opening of these deposits in the summer of 1909 to the close of 1909, nearly 5000 tons of fluorspar had been shipped, averaging 92% calcium fluoride. The exploitation and development of fluorspar deposits under present conditions in the Western States cannot be said to offer great inducement; nevertheless, the market for fluorspar is growing, and where deposits are found so situated that the freight rates do not hold down the return to a profitless level and where the cost of haulage does not eliminate all chances of gain, the development of such deposits should be encouraged.

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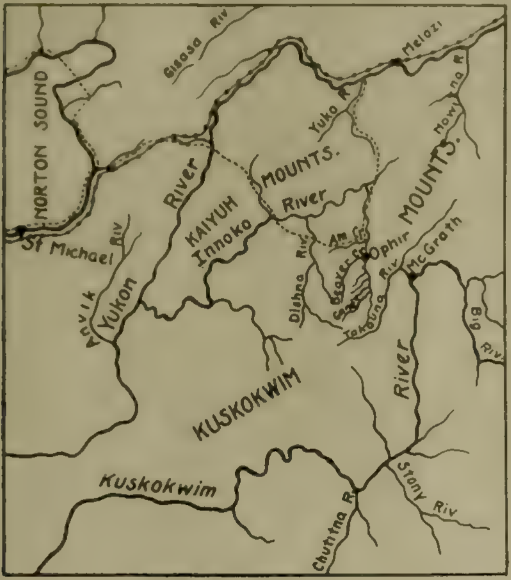
[1] Burchard, Ernest F. "Fluorspar in Colorado." Mining and Scientific Press, Aug. 21, 1909, pp. 258-260.

Kuskokwim River

By H. W. Reath

The Kuskokwim river is approximately 1000 miles long, being the second in size of Alaskan rivers, and is navigable for about 800 miles with light-draft steamers. Placer gold is found on every tributary from the mouth to its head-waters. In the last four years I have explored and prospected the Riglugalic river, the largest tributary on the south side. This stream empties into the Kuskokwim about thirty miles above Bethel. Slate is most common, but every type of rock characteristic of a mineralized country is found here. The principal minerals already found are gold, silver, and antimony, together with traces of platinum, tin, and tungsten. The quartz veins are, as a rule, wide and well defined, and can be traced for miles. At one place a bed of blue gravel occurs that looks like the pulp from a stamp-mill. I panned some of this and got a quantity of iron sulphide, assaying 1 oz. gold and $13.46 silver per ton. Without any doubt this has been ground down by glacial action from some large orebodies in the vicinity. This bed of gravel was covered by a blanket of fine blue clay about 1 ft. thick, which looked like settled slime. A sample from a place between patches of snow assayed $111 in gold, silver, and antimony; another sample taken for a width of 100 ft. assayed $8.68 in gold and $1.30 in silver.



MAP OF THE KUSKOKWIM.

Placer mining has been done in a small way on the Tuluksak river, thirty miles above Riglugalic river, and in the last two years about 1500 oz. gold was taken out; this gold is coarse, and in shape like a pumpkin seed. Two miners went outside last fall, taking along seven pounds of gold dust from the Tuluksak; but no gold has been taken out on the Riglugalic yet. The gold found on this river is fine and evenly distributed through the gravel; this is ideal for hydraulic mining, as there is sufficient grade in places and an abundant amount of water the whole season. Perhaps there is some good dredging ground, as good prospects can be found on the bars along the river, and there is a large area of auriferous gravel beds and ancient channels which the river has cut, exposing the bank of gravel about 80 ft. deep with a bottom about 12 ft. above present water-level. This could be worked at a cost of 4c. per cubic yard by hydraulicking. Ten miles south is the Quisluck river, where there is also placer gold. Nearly the same distance south is the Eak river, where there is reported to be placer gold. About forty miles south of Eak river is a small river, which empties into Kuskokwim bay about five miles below Quinhagamut, some prospectors there took out a few hundred dollars worth of gold dust last fall. Provisions are not unreasonably high at Bethel. Flour sells for $6 per 100 lb., butter, $1 a roll, bacon, 1 lb. for $1, beans and rice, 10c. per pound. Freight charges on goods from Seattle laid down on the river bank at Bethel are $30 per ton, and from Bethel to Golden Gate Falls by reindeer from $40 to $100 per ton. There is no need of a rush into this country because there will be found just as good mines ten years from now as at the present time. Whoever intends to come here should prepare to stay at least for two years. The gold is here, but it takes time to find it. The best time to come is about August 10, when the mosquito season will soon be over and there will be time to get settled for the winter. Good vegetables are raised along the river, and there are plenty of wild berries, which make excellent preserves. I believe beef cattle would do well here, as there is good grass along every river in the country. The river breaks up some time between May 1 and 15, and freezes over about October 15. Seventy-five working days in the season, as an average, can be counted on, according to my field notes. I had the pleasure of meeting last summer Major Richardson, the chief of the Alaska Road Commission. He is doing excellent work which will aid a great deal in developing the country and giving the prospector better facilities. The Northern Commercial Co. sent in a river steamer last summer and it is hoped that others will be sent.

Butte Copper Production

The copper production of the Butte mines for June is estimated at 22,691,200 lb., as against 21,720,770 lb. for May, and 21,156,150 for April.

The monthly yield of the Butte mines since the first of the year is shown below, with comparisons:

	1911.	1910.	1909.
January	22,172,930	19,224,250	26,502,600
February	20,697,320	13,755,620	24,871,730
March	21,522,060	24,575,700	28,077,510
April	21,156,150	25,087,200	25,347,420
May	21,720,770	28,363,760	26,443,240
June	22,691,200	26,356,200	25,187,784
July	....	24,303,500	26,580,820
August	....	24,762,800	26,061,140
September	....	22,990,050	26,584,180
October	....	22,913,781	28,166,160
November	....	23,636,550	27,649,144
December	....	22,564,125	14,675,880
Total	....	278,715,536	306,147,616

The daily record for June, showing tons of ore mined daily, pounds of copper per ton of ore, and total pounds of copper produced for the month, is shown in the following table:

	Tons ore mined daily.	Lb. Cu per ton of ore.	Lb. Cu total.
Boston & Montana	3,400	63	6,426,000
Anaconda	3,800	60	6,840,000
Butte & Boston	440	61	805,000
Washoe	300	60	540,000
Trenton	420	39	743,400
North Butte	900	61	1,647,000
Butte Coalition	870	70	1,827,000
Tuolumne	180	112	604,800
East Butte	360	90	972,000
Original	1,100	62	2,046,000
Miscellaneous	100	80	240,000
Total	....	..	22,691,200

As the average monthly production during 1910 was a little more than 23,000,000 lb. and in 1909 was slightly over 25,000,000, it is seen that the monthly production for the first half of this year has been 2,000,000 lb. less than last year.

Deep-Level Ores of the Rand

By An Occasional Correspondent

The question of permanence in the Rand Main Reef series has been reopened by C. O. Schmitt in a paper read by him before the Institution of Mining and Metallurgy in London at a time when many investors are viewing the continued decrease in grade with no small measure of anxiety. Mr. Schmitt's contribution was entitled 'Future Economies in Rand Production Plants', but, as pointed out by H. F. Marriott, of Wernher, Beit & Co., the title of the paper by no means indicates the wide scope of the subject-matter. For a number of years the future of the great deep-level mines of the Witwatersrand has been a theme for discussion, and the lessened yield per ton of the Rand today, when the deep-level areas are contributing such a large proportion of the output, compared to the epoch of outcrop mining, signifies to many that the conglomerate deposits become impoverished as greater depth is attained. The technical champions of the industry in London have, of course, taken up the cudgels on behalf of the view that the Rand is not in reality becoming poorer in depth, but that the reduction of the cost of operation has brought huge quantities of ore within the zone of profitable working, and that as a result the amount of ore available for milling has been increased at the sacrifice of value per ton. This is exactly what has happened, and although it has been shouted from the house-tops by directors, engineers, and managers for so long, it is still apparently the case that the public at large, and not a few mining engineers in particular, believe that the Rand in depth is but a bit of reflected glory of the Rand in the epoch of outcrop workings. H. F. Marriott has sharply discussed that portion of Mr. Schmitt's paper which touches on this all-important matter, and, backed as he is by years of South African mining experience, and a formidable array of facts and figures, his views are fully entitled to respect.

There can be no doubt that the basis of comparison between earlier and present-day Rand returns is erroneous, and that the results obtained in outcrop mines, chiefly from the Central Rand in the nineties, were misleading and quite unrepresentative of the field as a whole. Selective mining was naturally carried to a wholesale degree in those days. All the world over, the richest portion of the outcrop is first exploited, and the Rand is not an exception to this rule. With deep-levels the case has been vastly different, and even if it were desired to select rich sections (which in these days, when the Rand gold mining industry is run as a sound and enduring business, is not desired) it would be impracticable to avoid the sinking of deep verticals into zones of variable value. Of the many deep-level shafts sunk on the Rand during recent years, a number have intersected a medium-grade section, a number have cut the reef in an impoverished region, while others have struck high-grade ore. As a result of the extensive developments carried out from these shafts, vast amounts of low-grade rock of small value have been exposed and are included in the ore reserve. The central portion of the Rand, with one or two rich zones of restricted area on the eastern and western extensions, has been mainly responsible for all the fiction that has been circulated regarding the departed glory of the Main Reef Series. The outcrops of the Robinson, the Ferreira, and the Wemmer mines were of abnormal richness, but when the first few hundred feet was worked out there was but little to choose between their lower levels and the Robinson Deep, situated on their dip. It should, moreover, be remembered that there are numerous instances of deep-levels containing higher-grade ore than the outcrop. In so far as the central section of the Witwatersrand is concerned, the City Deep has proved a higher-grade mine than the City & Suburban; and the Village Main Reef is a richer mine than its outcrops, the Jubilee and Salisbury, have been.

The sum and total of H. F. Marriott's investigations is, that taking the Rand as a whole, the deep-level areas are of the same grade as the outcrop section over the whole length of the conglomerate formation, and it may be stated that Wernher, Beit & Co.'s engineer has not arrived at this conclusion without a very full and thorough investigation and the examination of much statistical data.

It is of interest and importance to note that H. S. Denny, who was for long associated with the General Mining & Finance Corporation in Johannesburg, holds a similar opinion, and in the discussion of Mr. Schmitt's paper, stated his case in plain and lucid terms, submitting interesting tables bearing on hypothetical cases assuming blocks of different values at different milling periods, which demonstrated that the mining industry has merely risen to the exigencies of the situation, and that, although the days of the small stamp-battery, ounce-to-the-ton rock, and high costs are over, a longer and more enduring period of far greater stability has been begun.

Washington Workmen's Compensation Act

This new law, which will go into effect on October 1, covers workmen in quarries, mines, smelters, and powder works, as well as in other lines of industry. The State has appropriated $150,000 for administering the law, and the Governor has appointed a commission composed of George A. Lee of Spokane, representing the legal profession, chairman; G. A. Pratt of Tacoma, for the manufacturers and employers; and J. H. Wallace of Seattle, for the workingmen. Some of the advantages claimed for the new law are that it gives adequate protection for employer and employee, increased safety of industrial operations, sure and certain relief for workers injured at extra-hazardous occupations, and their families and dependents, elimination of litigation, and consequent saving of retainer's fees and court expenses, and the regulation by State police powers of dangerous trades.

The law provides that each industry in the State shall contribute a certain percentage of its pay-roll to an accident fund, from which various sums are paid for total or part disability or on death to the family and dependents of the injured workman. The expense of handling the fund will be borne by the State. Injured workmen, their families or dependents cannot recover by law except where the injury is caused by the intent of the employer, in which case the workman or his family may recover not only the sums due under the new law, but also may sue for any excess of damage over those amounts. Where a workman is injured because the employer has neglected to observe the safeguards required by law or by the regulations of the department, the employer must pay 50% more than the fixed amounts. Should the workman intentionally injure himself he will receive no benefit.

The industries of the State are classified and certain premiums fixed for each class. The employers are required to pay three months premiums into the State treasury on or before October 1. After December 31, monthly payments are required; provided, however, that if any industry has a sufficient amount on deposit with the State to take care of its accidents no further payments shall be required. Each industry is responsible only for the accidents occurring in that class. It is intended that the accident fund shall be neither more nor less than self-supporting. The rates are subject to readjustment, depending on the number of accidents and the need of compensation of injured workmen.

Employers are required to report accidents promptly, and their books, records, and pay-rolls must be open for inspection by the commission. Refusal to permit inspection is made a misdemeanor and the employer also is penalized $100 for each offense, to be collected by action in court and paid into the accident fund. Misrepresentation in his pay-roll makes the employer liable to ten times the difference between the correct and the wrong figures. If the employer refuses or fails to pay his monthly assessments, a workman injured in his service may sue in the courts with the employer's defenses of 'fellow-servant,' 'assumption of risk' and 'contributory negligence' abolished. No part of the premiums can be deducted from the wages of the workmen, any violation by the employer of this section of the law being made a gross misdemeanor, punishable by one year in the county jail or by a fine of $1000 or both.

The schedule of payments for various injuries is as follows: In the event of death, expenses of burial, $75, payments to widow or invalid widower, $20 per month while unmarried, $240 in a lump sum on remarriage of the widow; for each surviving child under 16 years, $5 per month, monthly amount limited to $35. If no widow or widower survives, $10 per month to each child under 16 years. The same rule applies to children who become orphans by death of surviving parent, with monthly limit of $35. Dependents will be paid 50% of the average monthly support formerly received from the deceased workman, limited to $20 per month. Parents of deceased unmarried workman receive $20 per month up to time he would have been 21 years of age. When totally disabled, loss of both arms or one leg and arm, sight, paralysis, or other injury preventing the workman from doing any work, entitles him to $20 per month if unmarried, if supporting wife or invalid husband, $25 per month, if the husband is not an invalid, $15. For each child under 16 years, $5 per month additional up to a total of $35. In case of death of the totally disabled workman, the widow or widower receives $20 per month until death or remarriage and $5 per month additional for each child under 16 years. Orphaned children receive $10 per month.

When partly disabled by the loss of a foot, leg, hand, arm, eye, or fingers, the workman will receive a certain cash lump sum up to $1500. The loss of one arm at the elbow is made the maximum injury, and the payment for other injuries is scaled down by the commission. If the injured workman resides or moves out of the State the commission may lump the monthly payments, not to exceed $4000, based on the American mortality table. Any decision of the commission is subject to appeal in the superior courts. Howard L. Hindley, secretary of the commission, says that it is thought the new system will create a better feeling between the employer and the employee, and in the end establish the principle of State industrial insurance on a sound and practical economic basis.

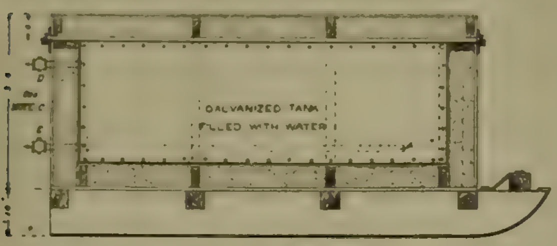
Cyanamide in America

There are now twelve factories engaged in the manufacture of cyanamide (lime-nitrogen), and one or two others in the course of construction, with an aggregate present and projected capacity of about 250,000 tons. These factories are scattered throughout Europe, with the exception of the American Cyanamid Co. at Niagara Falls, Ontario. The American company, which has been operating since January 1910, now has a capacity of approximately 13,000 tons a year. The product is somewhat more highly developed than much that is produced abroad, due to the requirements of the American market that it shall be capable of being compounded into complete fertilizers. The free lime, which constitutes a considerable percentage of 'cyanamide,' is hydrated; and it also undergoes a further treatment to eliminate to a large extent the dust nuisance which was so objectionable in the original product.

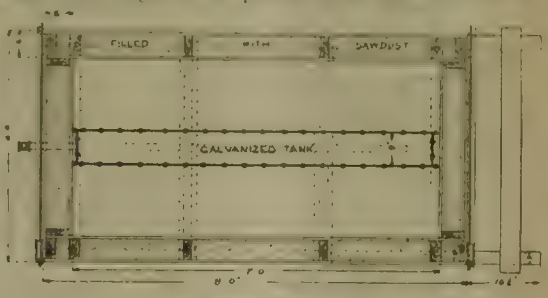
The plant at Niagara Falls is of a most substantial character, the buildings being entirely of concrete and steel, even to the roofs. Power is the chief single item of expense, and as the factory runs every minute of the day, 365 days in the year, it must be obtained continuously and cheaply. The process as followed by the American Cyanamid Co. consists of the making of calcium carbide, which is pulverized and treated in electric ovens with nitrogen gas under pressure. The nitrogen gas is derived from the atmosphere, by a modification of the well known copper process. The American Cyanamid Co. is, with one or two exceptions, the only cyanamide factory which does not use the liquid air process for the manufacture of its nitrogen. —*Jour. of Ind. and Eng. Chem.*

Portable Powder Thawer

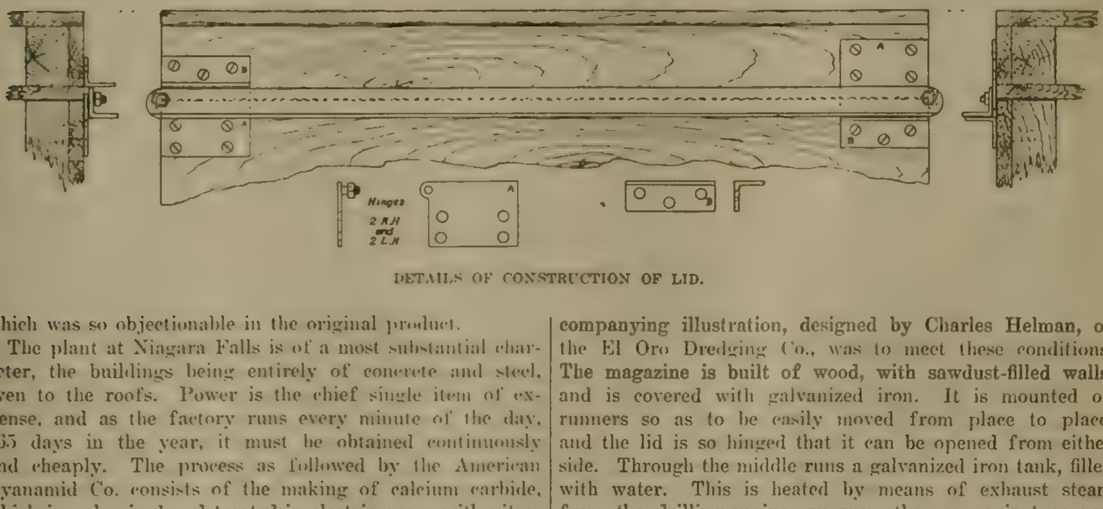
When a large amount of drilling and blasting in the field is to be done, the problem of handling the necessary powder becomes important. This is particularly true where the temperature is so low that the powder must be thawed before using. In the California dredging fields it is occasionally necessary to loosen up hard ground ahead of a dredge; and the same condition frequently arises in placer work. The magazine or powder-house shown in the accompanying illustration, designed by Charles Helman, of the El Oro Dredging Co., was to meet these conditions. The magazine is built of wood, with sawdust-filled walls, and is covered with galvanized iron. It is mounted on runners so as to be easily moved from place to place, and the lid is so hinged that it can be opened from either side. Through the middle runs a galvanized iron tank, filled with water. This is heated by means of exhaust steam from the drilling-engine, or any other convenient source. Full details of the construction are shown in the figures.



VERTICAL SECTION.



HORIZONTAL SECTION.



DETAILS OF CONSTRUCTION OF LID.

Principles of Agitation in Pachuca Tanks

By A. Grothe

In the Pachuca tank, agitation takes place in the body of the tank, during the downward motion of the pulp and does not manifest itself by any vigorous movement. The agitation in the air-lift is negligible on account of the shortness of the time during which it takes place, and its effect cannot be determined experimentally. The air-lift only serves as a convenient means of aerating the pulp, and lifting the solid particles from the bottom of the tank, after they have fallen through a column of solution equal to the height of the tank. This column itself has a downward motion, caused by the action of the lift. What concerns us is to know the rate of displacement of the solids in the solution.

Calling the velocity of the liquid v, and that of the solids v' we should endeavor to make $v' - v$ as large as possible. As v' is a function of gravity, and the retarding influence by the resistance of the medium, it is a constant in every case, determined by the degree of grinding and the consistence of the pulp. The factor v, however, is controllable within certain limits by regulating the quantity and pressure of the air. The greatest displacement of the solids in the pulp is obtained when the current in the lift is just sufficient to keep the cone clear of accumulation of solid particles. Therefore, the less vigorous the circulation the more perfect the agitation.

To determine the value of $v' - v$, a number of experiments were made. An experimental Pachuca tank of 18 in. diam. and 54 in. high, with air-lift, proportioned as in the large tanks, was fitted so that the air-lift discharge could be collected for a short time, instead of being returned to the tank. A charge consisting of a weighed quantity of ground ore and a measured quantity of water was made up, and when normal circulation was established, and sounding showed that no ore had settled near the bottom, samples of about 3 litres each were taken at intervals from the whole of the air-lift discharge, and investigated separately. As the results closely agreed, the average is used in the argument. Charges were made up of three different proportions of solid and liquid as follows:

I. 45.5 kg. ore with 136.5 litres water, giving 155 litres pulp of 3 to 1.

II. 64.41 kg. ore with 128.82 litres water, giving 155 litres pulp of 2 to 1.

III. 81.30 kg. ore with 121.95 litres water, giving 155 litres pulp of 1.5 to 1, from which the solids per litre of pulp were calculated.

(*a*) I, 294 gm.; II, 415 gm.; III, 524 gm.

The solids per litre of air-lift discharge were: (*b*) I, 426 gm.; II, 501 gm.; III, 580 gm.

The solids have therefore moved at a greater velocity than the water and $v' = \frac{(b)}{(a)} v$. The velocity of the solids was, therefore, I, 1.45 v; II, 1.21 v; III, 1.11 v.

The sizing test of the ore was as follows: All passed 80 mesh; 9.2% was retained on 100 mesh; 27.8 on 200 mesh; and 63% was finer than 200 mesh. A litre of pulp contained, therefore,

Mesh.	Gm.	Gm.	Gm.
(*c*) + 100	27.05	38.18	48.21
(*d*) + 200	81.73	115.37	145.67
(*e*) − 200	185.22	261.45	330.12

The air-lift discharge consisted of the following sizes:

Mesh.	Per cent.	Per cent.	Per cent.
+ 100	14.2	12.5	11.3
+ 200	39.4	32.4	30.3
− 200	46.4	55.1	57.4

and the solids contained in one litre of pulp:

Mesh.	Gm.	Gm.	Gm.
(*f*) + 100	60.49	62.63	65.54
(*g*) + 200	167.86	162.32	175.74
(*h*) − 200	197.66	276.05	338.72

The velocity of the particles of various sizes is,

$$\frac{(f)}{(c)} v,\ \frac{(g)}{(d)} v, \text{ and } \frac{(h)}{(e)} v, \text{ for the}$$

three classes, of pulp, therefore.

Mesh.	I.	II.	III.
+ 100	2.23 v	1.64 v	1.36 v
+ 200	2.05 v	1.40 v	1.20 v
− 200	1.07 v	1.06 v	1.03 v

The segregation of the particles takes place, not only according to size, but also according to specific gravity. To calculate the velocity of the sulphides, a sulphur determination was made before and during agitation, as follows:

Tank Charge

	I.	II.	III.
Percentage of solids	5.7	5.7	5.7
Grams per litre	16.76	23.65	29.87

Air-Lift Discharge

	I.	II.	III.
Percentage of solids	7.7	6.9	6.6
Grams per litre	32.80	34.57	38.28
Velocity of sulphides	1.95 v	1.45 v	1.28 v

The most interesting item of information obtained by these experiments is the displacement of the particles containing silver in the pulp.

Tank Charge

	I.	II.	III.
Grams silver per metric ton	995	995	995
Milligrams silver per litre pulp	292	413	521

Air-Lift Discharge

	I.	II.	III.
Grams silver per metric ton	1085	1046	1012
Milligrams silver per litre	446	526	587
Velocity of silver	1.53 v	1.27 v	1.12 v

So far we have only considered the relative velocity of the solids. To find the absolute displacement, it is necessary to know the velocity of the pulp in the air-lift. Experiments for the construction of empirical formulae are in progress. It is certain that those for lifts pumping water to a great height are not applicable.

Calling the velocity of the pulp in the lift V, then, the diameter of the lift being one-twelfth of that of the tank,

$$v = \frac{V}{143}$$

Taking V as 100 ft. per minute and the section of the lift as 1 sq. ft., then 100 cu. ft. of pulp is lifted per minute, which contains 88, 83, or 79 cu. ft. of solution according to the degree of density. Taking the last, as the least favorable, v is equal to $\frac{79}{143} = 0.55$ ft. or 6.6 in. per minute. The displacement of the particles in the solution is then:

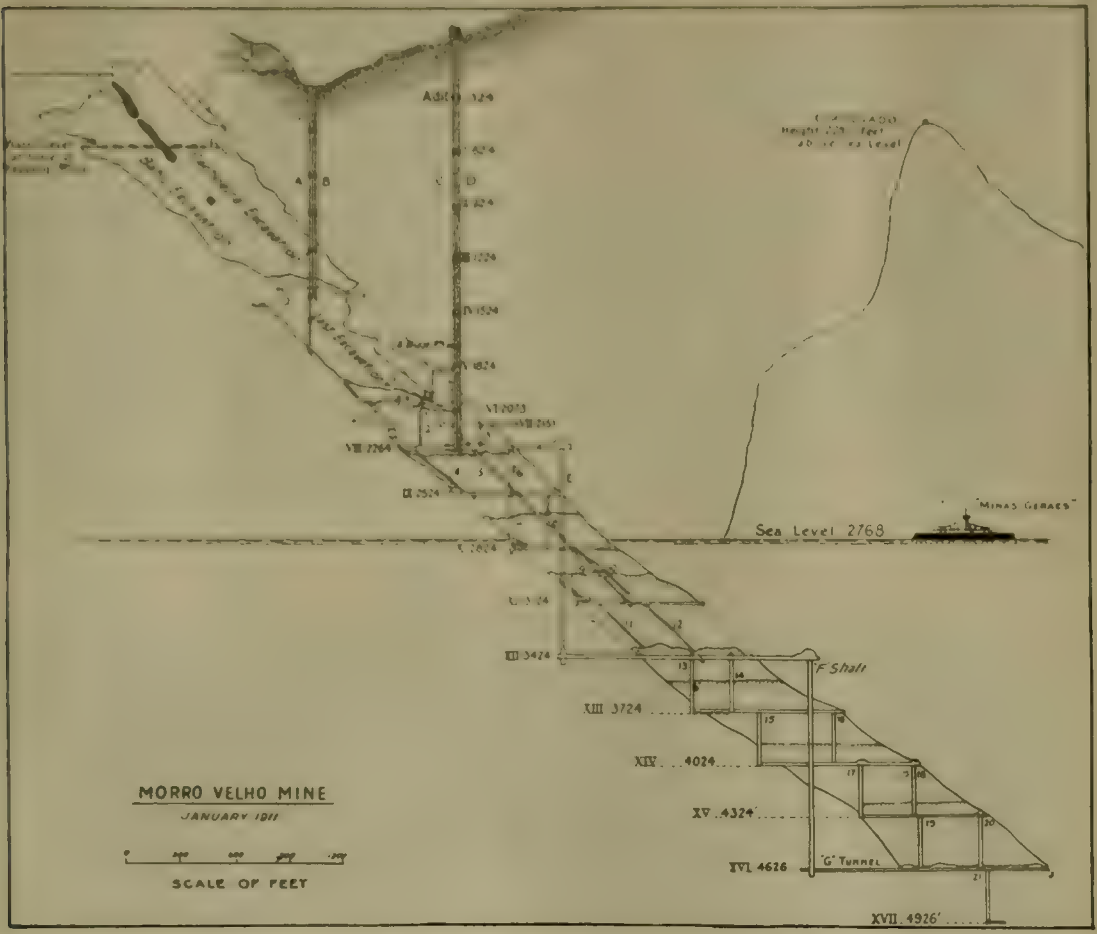
+ 100 mesh	0.36 v = 2.376 in.
+ 200 mesh	0.20 v = 1.320 in.
− 200 mesh	0.03 v = 0.198 in.
Sulphides in general	0.28 v = 1.848 in.
Particles containing silver	0.12 v = 0.792 in.

Apparently the displacement increases with v and the statement that for efficient agitation, v should be kept as low as possible, seems contradictory. But the experiments were made with the proper amount of circulation. If the latter is increased needlessly, the velocity of the liquid only will be increased and the values found above will become smaller.

The important facts brought out by this investigation, incomplete as it yet is, are: That all the components of the ground ore continually change their position with regard to each other and the solution, thus presenting the whole of their surface to be attacked by ever changing portions of the latter, leaving behind them a trail of quasi-saturated solution, which is obliterated in the air-lift (if not before) by secondary currents in the tank. The amount of this displacement, even in the most viscous of the pulps experimented with and for the finest and lightest of the particles, is several hundred times their diameter.—*Mexican Mining Journal.*

Morro Velho Mine

The Morro Velho gold mine in Minas Geraes, Brazil, has been worked continuously for 80 years by the St. John del Rey Mining Co., a London corporation. It is the deepest mine in the world. Level No. 17, which is now being developed is 4600 ft vertically below the adit or 4926 ft below the surface. A fuller description of the mine is given in the London letter of this issue.



Copper Production for Half Year

Hayden, Stone & Co., have prepared the table below showing the production for the first six months of 1911, in the estimated cost and the earnings per share for this year, on a 12½-cent metal basis, as compared with 1910.

	Production 6 months 1911	Estimated Production Year 1911	Production Year 1910	Estimated Cost 1911	Estimated Earnings per share 1911 (12½c. Copper)	Earnings per share 1910
Ahmeek	6,000,000	13,500,000	11,844,954	10c.	$6.70	$4.58
Allouez	2,700,000	5,500,000	4,655,702	10½	1.10	.71
Anaconda	124,000,000	250,000,000	266,608,461	9½	1.80	1.30
British Col.	5,000,000	10,000,000	7,143,456	9	.60	.43
Cal. & Ariz. . . .	23,488,000	50,000,000	54,163,596	8¼	3.40	3.35
Cal. & Hecla	37,500,000	74,500,000	71,509,261	8½	30.00	32.00
Chino . . .	———	9,000,000	———	*8	*3.00	———
Copper Range	16,000,000	32,500,000	32,856,692	8¾	3.20	3.38
Granby	10,000,000	21,500,000	22,750,111	11	2.00	1.20
Greene	23,000,000	47,000,000	45,680,145	11	.30	.20
Isle Royale	3,400,000	7,000,000	7,567,399	11½	.70	*.61
Miami	———	15,000,000	———	*8	*2.40	———
Mohawk	5,800,000	11,500,000	11,412,066	11½	1.15	1.88
Nevada Cons.	31,000,000	63,000,000	62,772,342	7	1.70	1.80
No. Butte	———	28,000,000	25,267,092	10	1.70	1.50
Old Dom.	10,525,000	21,000,000	17,712,755	9½	2.15	.70
Osceola	9,000,000	18,500,000	19,346,566	9	6.50	7.88
Phelps Dodge & Co.	66,545,246	133,000,000	138,805,652	8½	12.00	12.00
Quincy	10,500,000	21,500,000	22,517,014	10½	4.50	5.84
Ray Cons.	———	20,000,000	———	*8½	*2.60	———
Shannon	7,314,000	15,000,000	17,026,000	12	.25	.63
Tamarack	4,600,000	9,500,000	11,063,606	14½	———	———
Tennessee	———	13,000,000	12,429,009	10½	3.50	2.22
Utah Cons.	———	9,000,000	7,489,471	11½	.30	———
Utah Copper	46,000,000	95,000,000	85,644,511	8	4.00	3.46
Wolverine	4,800,000	9,600,000	9,757,101	7½	8.00	9.50
Total		1,003,100,000	966,023,962			

*When in full operation.

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Battery Foundations

The Editor:

Sir—In your issue of July 1, 'Puzzled Engineer' makes some statements and asks some questions about battery foundations which would indicate that he is not following the progress of this part of stamp-mill construction very closely. The sketch entitled 'Form No. 1' was designed and installed by me in the Goldfield Consolidated mill in 1907, and has been fully described by J. W. Hutchinson in his articles on the Consolidated mill which have recently appeared in the *Mining and Scientific Press*.

The sketch 'Form No. 2' was also designed by me and has been installed at the Nevada Hills mill, which is expected to be in operation within the next sixty days. Both of these installations are the first of the kind that have ever been used, to the best of my knowledge. If 'Puzzled Engineer' wants information on these points, he should at least sign his name.

J. B. FLEMING.

Fairview, Nevada, July 5.

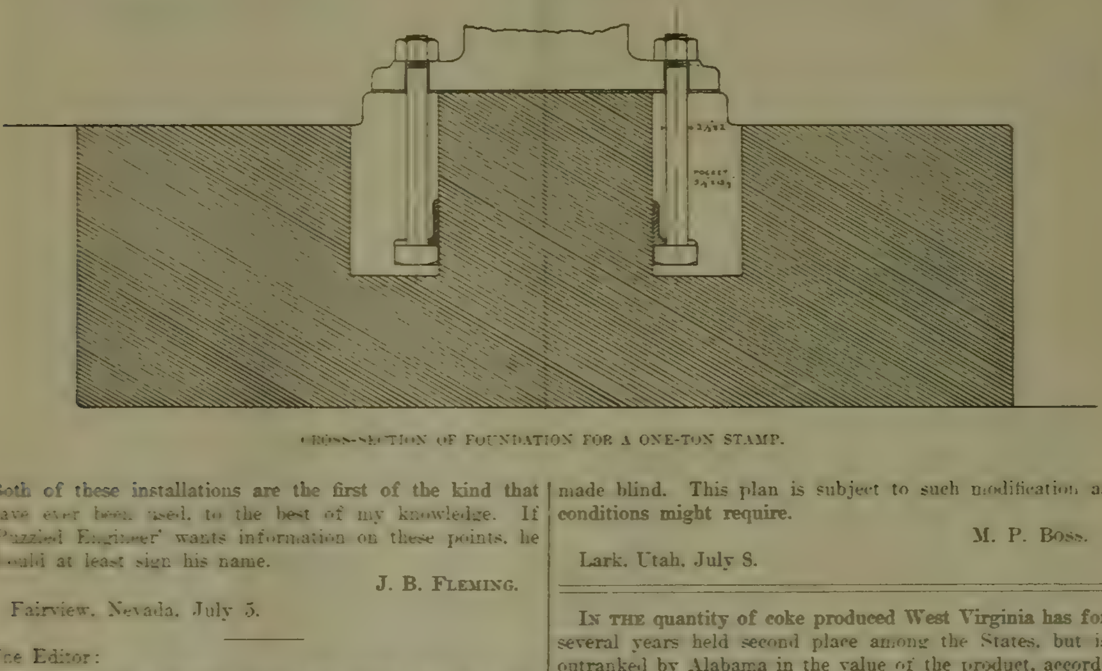
The Editor:

Sir—'Puzzled Engineer' raises the point of best form for battery foundations and shows three methods of anchorage, the adoption of any one of which need bring no serious regrets. But the three cuts he has shown are all of the same general form, built as though their prime object was to disseminate the effect of a tremendous blow from a central point to a broadened base some distance below. The pedestal idea for concrete battery foundations is all but universal.

Now the force of a single blow from a one-ton stamp, distributed through the bottom of a mortar having an area of [illegible] or two thousand square inches, would mean but slight pressure to each square inch, not counting the deadening effect of three tons, more or less, of mortar weight, and the cushioning effect of the ore. It is the [illegible] of blows producing vibration that we [illegible] foundations, and that is the one factor to consider. There is no particular objection to a pedestal form, if conditions will allow it, which is not generally the case in a stamp-mill, but a pedestal does not neutralize vibration as well as [illegible]. In other words, the closer to firm contact with Mother Earth the better, and a pit filled with concrete would be better than a pedestal.

The eight anchor-bolts commonly used for each mortar are an inheritance from wooden-block foundations. My personal observation leads me to believe that vibratory action on a tightly-tensioned anchor-bolt is so local that a bolt is as liable to break in a row of four bolts as it is in one or two (of the same size). Acting upon this idea, I years ago adopted the use of four 2½-in. anchor-bolts instead of eight of smaller size. While I am not prepared to say that no 2½-in. anchor-bolt ever broke, I have never known of such an occurrence, and it surely is so rare that it is not essential to provide for a rapid change.

I herewith show a plan of mine of a foundation for a one-ton (or less) stamp. The concrete is 9 by 3 ft. deep. The base of the mortar is 40 in. wide and the anchor-bolts are spaced 30 by 42 in. The anchor-bolts are 2½ in. by 2 ft., and are anchored by angles 5 by ⅝ in. by 6 ft. In this design the angles have a grip on the foundation, without weakness, far in excess of the bolt strength, but should any doubt exist, twisted steel can be suspended from the angles to reinforce to any desired extent. With the bolts in place the pockets can be filled with coarse sand, over which a crust of concrete can be laid and the pocket be made blind. This plan is subject to such modification as conditions might require.



CROSS-SECTION OF FOUNDATION FOR A ONE-TON STAMP.

M. P. BOSS.

Lark, Utah, July 8.

IN THE quantity of coke produced West Virginia has for several years held second place among the States, but is outranked by Alabama in the value of the product, according to Edward W. Parker, of the United States Geological Survey. The reason for this lies in the fact that the output of Alabama has in the iron-manufacturing centre of Birmingham and vicinity a local consumptive market, whereas practically all of the West Virginia coke is shipped to furnaces outside of the State. In reaching for these markets not only does the coke of West Virginia have to meet in competition the product of other States, but each district in the State becomes a rival with the other West Virginia districts and the result is exhibited in the statistics of production and value. Alabama ranks third in output of coke, her production in 1910 being smaller than that of West Virginia by more than 550,000 tons, but the value of Alabama's product exceeded that of West Virginia by over $1,800,000. The quantity of coke produced in West Virginia in 1910 was 3,803,881 short tons, valued at $7,355,233. Alabama's production was 3,249,027 short tons, valued at $9,165,821. In quality the West Virginia coke is better than that of Alabama, but the average price of Alabama coke in 1910 was $2.82 per ton and that of West Virginia coke was $1.93.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

AN EXCELLENT PAINT for iron, steel, stone, or wood is a mixture of soapstone and oil. On bridges, etc., it will last for years.

A SOLDERING MIXTURE that will not corrode like chloride of zinc, is made up of one pound lactic acid, one pound glycerine, and eight pounds water.

A RUST JOINT may be made by mixing 10 parts iron filings and 3 parts chloride of lime to a paste by means of water. Apply this to the joint and clamp up. It will be solid in 12 hours.

LINES omitted on a tracing can often be produced on the blue-print by scratching through the blue surface with a sharp pointed knife. If carefully done, the resulting line is much better than one made with erasing fluid.

SPRINGS are best tempered by using fish or bank oil. It gives sharper temper than black oil or cottonseed oil. When using fish oil, springs will stand up better if a shade less heat is used for tempering than when using black oil.

ALUMINUM POWDER is used to an increased extent in the manufacture of metallic paints and varnishes, its property of not tarnishing making it particularly suitable for this purpose. The paint is valuable in protecting iron and in rendering woodwork partly fireproof when applied in thick coats.

FROST-PROOF MORTAR may be made by taking one barrel of portland cement, one barrel slaked lime, and three barrels sharp sand. Mix the whole dry, then add sufficient carbonate of soda solution to make of proper consistence. The first setting should take place in one hour. After twelve hours good cement should have reached the final setting stage.

TO SOFTEN CAST IRON, heat the whole piece to a bright glow and gradually cool under a covering of fine coal dust, etc. Small objects are packed in quantities, in a crucible in a furnace or open fire, under materials which when heated to a glow give out carbon to the iron. They should be heated gradually, kept at a bright heat for an hour and allowed to cool slowly. The substances recommended to be added are cast-iron turnings, sodium carbonate, or raw sugar. If only raw sugar is used, the quantity should not be too small. By this process iron may be made so soft that it can almost be cut with a pocket-knife.

COKE is produced by two methods—in beehive ovens, where the coke is the only product recovered, and in by-product ovens, where all the important subsidiary products are conserved, such as gas, ammonia, creosote, and coal tar. At present the bulk of the coke made in the United States is manufactured in the old-fashioned beehive oven with an annual waste of millions of dollars worth of by-products. In 1910, according to E. W. Parker, 17.13% of the total coke output was made in by-product ovens, as against 15.91% so produced in 1909. The figures obtained by the Geological Survey show that there is a gradual increase in the use of by-product ovens. At the close of 1910 there were 2187 coke ovens in course of construction, and of these 920, or 42.07%, are by-product ovens.

ASBESTOS occurs in three type forms—cross fiber, slip fiber, and mass fiber—distinguished by the form of aggregation. The most valuable asbestos fiber occurs in cross-fiber veins. The fiber runs directly across the vein from side to side. Its length is thus limited by the width of the vein and ranges from [illegible] to 2 in. For the most part the veins of asbestos separate easily from the country rock, and, when broken across, expose the beautiful white fluffy asbestos fiber, with the sheen of silk. The highest grade of asbestos, about an inch in length, is common in the eastern provinces of Canada, but has not yet been produced in the United States. It is worth about $225 per ton. The lower grades, ranging from $100 down to less than $10 per ton, are much the more abundant in all asbestos fields. Slip fiber occurs along slipping planes or faults and shows the direction of the motion. Most of the slip-fiber asbestos is of low grade.

BITUMINOUS coal seams, when outcropping on the surface, can frequently be detected by the black color which they impart to the soil. When they outcrop on a hillside the black material will be carried down the slope by the combined action of frost and gravity, so that a narrow seam may give rise to a very wide black zone. In other cases a wide seam may be nearly completely covered with earth, and in the case of an easily oxidized coal, the outcrop may be marked only by some gray or red ash; therefore too much dependence should not be placed upon this indication. Samples of coal taken near the outcrop are almost valueless, as the coal will be oxidized, and as some coals oxidize more readily than others, little can be learned from such a sample as to the real character of the coal. Bituminous seams have been less disturbed than anthracite seams, hence are less likely to be seriously faulted.

GARNET is marketed chiefly in the Atlantic States, where it is used for manufacturing garnet sand-paper, and in the shoe industry for dressing leather. The value of the crushed and sized material is about $32.37 per 2000 lb. Freight from the Pacific Coast would not be much less than $15 per ton. This would leave about $17.37 per ton sacked at the mine here, out of which would have to be paid the cost of mining, crushing, washing, and sizing. While this looks as though it might leave a margin of profit, the fact that the total consumption last year was only about 2000 tons, and the main producers are in a position to increase their production almost indefinitely, means that in the face of competition they would simply reduce their prices. The consumption of garnet, instead of increasing, as might be expected, has actually decreased, owing to the production of artificial abrasives at Niagara Falls. If any large users were to establish themselves on the Pacific Coast, a deposit of garnet might become of commercial value, but at the present time it is not feasible to operate at a profit.

QUARTZ is used for a great variety of purposes, principally in the manufacture of wood filler, pottery, paints, and scouring soaps. In pottery quartz serves to diminish shrinkage in the body of the ware; it is used also in many glazes. Quartz for these purposes should be nearly free from iron-bearing minerals. Finely ground quartz is used in paints to increase the resistance of the paint to the weather. In scouring soaps and polishers ground crystalline quartz is preferred to silica sand, not only because of its greater angularity, but because of its superior whiteness. Massive quartz, crushed and graded to various degrees of fineness, is extensively used in the manufacture of sand paper and sand belts, and as a scouring agent with sand-blast apparatus. Much ground quartz is used in filters, and some of the most finely pulverized grades are used in tooth powders and in place of pumice as a cleaner by dentists. Crystalline quartz and sand have been used to some extent in the manufacture of silicon and of alloys of silicon with iron (ferrosilicon), copper, and other metals. Ferrosilicon is largely made in the electric furnace by using coke to reduce the quartz to the metallic state and some iron ore or scrap iron to alloy with the silicon. The resulting product, ferrosilicon, is used in the manufacture of silicon steel.

Special Correspondence

WASHINGTON, D. C.

Controller Bay Question.—La Follette Bill.—Provision for Development.—National Coal Reserve.—Investigation of Public Lands.

Washington is just now agitated over the question of who owns and controls the harbor of Controller bay, one of the two outlets for the rich Alaskan coalfields. Richard S. Ryan, claiming to represent the Controller Bay company, came to Washington and induced the authorities to exclude from the Chugach National Forest the land along the shore of Controller bay. Then he and his associates filed upon it. Now it is claimed that Ryan represents the Guggenheim syndicate, and that with their control of Cordova bay and the Copper River & Northwestern railroad, already built into the coalfields, this syndicate has a complete monopoly upon the transportation of coal from the Territory. Ryan, while here, insisted that he not only did not represent the Gugenheims, but that his company is a rival to that syndicate.

In spite of the urgent need of adequate and understandable legislation that will permit the opening of the Alaska coalfields, there is no likelihood of any action being taken at this special session of Congress. The Democrats made an iron-clad rule not to discuss any legislation except Canadian reciprocity and the wool schedule, and are living up to it. But the refusal of the Democrats to act has not deterred members of Congress from introducing bills which seek to regulate the disposal of minerals on the public domain. Robert La Follette, Senator from Wisconsin, the other day introduced a measure providing for a new leasing system. This first withdraws from entry and sale all public lands containing coal or other minerals mined for fuel, oil, gas, or asphalt in the United States. A citizen has the right to apply for a license to mine these minerals underlying areas not exceeding five sections and to use as much of the surface as shall be necessary for the proper conduct of the business. The bill further provides that the license shall not exceed 30 years, and a rental of not less than 10c. per acre shall be paid each year in advance, which may be abated by the amount paid in royalties each year. The bill provides that the licensee shall pay a royalty of not less than 8c. per ton 'mine run' on all coal or other minerals mined for fuel, and of not less than 60c. per ton upon mineral mined for hard asphalt, not less than 15c. per barrel of mineral mined for soft asphalt, not less than one-eighth of the value of the product of any oil well, not less than $50 per annum for each gas well not utilized, and at a rate of not less than 1c. per 1000 cu. ft. of gas when the product of such gas well is utilized.

James Wickersham, delegate from Alaska, has introduced an innocent-looking measure in the House which contains much more than its official title: "To establish a national coal reserve in Alaska and for other purposes." The bill provides that this national coal reserve shall contain 15,000 acres of land, 5000 acres in the Katalla or Bering River district, 5000 acres in the Matanuska coalfield, and 5000 acres in the Kenai peninsula. Section 2 of the bill provides that upon the reservation of the coal land as a national reserve for the use of the United States Government, all other coal lands in Alaska not included in the national reserve shall be open to entry and sale under the laws of the United States in force in Alaska. John E. Raker, representative from California, has introduced a resolution requesting the Committee on Public Lands to make a complete investigation of the administration of the public-land laws with reference to prospecting, locating, appropriating, and listing lands, especially of mineral lands. Mr. Raker wishes to know whether prospectors, miners, and mineral claimants have been denied, or unjustly interfered with in the enjoyment of rights and privileges guaranteed to them.

SALT LAKE, UTAH

Good Progress in Utah.—Increase of Production by Utah Copper.—Ohio Copper Doing Well.—Utah Mines Coalition.—New Ore-shoots at Tintic.—Pioche Merger.

The feeling in mining circles is more optimistic than it has been for a long time. From the different camps of Utah reports are coming of enlarged operations, attended by favorable results. There is nothing savoring of a boom, but mining men are finding less difficulty in financing their operations, several prospects are turning into mines, and established mines are hiring more men and reporting encouraging developments. The dividend record of the first six months for Utah mines shows an improvement over 1910. Without taking into consideration a number of close corporations and leasing companies which do not report, the mines of Utah paid out $5,371,142 in dividends during the first half of 1911. This is at the rate of $10,742,282 per year, as compared with $8,758,873 for 1910. Utah Copper leads with $2,310,256. If the price of copper rises as its friends predict, the Bingham mines should be able to make a still better record without increasing their production. Utah Copper's output is steadily creeping up. In April it went ahead of the corresponding month of 1910, being 8,169,248 lb., as compared with 7,902,643 lb. In May it was still larger—8,391,879 lb.—though it fell below May of last year, when the output was 8,862,913 lb. The Yampa property at Bingham is doing much better since the change in management. This has been accomplished through changed methods of mining and handling the ore, put in by Mr. Moodie, general manager. W. W. Bellows, president of the Utah-Bingham company, says that work will shortly be resumed on this property, which is controlled in London.

OHIO COPPER CO. MILL.

While the financiers are discussing what next to do with Ohio Copper, the mine management is going ahead and turning out copper at a rate which leads some enthusiastic people to predict that the mine may eventually do its own financing. Officials of the company claim that the cost is now only a trifle over 9½c. per pound, and that the property is earning at the rate of $250,000 per year. The mill is now handling 1700 tons per day, which amount will be doubled when the second unit is installed. In the Big Cottonwood district several properties are shipping, and work is being undertaken on numerous prospects. In Alta similar conditions prevail. It looks as though the Utah Mines Coalition Co. had a real mine, judging from the bodies of silver-lead ore already exposed, and the shipments which are steadily reaching the smelter.

In the Tintic district, the old reliables are shipping right along, while a great deal of new work is being undertaken. Among the significant developments recently have been discoveries in the Colorado and the Iron Blossom. In the former a new ore-shoot, paralleling the original, has been discovered, and in the latter a large ore-bearing cave has been broken into. These are taken to indicate the opening up of entirely new ore shoots in this end of the district. Sioux has paid [illegible] $30,000, making a total of [illegible].

Beaver county comes in with the report of some profitable results from the operations of the South Utah, [illegible] Cactus and Newhouse Mines & Smelters, and with the news that the Majestic company is accomplishing the unwatering of the Harrington-Hickory group and is opening up some good ore below the old water levels. The Moscow is shipping three to four cars of high-grade silver-lead ore per month, while the Sheep Rock is getting some streaks that run into the thousands of dollars per ton, with a larger quantity of lower-grade ore, for which a mill is being built. A syndicate backed by European capital is preparing to start a party from Salt Lake to explore the entire region which will be tapped by the Moffat road in its extension from its present terminus in Colorado to Salt Lake City. Many other prospecting parties are in this field and elsewhere. The closing in Salt Lake of a deal, after long negotiations which have been declared off more than once, for a consolidation of the Ohio Kentucky with the Nevada-Utah in Pioche, means a settling of the difficulties between these two companies and an extensive campaign of development.

BLACK HILLS, SOUTH DAKOTA

Work on Homestake Hydro-electric Plant.—Construction of Bismarck Mill.—Working Costs at Wasp No. 2.—Jungle Copper Mine.—Settlement of Columbia Litigation.

September 1 will see the work on the Homestake hydro-electric plant on the Spearfish practically completed. The lining of the $1\frac{1}{2}$ miles of tunnel with concrete is rapidly being finished, the machinery for the power-plant has been delivered, the intake dam is complete, and by the date mentioned it is expected that the plant will be ready to run. The operation of practically two-thirds of the Homestake's machinery by electricity will save enough boiler water to run nearly 100 stamps, and persistent rumors are afloat to the effect that the erection of a new stamp-mill is contemplated.

The Bismarck Consolidated Mines Co. put a crew of men at work on the first of July, and will increase the force and push work on mill construction in an endeavor to have the cyanide plant running by late fall. The property adjoins the Wasp No. 2, on Yellow creek, and has similar ore. The mill will have a capacity of 250 to 300 tons per day, but will be enlarged to 600 tons within a few months. The ore received in one-ton mine cars will be dumped into bins of 400 tons capacity, crushed to pass a $\frac{1}{2}$-in. ring in one No. 6 and two No. 3 Gates crushers, and further reduced to $\frac{1}{4}$-in. mesh in two sets of 16 by 36-in. Allis-Chalmers rolls. The plant will be driven by electricity throughout all departments. Zinc-shaving precipitation will be used. The general manager is Fred B. Hitchings, Deadwood. W. W. Graham is millwright in charge of construction.

Wasp No. 2 paid two dividends of 1c. per share each in June. The company is capitalized for 500,000 shares of $1 each. During May the mill handled 14,800 tons of ore from which bullion to the value of $29,249 was recovered. Total expenses, including general expense, were $15,040, or $1.0161 per ton. The June tonnage was 14,400, and bullion recovery practically the same as May. Since resuming sinking the North Homestake shaft, at Maitland, has been deepened 100 ft., and is 320 ft. deep. A small station will be cut at this level and sinking continued several hundred feet farther. Shipments of 6% copper ore commenced this month from the Jungle mine, in the Custer Peak district, to the Omaha smelter. The ore is an oxidized porphyry, although it shows a change at 65 ft., the lowest depth reached. There is a large body above this level which can be cheaply mined.

Litigation over the Columbia mine, at Keystone, has been settled and the interests consolidated under the incorporation of the Columbia Mining Co., capital stock 500,000 shares of a par value of $1 each. The officers are: John Marion, president; F. R. Griffith, vice-president; J. A. Bedard, secretary and treasurer. The directors are John Marion, John A. Marion, and F. R. Griffith, of Keystone; Thomas Gilroy and F. J. Marion, of Lead. A shaft 115 ft. following the dip of the vein showed a quartz body from 4 to 16 in. wide, worth from $40 to $150 per ton as shipped to smelters. Later a vertical shaft, planned for a permanent working shaft, was started, and at 12 ft. rich ore was encountered. The body at this point is 30 in. wide and is valued at $25 to $100 per ton. This shaft is 352 ft. distant from the incline shaft. The plans of the company for the immediate future include sinking the vertical shaft to a depth of 500 ft. and equipping the property with a modern mill to handle the ores by amalgamation and cyanidation.

LONDON

Poderosa Copper, Chile.—Prospects of Deep Working at the St. John del Rey Gold Mine, Brazil.

Many sharp words have been exchanged in connection with the management and development of the Poderosa copper mine in Chile. From the most recent information published, however, it is clear that Robert Hawxhurst, Jr., of San Francisco, the first manager, is being justified by events. The mine is in the Andes at Collahuasi, Chile, not far from the Bolivian border, and is situated 15,000 ft. above the sea. The ore deposits are rich in copper. The directors made the initial mistake of declaring large dividends without reckoning on the necessity for providing funds for further development, and consequently the company was soon in a critical position. The directors blamed Mr. Hawxhurst, who resigned, but later most of them had also to resign to make way for others. C. H. Macnutt was appointed manager in the meantime, and took control during 1909. The rest of that year and the first half of 1910 was occupied in reorganization, and by the middle of 1910 it was possible to increase the output. The total amount of ore raised during 1910 from the three different workings, Poderosa, San Carlos, and Rosario, was 28,530 tons, averaging 17.8% copper; 21,442 tons averaging 4%, and 5102 tons averaging 2.5%. The deliveries of first-class ore were 21,797 tons, averaging 22% copper and 7.8 oz. silver, shipped from Mejillones, and 1544 tons averaging 13% copper and 4.2 oz. silver, shipped from Antofagasta. Some of the ore delivered came from the dumps to the extent of 3400 tons, some of which averaged 25% copper. Development during the year exposed 17,180 tons averaging 23% copper, and on December 31 last the ore reserve was estimated at 35,000 tons averaging 22% copper and 7 oz. silver. The dumps are reported to contain 96,000 tons averaging 4.7%. In September Mr. Macnutt started to concentrate the dump ore by means of hand-jigs and sluice-boxes, and this work has already proved profitable. Owing to lack of funds, Mr. Macnutt has not been able to do as much prospecting work as is desirable, but now that the evil effects of premature distribution of dividends have been counteracted, he intends to conduct development work on a large scale in the near future. During 1910 the income from the sale of ore was £191,870, and the net profit was £38,471. The year began with a debit balance of £67,272, which is now reduced to £28,801. Since the close of the year the directors have been able to redeem £36,000 of debentures. Experiments have been actively conducted in connection with the concentration of second-grade and dump ores, and a plant is to be erected. It will be seen from the above record that Mr. Macnutt has done what Mr. Hawxhurst planned to do, and that the latter's estimate as to the capacity of the mine has been confirmed.

The Morro Velho gold mine in Minas Geraes, Brazil, is the deepest mine in the world. Level No. 17, which is now being developed, is 4600 ft. vertically below the adit, or 4932 ft. below the surface. The lode dips 45°, and operations below Level 8 are by means of underground vertical named 'E' and 'F', each 1200 ft. deep and extending from Levels 8 to 12, and 12 to 16, respectively. Level 16, at 4300 ft., has now been driven nearly far enough for the commencement of another shaft, 'G'. The levels are 300 ft. apart. As the lode shows every sign of persistence, George Chalmers, the manager, is making arrangements for work to be continued to a depth of 6500 ft. Efficient ventilation for the purpose of reducing the temperature of the air and rock is of course of prime importance. Before the 'F' shaft was completed the workings on the fourteenth and fifteenth levels were unpleasantly hot, but as soon as through connection was made conditions rapidly improved. At the present time the ventilation is effected by a Capell fan driven by an 80-hp. motor, at the surface, together with some auxiliary fans underground. It has now been decided to provide two more fans, only one of which will be put in commission at first, with a 150-hp. motor. As the depth of the workings increases the second will be started with a 300-hp. motor, and later the first fan will be driven by a 300-hp. motor. Close investigation has recently been made with a view to ascertaining the greatest depth to which the mine can be worked. During the four hottest months of the year, November to March, temperature readings were regularly taken of the air at each level and of the rock at the end of the 10-ft. holes. It was found that from adit to Level 8 the air temperature is slightly greater than that of the rock. Thereafter the rock temperature becomes greater. From Level 14 to 17 both advance more rapidly, a fact due to these levels having been open only a comparatively short time, and the rock having been exposed to the cooling effect of only a small quantity of air. The figures relating to the original temperatures when the rock was first exposed at various points and the subsequent fall in the temperature are of considerable value in helping to forecast future conditions. On Level 14 in 1906, when it had just been reached, the rock temperature was 98°F., and the air temperature 95°. As soon as the level was connected with the ventilating system the rock temperature fell to 92½°F., and that of the air to 87½. With the more efficient system of ventilation it may be assumed that the temperatures of air and rock will not increase so rapidly, but will advance in approximately arithmetic progression as in their course from adit to Level 8. The probable increase in air temperature may therefore be expected to be such as to bring the temperature at a depth of 6500 ft. to 95°F., which is practically the temperature of the workings at Level 16 at the time of writing, so it may be supposed that with efficient ventilation work can be carried on at this depth.

The present position at the St. John del Rey is admirably reflected in the eightieth annual report recently issued. The report covers the year ended February 28 and shows that mining, milling, and development work have given satisfactory results. The only adverse circumstance was the insufficient supply of water-power owing to drought, and the consequent extra expense on steam-power. The amount of ore raised was 193,195 tons, of which 189,600 tons was sent to the 130-stamp mill. The yield by amalgamation and cyanide was 98,726 oz., realizing £421,178, or 44s. 4d. per ton. The working cost was £265,058 or 28s. per ton, development £12,387 or 1s. 4d. per ton, and London expenses £3692. In addition £43,057 was allocated to capital expenditure; £5425 was paid as interest on debentures, £10,000 as dividend on preference shares, being 10%, and £50,078 was distributed on the ordinary shares, being at the rate of 1s. 10d. per share, an increase of 2d. per share as compared with the previous year. The reserve fund invested in high-class securities has been re-valued and now stands in the books at £96,472; it is used in part to improve the financing of drafts between England and Brazil. A new unit of water-power from the Peixe river will shortly be at work and will provide an additional 1000 hp. The ore reserve is estimated at 1,158,560 tons, or sufficient for five years' work. Owing to the nature of the methods of mining no further development will be possible for two years until the seventeenth or eighteenth levels are fully opened.

TORONTO, CANADA

Bush Fire at Porcupine.—Two New Camps Established.—Progress at Rea and Preston East Dome. — Discovery at Nipissing. — La Rose Dividend. — Danger at Crows Nest Pass.

The Porcupine branch of the Temiskaming & Northern Ontario railway is now open for traffic, though the ballasting of the last few miles has not been completed. The camp was visited by another bush fire on July 2, which destroyed the plant of the Dome Extension, the men employed escaping with difficulty. Captain Anchor and several of the force sustained severe burns in fighting the flames. The loss to the company is not serious, as the plant and building destroyed were of a temporary character. In fact, the stripping of a large area of vegetation by this and the previous fire, though resulting in some present inconvenience and loss to individual companies, is regarded as on the whole advantageous, as it considerably facilitates the work of the prospector in discovering surface exposures. The Bewick-Moreing syndicate has established two new camps: Camp No. 3 is situated on the lots adjoining the Dome Extension on the north and east, and Camp No. 4 on the Timmins group of claims in Deloro. A large force is engaged in stripping and tracing the leads.

The Porcupine Investors, Ltd., a new company organized in London, capitalized at $1,500,000, has acquired three claims to the north of the Dome and North Dome properties, and has let contracts for drilling to determine the depth of the orebodies. Development is being actively pushed at the Rea mines. The main shaft, now down 240 ft., will be sunk to the 500-ft. level and adits run to tap the big orebody in the main vein. A second shaft is being sunk, which will be connected with shaft No. 1 by an adit at the first level. Many new leads have been found by surface prospecting. At the Preston East Dome a new vein 15 ft. wide has been discovered on a property adjoining the Dome, which will be opened up immediately, power being supplied by a 24-hp. boiler. A good find has been made at the Foley-O'Brien in driving at the 160-ft. level. The vein is quartz, assaying $10 per ton, intersected with rich stringers showing free gold. On a claim of the Armstrong-Booth syndicate, south of the Rea, a number of stringers have been found from which free gold has been panned out in large amounts. The Achilles, a Montreal company, capitalized at $1,000,000, operating to the north of Porcupine lake, has found visible gold at the 125-ft. level in a quartz vein 7 ft. wide. The Vipond has cut No. 3 vein at the 100-ft. level where it shows free gold.

A new vein of high-grade ore has been found in a crosscut at the 100-ft. level from the No. 123 shaft of the Nipissing. It is near the O'Brien boundary and is the first tangible result of development in the Keewatin formation in this part of the property. Good ore is also being taken from No. 12 shaft, which has been pumped out. The annual report of the Buffalo mill shows a recovery of 86.90% of all silver mined, 41,484 tons, of an average mineral value of 36.07 oz. being treated, making a total of 1,496,255 oz. handled. The La Rose continues its policy of accumulating a large cash surplus instead of paying heavy dividends. Its total income for the first five months of the year was $809,028, the expenses amounting to $273,895, leaving a profit of $535,132. Its present cash surplus applicable to dividends amounts to $1,300,000. The Trethewey has increased its capital from $1,000,000 to $2,000,000. A new orebody cut on the 150-ft. level of the Nova Scotia, where the shoot is 40 ft. long by 4 ft. wide, of good milling ore, is yielding well. As the vein has been found on the surface, the ore is supposed to carry to the upper levels. The Wettlaufer, in the South Lorrain area, is installing a 10-stamp mill.

A report by R. W. Brock, Director of the Canadian Geological Survey, has excited grave apprehension for the safety of the mining town of Frank, Alta. Mining operations have so weakened the northwest shoulder of Turtle mountain, which overhangs the town, that a landslide similar to that which occurred in 1903 is threatened. The mountain has been under inspection by the Geological Survey since that catastrophe, and last year two small cracks were detected which have since become more pronounced. The mine is operated by the Crows Nest Pass Coal Co. The report conveys an urgent warning that any further undermining may result in disaster.

FAIRBANKS, ALASKA

New Company.—Core Drilling.—Theft at Chena Mill.—Five-Stamp Mill for Bedrock Creek.—Good Ore on Wolf Creek.—Placer Gold.

Following the mill-run of 66 tons from the Golden Sherrard lease, which averaged $71 per ton, the lessees, who also hold an option on the property, have incorporated for $120,000. The Newsboy and Lucky Lad claims will be held by the Newsboy Mining Co., enough stock being sold to take up the option of $20,000, and to erect a hoist and mill. For development purposes, $100,000 worth of stock was set aside, and was all subscribed locally in twelve hours. A 5-stamp mill has been ordered by wire, and will be ready by the middle of September.

The Fairbanks Core Drill & Mining Co. has ordered a core-drill to be shipped from Seattle by June 1; stock in the company has been selling steadily, only about 1000 shares being left from the block set aside for operating expense this season. E. H. Mack, secretary and manager, has already made tentative contracts for drilling holes on promising properties for an interest in the ground. Goyette & Jacobson have sold their Fairbanks creek properties to McGinn, Berry & McIlroy. The last mill-run from this property returned $74 per ton, and the bottom of the shaft shows a strong vein. A contract will be let for sinking the shaft another 100 ft. During the last month, Alois Frederick has timbered 100 ft. of the lower shaft on his Vault creek property and installed a boiler and hoist. Plans are being made by McDonald, Drury, Cathcart, and Friedrich to further prospect the extension of the Friedrich's vein, bought from Hoel Bros. & Co. An explanation for the slender returns from the early runs at the Chena customs mill has been found. A former employee of the mill has been arrested and charged with stealing amalgam. Of five or six of the early runs which were made at the Fairbanks mill, it was noticed that the amalgam on retorting shrank 75 to 99%, where the normal shrinkage should have been not over 50 per cent.

Walter Hall, of the firm of Rhoads & Hall, of the Gold Coin claim, on Bedrock creek, has already shipped a 5-stamp Joshua Hendy mill, from San Francisco, for use on the claim. The mill has already been paid for by ore taken out in development work. A recent run of 54 tons at the Chena mill netted $6700, while a 90-ton lot just being milled is expected to net between $15,000 and $20,000. A quarter of a million dollars' worth of ore is already blocked out, and the normal output of the mill should not be less than $1000 per day. The battery is fitted with front chuck-block and back splash-plate, this arrangement being found very satisfactory for the free-milling ore on that claim. A vein which has attracted much attention because of good mill-runs and high assays of samples, is owned by M. Grummere, on Eva creek, a tributary of Ester. A half interest was recently acquired by Jim Lennon and 'Shorty' Thomas. The vein is 8 ft. wide and assays of samples taken from the pay-shoot run from $50 to $100 per ton. The Herschberger vein, owned by Zimmerman and Herschberger, has recently been acquired by Gordon & Sterling. This was located last winter and is 5 or 6 ft. between walls, 2 ft. of which is comparatively high-grade ore. The whole vein will pay to mill; there is now a large shipment awaiting treatment at the Chena mill.

A small lot of the ore found on the Wolf creek properties belonging to Balzimer & Nordale was put through the Fairbanks mill. This gave returns of over $100 per ton, the concentrate assaying a trifle less than $1000 per ton. The main cross-cut is still being driven to cut other veins, as there have been five veins discovered on the surface, that should be cut in another 600 ft. Steady development on the adjoining property, owned by Horton & Solomon, shows the vein to have three bandings, a 6-in. high-grade streak in the hanging wall, a 2-ft. filling in the centre of rock that will mill close to $40, and 3½ ft. in the foot wall of lower grade that will pay to mill. The Fairbanks Quartz Development Co. has awarded the contract of sinking a 200-ft. shaft to Gus Peterson. The plant is being moved to the ground and work will commence immediately. The Bonding & Leasing Co., of which F. S. Gordon is the moving spirit, is an assured fact, as the $10,000 guarantee was easily raised, and W. B. Vanderlip is already on his way in to take charge of the practical work of the company. Much placer gold is being brought into town and sold to local banks, although the Wells Fargo Express Co. has diverted some to San Francisco. The season's output will be very satisfactory, judging from the present outlook.

NEW YORK

State of the Copper Market.—Production for June.—United Verde Dividend.—Superior & Boston.—Interest in Pioche.—Little Interest in Porcupine.

The intense heat prevailing made the celebration of the national holiday a welcome interruption to market activities, or perhaps 'inactivities' would be a better word. In copper there has been a marked effort to magnify a little active buying into a demand that would immediately so diminish existing surplus as to make a 'runaway market' a real danger. Daniel Guggenheim gravely commented upon this phase of the copper situation in a recent interview. Much has been made of the splendid existing foreign demand which has been for some months reaching high-record figures. Conservative judgment would apparently look for a slight reaction rather than further increase in this direction. Mr. Guggenheim's views and Henry Krumb's recent estimate of Utah Copper are hardly harmonious. Mr. Krumb says that Utah Copper can for the next fifteen years produce 150,000,000 lb. of copper annually and lay the product down in New York at a cost of not more than 7½ cents per pound. When it is considered that Utah will soon be milling 20,000 tons of ore daily, or more than 7,000,000 tons annually, a 'runaway copper market' seems an imaginary danger. The tonnage to be handled by the Utah mills will equal the total tonnage of all the Lake mines and twice that of the whole camp of Butte. A possible shrinkage of 10,000,000 lb. is expected in the Producers' report, but the metal market is dull, with 12¾ quoted, and sales are made at fractionally less. Operators are evidently hoping for improved metal prices, and curtailment is about as much in evidence as at any time during the past nine months. Anaconda smelters turned out 21,850,000 lb. in June, against 23,254,-

UNITED VERDE SMELTER.

000 lb. a year ago, and 23,595,000 lb. in June 1909. The Phelps-Dodge output for June was 10,893,714 lb., as against 11,253,309 lb. in May, 11,063,454 lb. in April, and 12,236,-689 lb. in June 1910. In the case of the Calumet & Arizona, the Shannon, and other producers, there is apparently about the same proportionate shrinkage. There is good ground for the opinion that this action is a sane conservation of ore reserves by prudent management, rather than any concerted movement toward curtailment.

W. A. Clark, former senator from Montana, in his capacity as stockholder of the United Verde, had a bad shock when he met with the company's board of directors and decided not to declare the usual monthly dividend of 75 cents. The Clark mines have never lent their support to the policy of curtailment, but in this instance there have been some recent severe cave-ins, doing further damage to smelter foundations, and necessarily curtailing output. The real question is whether Mr. Clark can justify his action as director, with himself as shareholder. Greene-Cananea is apparently beginning to come into its own. May costs were brought down to 9c., and earnings were at the rate of $2,000,000 per year, which would be equivalent to 80c. per share upon the 2,500,000 shares outstanding, and equal to 13⅓% upon the present market price of the shares.

The shareholders of the Superior & Boston are to hold a special meeting at Boston, July 25, to authorize an increase in the capital stock of the company of 50,000 shares. The company's treasury has been reinforced by a loan of $200,000 secured through Hayden, Stone & Co. As an example of the force of sentiment in making markets, the course of Lake Copper deserves consideration. Some fifteen months ago the shares were selling around $94 per share on possibilities. Now the possibilities are being realized. Exploration work has reached the eighth level and there have been no disappointments so far. Notwithstanding this, the shares are selling for some $50 less than the high quotation record, while intrinsically worth more now than ever at any time heretofore. South Lorrain is possibly to develop into a real rival of Cobalt. Good ore has just been found on the Belle Ellen, which lies about a mile north of Wettlaufer; some of the ore is as high as 6000 oz. of silver per ton.

The merger story concerning the properties at Pioche has been revamped and is being passed out once more. The news is important in the Eastern market on account of the Nevada Utah stockholders, who are many, and who all have staggering losses, and who would all welcome any news that would galvanize some life into this issue. If the Nevada Utah, the Ohio Kentucky, and the Pioche Consolidated can finally combine on some real operating basis, the consolidation will have an interested public ready made and waiting for market movements. The Nevada Superior Mines Co., composed of people in and about Rockford, Illinois, and operating at Humboldt, Nevada, is about to build a 75-ton mill and concentrator. The Porcupine boom seems dead. It was many times repeated that the long-looked-for activity would appear the moment the railroad opened for passenger traffic. This occurred two weeks ago, but there was not even a ripple of response in the market. Forest fires now appear to furnish the only exciting news.

BUTTE, MONTANA

SMELTER PRODUCTION FOR JUNE.—LARGE SCALE OF WORK OF THE ANACONDA.—SALE OF ALICE G. & S. M. CO.—CHINESE INSPECTOR OF MINES.—REPORT OF TUOLUMNE C. M. COMPANY.

The official figures of the Washoe and Great Falls smelters for June show that the production was 21,850,000 lb., as compared with 21,700,000 lb. in May. The increase of 150,000 lb. was largely due to the Tuolumne shipping more ore than in May, which made the production of that company in the vicinity of 600,000 lb. as compared with 500,000 lb. in May, while the North Butte also ran a little over the average of 2,000,000 lb. for many months past. Of the production of 21,850,000 lb. the Washoe smelter at Anaconda turned out 16,700,000 lb. of copper and the Great Falls smelter 5,150,000 lb. All the ore of the North Butte and the Tuolumne companies goes to the Washoe smelter. The mines of the Anaconda company had practically the same production as in May. The East Butte company produced about 1,100,000 lb., so that the total production of this district for June was 22,950,000 tons.

Some idea of the immense amount of work carried on by the Anaconda Copper Mining Co. and the amount of money required each month to pay the employees may be gained from the fact that, at the present time, there are over 12,000 men on the payroll in the various departments of the company's works; nearly 6000 in Butte alone. When it is considered that a curtailment in the copper production of 15% is in force, and that other departments of the company such as the lumber, coal, and smelters must necessarily also curtail work, the number of men employed is surprisingly large. The miners are paid $3.50 per day, but there are at least 2000 who receive considerably over that amount, and it is a conservative estimate to say that the men altogether will average $3.75 per day, so the money required is nearly one and a half millions per month.

The fight in opposition to the sale of the Alice Gold & Silver Mining Co.'s property to the Anaconda company is to come up on July 12, which is the time set for the hearing of the application of the Anaconda company for the dissolution of the Alice company. A large number of the stockholders residing in New York, Boston, Salt Lake, and Butte have filed objections to the sale, and a fierce legal battle is expected. It is claimed that under the laws of Utah, where the company is incorporated, every stockholder must give his assent before a sale of the property can be legally made. It is stated that it is an old Utah law that a corporation cannot dispose of its property without the consent of every holder of stock. It may be remarked that quite a large number of the New York, Boston, and Butte stockholders who are contesting this sale are holders of Butte Coalition stock, and that some of the same grounds under which the protest is being made will be later brought forward to prevent a dissolution of the Butte Coalition company. A prominent New York lawyer has been engaged by the minority stockholders to conduct the case in their behalf, and it is understood that he will be assisted by at least two others who are prominent in corporation and mining law.

E. H. T. Chen, the supervisor of mining and smelting for the Chinese Government, has completed an examination of the methods of handling and treating ore at the Washoe smelter, and has gone to Tooele to inspect the plant of the International Smelting & Refining Co. He proposes to visit every mining centre in this country before returning to his native land.

The net profit of the Tuolumne Copper Mining Co. for the year, as shown by a statement filed with the Assessor for taxation purposes, was $24,768, as compared with $112,619, according to the statement filed the previous year. The gross revenue for the present year was $480,950, and the total amount of ore extracted was 31,509 tons. In connection with this year's report, it may be pointed out that the company paid two dividends, in February and May, which it did not do last year, and, in addition, has gone to an immense outlay in the past few months in installing new equipment. The annual meeting of the company was held a few days ago, and the reports submitted by the president and secretary-treasurer were deemed of a most satisfactory nature. The report, however, only deals with the affairs of the company for seven months, from June to December, at the end of which month it had a cash balance of $323,839. The by-laws of the company have been changed, and henceforth the annual meetings will be held in March instead of June, and the reports will be for the twelve months. From June 1, 1910, to December 31, the company shipped 18,957 tons of ore, containing 3,112,288 lb. of copper averaging 8.199%, and 58,965.56 oz. silver. The gross value of the metals was $293,738, and the net value, after deducting smelter and freight charges, was $177,885.

General Mining News

ALASKA

Valdez District

At the W[illegible] tunnel [illegible], on Mineral creek, near Valdez, the adit is being driven by three shifts at the rate of 4 ft daily. The vein is reached by a crosscut, and drifting on the vein is in progress. The ore is said to be high grade in gold.

Two quartz claims have been located in the Sheep Bay district by R. F. M[illegible]ard, J. M. Lathrop, and Thomas Blainey. One, known as the Mabeso, is situated three quarters of a mile west of Sheep bay and 1500 ft south of the glacier; the other is called Crossroad and is one mile west of the bay and 2000 ft south of the glacier. The King and Queen claims have been located by L. C. Townsend and Jess Crawford. One is near the Sunnyside and the other near the Wild Rose.

A great many quartz locations have been made in the vicinity of Valdez and the outlook for developing an important mining district there is promising. Some rich ore has been found in Cordova district, and numerous claims located. The veins are from 1 to 2 ft. wide, and are rich. Snow has, until recently, greatly retarded a more vigorous development of these prospects. It is said the town of Valdez is almost deserted, nearly all of the able-bodied men having gone out into the hills to prospect for gold-bearing quartz. The discoveries of last fall were made so late in the season that it was impossible to get in supplies, owing to the snow. This summer season will see the necessary winter supplies on hand, in most cases, to continue work throughout next winter.

The Alaska Gold Hill Mining Co. has established a camp at its mines near Bigelow on Mineral creek. A crew of men has improved the trail up the glacier to the Valdez and Ibex properties, avoiding the larger crevasses, filling in the smaller ones, and draining off the water; the men are placing the trail in excellent condition for packing supplies. A large crew is at work on the Ibex, crosscutting the lead at a depth of 250 ft. The tunnel is in 100 ft. The vein on the surface is from 1 to 3 ft. wide. The work is under the supervision of Sam Conninger, formerly of the Ellamar mine.

MAP OF ALASKA.

These are reported to be [illegible] producing well [illegible] Katalla oilfield and [illegible] other outfits are about ready to commence operations. A pipeline has been laid from what is known as the old English property, to storage tanks holding 15,000 gal. A small refinery has been built at Katalla and the gasoline made there is all sold to local consumers.

ARIZONA

Cochise County

John Pearce is said to have made a good find at the famous Commonwealth mine at Pearce. The Shattuck-Arizona Copper Co. has suspended operations at its mine, due, it is said, to the low price of copper. One hundred and fifty men are thrown out of employment.

The annual report of the Calumet & Arizona, just issued, shows a production in 1910 amounting to 28,020,506 lb of refined copper, with gold and silver content of $265,364. The net profits were $1,142,716, of which $800,000 was disbursed as dividends. The company now has assets, exclusive of mines and surface works, of $3,706,774, of which about half is cash.

Gila County

It is reported that the Sleeping Beauty Copper Co., which owns large holdings in the Sleeping Beauty mountains, nine miles northwest of Globe, will start work at once sinking a double-compartment shaft. At the Miami concentrator, at Globe, three units have been in operation during the past month, turning out about 65 tons daily of 40% concentrate, with net extraction of about 75% of the sampled value of the ore treated. This percentage is expected to be materially bettered with long operation of the plant.

Graham County

The work of more fully equipping the property of the Frisco Placer Mining Co., on the San Francisco river, seven miles below Clifton, is now in progress. It has been decided to use water for the whole process instead of only the latter part as originally planned. A cableway is being constructed, and to this cable will be attached a plow for loosening the material, to be followed by a number of scrapers, also attached to the cable, which will pass over 3-in. grizzlies. Oversize will be wasted and the undersize fed to trommel. The oversize from first trommel will go by belt-conveyor to waste dumps; undersize will go to a second trommel, screening 16 mesh; undersize from here to two fine sluice-boxes, oversize to coarse sluice-box; overflow from fine sluices through a Pierce amalgamator. The full plant operating will necessitate 12 men, and will use about 500 gallons of water per minute. A gasoline engine furnishes motive power.

Maricopa County

J. S. Baycroft is authority for the statement that work on a large scale will be started on the Palo Verde mine in the Saddle mountain district. There are four drifts on the property, 112, 110, 45, and 35 ft. deep, respectively. Drifts 125 ft. in length and 12 test-pits have proved an orebody 2100 ft. long and 600 ft. wide which assays $3.50 gold, $1 silver, and 2½% copper. The Buckeye railroad is only 18 miles from the property.

Mohave County

The Tom Reed Gold Mines Co. lately paid another dividend, disbursing about $40,000 in a 4% dividend. This is the largest disbursement since the company was incorporated and shows the big earning capacity of the mine. The ore that is being opened on the 550-ft. level indicates that the property will become one of the largest dividend-payers in the territory. S. C. Bagg has made arrangements for the sale of the Cyclopic mines, in the Gold Basin district, to an Eastern corporation represented by George Crearar and B. L. Smith. During the ten years just past, while the property was under the management of Mr. Bagg, the ore reserves have been largely increased. The milling plant will be remodeled.

Pima County

The Golden Age company is developing its property in the Comababi district, 64 miles west of Tucson, and plans to build a mill. J. M. Shrote is optimistic regarding the future of that neighborhood and says that the entire district is worth prospecting.

Pinal County

The Sterling Development Co. has started drilling for oil on its property near Mammoth. It is in this neighborhood that an 800-ft. well was sunk by Sullivan and associates and abandoned because of conflicts among those interested.

Yavapai County

The actual work of sinking the main shaft on the property of the Arkansas & Arizona Copper Co. has started.

CALIFORNIA

Amador County

The new 500-hp. hoist for the Argonaut mine is now being installed. The interior of the old hoist-house has been rearranged and the auxiliary equipment has been in place for some time. The Argonaut is 3800 ft. deep. Work was started last week in unwatering the shaft of the Mitchell mine preparatory to resuming operations. The mine has been idle for some months. It is the hope of those in the vicinity that the affairs of the company have been arranged so that this property may be worked in a manner that will give the mine a fair test as to its value. It is reported at Jackson that the South Eureka Mining Co. has purchased the Oneida mine, near Sutter creek. This property adjoins the South Eureka on the south, and has a good productive record.

Butte County

Another big dredge for the Natomas Consolidated was floated last week two miles south of Thermalito. The buckets are of 13 cu. ft. capacity and dig 35 ft. below the water-line. The entire boat contains 675,000 ft. of lumber.

Calaveras County

The Fox mine, near San Andreas, operating by the dredging process, was closed down last week by an injunction issued by the United States Circuit Court for obstructing the navigability of the San Joaquin river.

Eldorado County

Remarkably low costs are reported from the Sunrise mine, in the Kelsey district, about 6 miles north of Placerville. The mine is equipped with a 10-stamp mill and is worked by an open-cut. The breast, which extends from the hanging to the foot-wall, shows a 15-ft. face 40 ft. high. Two miners, working one shift of eight hours, with one mucker or car-man, supply ore enough to keep the 10 stamps running continuously, 40 tons being reduced by the mill every 24 hours. The actual cost of mining and milling ore at the Sunrise is between 62 and 63 cents per ton.

Mariposa County

A vein of rich ore has been uncovered at the 300-ft. level of the Bondurant mine at Coulterville. Ten men are at work sacking the ore. It is said that the 10-stamp mill is to be started soon. George H. Gerkin is superintendent. The Louisiana mine, adjoining the Bondurant, has been bonded to G. F. Dyer, consulting engineer of the Merced Development Co., of Merced.

Placer County

(Special Correspondence.)—A large building is in course of construction at the Rawhide mine, near Towles, to be used as a boarding house and for company office. The gravity tramway is nearly completed, and plans for a new mill are under consideration. A large amount of ore is available in the mine which now only needs a suitable mill for its reduction. The development consists of three adits in each of which large ore reserves are exposed. A rich find is reported having been made in the Home Ticket drift mine near Last Chance, east of Forest Hill.

Towles, July 9.

Tuolumne County.

(Special Correspondence.)—The water is being taken from the shaft of the Mazeppa mine, a mile south of Stent, with a view to further development. Some very good ore has recently been discovered near the south end of the vein. The management of the Golden Rule Mines Co. is contemplating unwatering the lower levels of that property to further develop the large bodies of low-grade ore on the 1400-ft. level and below it. The shaft is down 1400 ft. and a winze is down 400 ft. below that level.

Stent, July 8.

COLORADO

Chaffee County

Clyde Manamaker and Casey Gibbs have located 15 claims near Salida on which there is a vein of 1½ to 2% lithium ore. The property is within one mile of a railroad and can be mined and loaded on the cars very cheaply.

Gilpin County

The Black Jack mine in Silver gulch is to resume operations, a new company having been organized under the name of the Black Jack Mining Company to work the property, which is situated within a few hundred feet of the Coaley mine. The surface improvements consist of a good shaft-house which encloses a 25-hp. boiler and hoist. The main working shaft is down a depth of 140 ft., and it is the intention of the new company to sink it 100 ft. as soon as the necessary repairs are completed on the surface.

Hinsdale County

An option on the Highland Chief properties has been granted to a syndicate represented by C. H. Martin, following an examination and report by Edwin Chase of Denver. Arrangements have been made for systematic development and production. Additional equipment, including a tube-mill of 100 tons capacity, will be purchased for the new Rankin process plant, it is reported, and it will be opened for custom ore. The test runs on the refractory ore from Black Crook made in the Rankin plant are said to have been entirely satisfactory.

Lake County

W. H. Covey and associates have secured a lease on the Fairplay and adjoining property to the north and west of Adelaide Park. An electric hoist is to be put in and active prospecting started at once.

Ouray County

The White Cloud, near the Guston in the Red Mountain district, is unwatering its shaft preparatory to active development work. Thomas Darby, of Denver, is in charge.

Park County

A new find in the famous old Tarryall placer district has revived interest in Park county. Look Bros. have found gold nuggets in the bed of Deadwood creek, which is a tributary of the Tarryall, and although the property is only 3½ acres, the owners are said to have refused an offer of $50,000.

San Juan County

A rich find has been made by Judson Clevenger on his group of claims on Sheep mountain in the South Mineral Creek district. A 3-ft. vein of ore which assays 2.44 oz. gold and 231 oz. silver has been cut at about 400 ft. from the portal of the main working adit. Officials of the American Smelting & Refining Co. have been spending considerable time at the Silver Lake mine. It is reported that a shortage of lead ore at the Durango smelter has necessitated the operation of the Silver Lake mine by the smelting company and that it will resume operations in a moderate way at once.

San Miguel County

The Nelson mill has resumed operations, and [illegible] are dropping on ore from the Nelson vein, which is under lease to George Hart and I. E. Brown.

Teller County

Work of [illegible] the West Home mill at Cripple Creek is progressing at a good pace under the supervision of Ed. Holmes of the United Gold Mines Co. and John [illegible] McMahon, the Cripple Creek consulting engineer. It may be [illegible] before the treatment of ore can commence. There are many changes to be made, involving an expenditure of several thousand dollars.

IDAHO

Idaho County

S. R. Gayton, general manager for the Idaho Realty, Power & Mines Co., has arrived at Dixie and states that within a few weeks work will start on the erection of a power plant and opening of the placer holdings on Crooked creek.

Shoshone County

Following the recent exposure of a good vein of galena in the Blue Star mine, near Kellogg, the officers of that company have decided to increase their working force in the mine and push development work as fast as possible in the hope of putting the property in the producers' list by next season. The Bullion Mining Co. has a force of 20 men working on the wagon road from Borax to the mine, also repairing the compressor and rebuilding the bunk house which was destroyed by the forest fires of last August. As soon as the road is completed and the buildings erected, sacking will be resumed. With a new wagon road to the railroad, the Bullion will soon be ready to make a shipment of copper ore to the smelter. The Dalmatia Mining Co. has started a new adit on its property on Pine creek. Ed. Hedin, of Wallace, has been elected secretary. The directors of the Success Mining Co. have declared a dividend of $15,000, being the second one of that amount paid by the company. The Surprise Mining Co. is giving its remodeled mill a trial run. The mine is on Pine creek, four miles south of Wardner.

MONTANA

Silverbow County

(Special Correspondence.)—It would appear that the curtailment agreement existing among the leading copper producers of the country is to be continued after its expiration on August 1 until such time as the increased demand for the red metal relieves a large part of the present existing surplus. Such a conclusion is reached from an interview given by John D. Ryan, president of the Amalgamated Copper Co. He said, in speaking of the copper industry: "The surplus accumulation after the panic of 1907 is being gradually worked off, and with a return of good business conditions I look for better times for the copper industry, with considerable increase in the prices for the metal." Then he added: "In the meantime I don't think we are likely to produce any more copper than at present." Mr. Ryan, in reply to a question as to the correctness of the published statement that the Amalgamated Copper Co. had taken over the Missouri River Power Co., said that the published statements were incorrect. He added that the Amalgamated company had not acquired and did not intend to acquire control of any other power company. He said that the company did not have any interest in the Missouri river company and has not for years.

When the new furnace is installed at the East Butte smelter it is estimated that the company will be in a position to produce 2,000,000 pounds of copper per month. This new furnace will make the third, and will be finished in the course of the next three months and possibly sooner, as all the material is now on the ground. While it is not the intention of the company to run the smelter to its full capacity under present copper market conditions, there will possibly be some slight increase, as the company has a large amount of ore [illegible]. When the improvements now being made [illegible] the company expects to be in a position to resume [illegible] immediately.

Some time ago the North Butte company purchased the Berlin company's claim, and as the stockholders of the Berlin were without property, application was recently made to the court for permission to dissolve. The order has been made, and John D. Pope, manager for the North Butte company, W. D. Thornton, stockholder of the Berlin company and also president of the Greene Cananea company, and Harry Holp, also a stockholder of the Berlin company, named to act as trustees in the dissolution proceedings. The Berlin claim is now one of the North Butte's most valuable assets. The Tuolumne company has declared the regular dividend of 15c., payable on August 15. "We can very easily take care of this rate of dividend and meet all obligations without impairing the treasury to any extent," said Mr. Hickey, the president, recently, "but with the market conditions as they are at present, it would be folly to attempt to increase the rate, as some think we would be justified in doing. The market looks good for an improvement, and it would not surprise me to see the surplus largely wiped out, and 13c. copper in the next few months; but we will have to wait until that time arrives before we increase the dividend. We are increasing our ore reserves every day and shipping about 200 tons per day, and when the new equipment is in place we will be in a position to ship at least 500 tons per day to the Washoe smelter." Some parts of the new surface plant have already arrived, but it is not believed that the equipment will be in position and ready to be operated much before the middle or latter part of August. It will be all installed without a delay of more than three days in mining operations.

GREAT FALLS SMELTER.

Butte, July 7.

NEVADA

Churchill County

The test run of one month has been completed at the mill of the Nevada Wonder Mining Co., at Wonder. It consists of a 10-stamp battery (the stamps weighing 1400 lb.), classifiers, tube-mills, concentrating-tables, Chilean mill, and cyanide plant. The capacity is 100 tons per day. It was built by the Mill & Smelter Engineering Co., of New York.

[illegible] County

[illegible] Wheatley and Roscoe [illegible], working on the [illegible] Nevada [illegible] of the Bamberger-Wheatley property, at [illegible], have opened up a vein of [illegible] which they are [illegible] from the new shaft recently sunk on the property, which assays as high as [illegible] per ton.

Humboldt County

The Seven Troughs Coalition Mining Co. is remodeling its mill. [illegible] battery, a Dexter [illegible], and a cyanide plant are to be added, and numerous improvements in the present equipment made.

Lincoln County

The Day Bristol Consolidated Mining Co. has been formed to take over the holdings of the Nevada Utah company and the Bristol Consolidated Mines & Smelting Co. The capital is $10,000,000 in shares of $10 each. Ernest R. Woakes is president and general manager. The Day and Bristol properties adjoin, being on opposite sides of the mountain. The plan of development is to continue the workings of the Day adit through the mountain to connect with the workings of the Bristol. The early workings of the Bristol extend down to the 800-ft. level, and the extension of the Day adit will add to this 800 to 1000 ft. more, giving a total depth of 1600 to 1800 ft. The work on the Day adit will be resumed at once, and when completed will form an ideal outlet for the Bristol [illegible] which will be loaded on the cars at the Day [illegible] of the long haul previously necessary to market the ore. This advantage will make possible the handling at a good profit the immense amount of low grade ore in the Bristol workings which has heretofore been [illegible]. The Pioche Pacific Railroad Co. has also been [illegible] by the same group of men that control this new merger. A new 12-mile line will be built between Pioche and Royal City.

Nye County

The Tonopah-Belmont has struck a good orebody on the [illegible] level, approximately 1300 ft. deep, and has started work on a crosscut south from the shaft. This is the deepest point at which work has been conducted. It is said that [illegible] is being found in the [illegible] of the White Caps at Manhattan. A lease is being worked by F. W. [illegible] and associates of [illegible], who have lately [illegible]. [illegible]

OREGON

[illegible] County

[illegible]

[illegible] County

[illegible]

settled by a decree in favor of the mortgagees. Some time ago the property was sold for $85,000. Fifty thousand dollars was paid in cash and the remainder of the purchase price was held in abeyance subject to notes covering the premises. The property has been operated for many years. The mine has plenty of water and machinery, and is well equipped. Before the sale the mine had been leased for three years to J. R. Harvey. The property consists of 1500 acres, all of which has been patented.

SOUTH DAKOTA

Pennington County

Development work in the mine of the Harvest Mining Co., near Pactola, has been temporarily suspended pending arrangements for the installation of necessary machinery. The company, in which Pittsburg people principally are interested, and of which Frank Sherman has had the management, has been doing some systematic development work and has accomplished a great deal, considering the amount of money expended.

UTAH

Salt Lake County

Some recent figures have credited the Utah Copper Co.'s mines with having 203,800,000 tons of copper ore actually developed, with the probability of having not less than 250,000,000 tons of ore in the mines, which, on an assumed average saving of copper of but 1%, would yield 5,000,000,000 lb. of metallic copper. The life of the property is estimated at 35 to 40 years on the basis of a 20,000-ton daily output, which would give a gross annual production of 140,000,000 lb. of copper.

Juab County

An important discovery is reported as having been made in the [illegible] Beck mine in Tintic district. The discovery was made on the [illegible] level, some distance north of the shaft. The ore carries 30% lead with some silver, and is being shipped. From 60 to 70 tons of ore is being shipped from the [illegible] to the United States smelter, that nets about $2 per ton. The [illegible] has been shipping ore running [illegible] and nearly [illegible] lead. The shipments for [illegible] are expected to reach 30 cars. The Gold Chain mine is making some improvements to its surface equipment, including a second compressor. The United [illegible] has a hoisting plant [illegible] the Buckeye, and is equipped to sink 1000 feet.

WASHINGTON

Ferry County

Special Correspondence.—The [illegible] company has shipped three carloads of ore from a [illegible] at a depth [illegible]. [illegible]

The New York Consolidated company [illegible] toward the [illegible]. [illegible]

The [illegible] of the North Washington Power & Reduction Co.'s mill [illegible]. [illegible]

[illegible]

[illegible], July 8.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

Oscar Hershey is at Juneau, Alaska.

Charles Butters has gone to London.

H. J. Callahan is at Treadwell, Alaska.

L. H. F. [illegible] has been at Butte recently.

John D. Ryan was at Great Falls recently.

Heinrich Ries is on his way to San Francisco.

H. Foster Bain was at Juneau and has gone to Valdez, Alaska.

Falcon Joslin has gone to Fairbanks, Alaska, for the summer.

Frank Keyes, of the [illegible] Gold Mines Co., is at Portland, Oregon.

Tom C. Parker, of Cortez, Nevada, was in San Francisco Monday.

F. A. Hammersmith has returned to San Francisco from Treadwell, Alaska.

J. C. Roberts has returned to Salt Lake City from the Spring Valley oilfields.

W. H. Weed is at Butte in the interests of the Butte Ballaklava Copper Company.

W. H. Storms has returned to Berkeley from an examination of the Rawhide mine, near Towles, California.

E. H. Benjamin has returned to San Francisco from an extended tour through the Eastern cities of the United States.

Philip Argall has returned to Denver, having suffered no further injury in the wreck of the *Spokane* than the loss of baggage.

Whitman Symmes, superintendent of the Union Con. and Mexican mines, has returned to Virginia City, Nevada, from San Francisco.

Arthur J. Hoskin is at Alma, where with **A. B. Patton** and **C. E. Smith**, he is engaged in a study of that district for the Colorado Geological Survey.

Raymond C. Benner, of the University of Arizona, is doing exploration work this summer for Mackenzie & Mann, in the province of Ontario, Canada.

F. H. Probert was at the Ray Central, and is now at the Cactus at Bellevue, Arizona. He will next visit the La Caridad mine at Nacozari, Sonora.

Nelson Dickerman, for the past year assistant to **Newton Cleaveland**, general manager of the Natomas Consolidated, has been appointed superintendent for the Kirtley Creek Gold Dredging Co., at Salmon, Idaho.

Jesse J. MacDonald has been detained in Colorado on professional business. He is now on his way to Victor, Cripple Creek, and Denver, and will leave there July 15 for San Francisco, stopping at Salt Lake City.

Copper Producers' Association Report

The monthly report of the Copper Producers' Association was in all respects rather favorable, the most noteworthy feature being a decrease of over 8,500,000 lb. in stock on hand compared with the previous month. Production for June was some 2,000,000 lb. less than for May. Domestic deliveries fell off almost 3,000,000 lb., but this was more than offset by an increase of almost 9,500,000 lb. in export. The detailed statement follows: Stock of marketable copper of all kinds on hand at all points in the United States June 1 is 165,995,932 lb. Production of marketable copper in the United States from all domestic and foreign sources during June, 124,554,312 lb. Deliveries of marketable copper of all kinds on hand at all points during July, 157,437,164 pounds.

Market Reports

LOCAL METAL PRICES

San Francisco, July 13.

Antimony	12–12½c	Quicksilver (flask)	$48–49
Electrolytic Copper	14–15¼c	Tin	47–48½c
Pig Lead	4.75–5.75c	Spelter	7–7½c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50–9.75, large $7.50–8.50

METAL PRICES

By wire from New York

Average daily prices in cents per pound

Date	Electrolytic Copper	Lead	Spelter.	Silver, per oz.
July 6	12.48	4.50	5.60	52¾
" 7	12.48	4.50	5.60	52⅞
" 8	12.48	4.50	5.60	52⅞
" 9	Sunday		No market.	
" 10	12.48	4.50	5.60	52⅞
" 11	12.48	4.50	5.60	53
" 12	12.48	4.48	5.60	52⅞

ANGLO-AMERICAN SHARES.

Cabled from London

	July 6 £ s. d.	July 13. £ s. d.
Camp Bird	1 9 9	1 9 6
El Oro	1 3 6	1 3 9
Esperanza	1 10 0	1 13 4½
Dolores	1 6 0	1 6 0
Oroville Dredging	0 6 9	0 6 0
Mexico Mines	7 10 0	7 12 6
Tomboy	0 19 0	0 18 1½

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing prices, July 13.		Closing prices, July 13.
Amalgamated Copper	$ 69	La Rose	$ 4⅝
A. S. & R. Co.	80¼	Mason Valley	9⅛
Braden Copper	4⅞	Miami Copper	20¾
B. C. Copper Co.	6⅛	Mines Co. of America	5¼
Butte Coalition	18⅝	Nevada Con	19¼
Chino	23⅝	Nevada Utah	⅜
Davis Daly	⅞	Nipissing	9⅞
Dobie	2⅝	Ohio Copper	1⅝
Dolores	5	Ray Central	1⅝
First National	1⅜	Ray Con	17⅝
Foley O'Brien	1¼	South Utah	⅜
Giroux	6¼	Superior & Pittsburg	16⅝
Goldfield Con	5⅝	Tenn. Copper	41⅝
Greene-Cananea	7	Trinity	4
Guanajuato Con	⅞	Tuolumne Copper	4⅝
Hollinger	13⅝	United Copper	2⅝
Inspiration	8¾	Utah Copper	0
Kerr Lake	6⅛	Yukon Gold	4

COPPER SHARES—BOSTON.

	Closing prices, July 13.		Closing prices, July 13.
Adventure	$ 6	Mohawk	$ 49
Allouez	29	North Butte	32¼
Atlantic	6	Old Dominion	47⅝
Calumet & Arizona	58	Osceola	102
Calumet & Hecla	465	Parrot	11
Centennial	12	Santa Fe	1⅝
Copper Range	60	Shannon	11
Daly West	5⅝	Superior & Pittsburg	16⅝
Franklin	12	Tamarack	34
Granby	38⅝	Trinity	4
Greene Cananea, ctf	6⅞	Utah Con	16¾
Isle Royale	17	Victoria	1¾
La Salle	8½	Winona	8
Mass Copper	8	Wolverine	112

(By courtesy of J. C. Wilson, Mills Building.)

NEVADA STOCKS.

San Francisco, July 13.

Atlanta	$ .15	Mayflower	$ .06
Belcher	.65	Mexican	3.90
Belmont	6.25	Midway	.16
B. & B	.40	Montana Tonopah	.78
Booth	.08	Nevada Hills	3.45
Chollar	.10	Ophir	2.40
Combination Fraction	.08	Pittsburg Silver Peak	.63
Con. Virginia	1.20	Round Mountain	.58
Florence	1.25	Sandstorm Kendall	.08
Goldfield Con	5.55	Savage	.24
Gould & Curry	.18	Tonopah Extension	.90
Jim Butler	.26	Tonopah of Nevada	6.00
Jumbo Extension	.18	Union	1.55
MacNamara	.18	West End	.52

(By courtesy of San Francisco Stock Exchange.)

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS.

NATURE OF OIL AND GAS—LEASE

Oil and gas while in the earth are unlike solid minerals in that they are not subject to ownership from the soil; and accordingly a lease or grant of the oil and gas is in effect a grant not of the oil that is in the ground, but of such a part as the lessee may find, and such a lease passes no estate that can be the subject of ejectment or other real action.

Kolachny *v.* Galbreath, (Okla.) 110 Pacific, 902.

INJURY TO EMPLOYEE IN GYPSUM MINE

The duty of a master to furnish a safe working place for his servant to perform his work does not apply to a person employed in a gypsum mine to break the rock after it has been blasted.

Strepanski *v.* Grand Rapids Plaster Co., (Mich.) 127 Northwestern, 706.

INJURY TO ZINC MINER—EVIDENCE

A person employed as a mucker in a zinc mine was injured by an explosion of a 'missed shot.' In an action for injuries a question to a witness as to how many accidents occurred during a period of three years was properly excluded, and the ruling was harmless where the mine owner was permitted to show that missed shots frequently happened in the mine, as accidents from other causes were immaterial.

Hochshultz *v.* Potosi Zinc Co., (Nev.) 110 Pacific, 713.

CONTRACT FOR PURCHASE OF MINING CLAIM

A contract for the sale of mining claims and stipulating that such claims and all machinery placed thereon in working the mine shall be the property of the vendor until the purchase price is paid, and providing that the purchaser shall work and develop the mine and extract ores and appropriate the proceeds, gives such purchaser the right to prospect and develop the mines, but he can not commit waste or remove from the place any property constituting a part of the realty other than the ore so mined. In such case the machinery on the claim for use in working the mines becomes fixtures attached to the mine, and such machinery can not be attached by the creditor of the purchaser while the purchase price remains unpaid.

Conde v. Sweeney, (Cal.) 110 Pacific, 973.

ACTION ON COAL LEASE—AFFIDAVIT OF DEFENSE

In an action by a lessor to recover the value of coal mined from a small tract of land forming part of a larger tract of coal lands operated under a lease from the plaintiff's predecessor in title to an assignor of the defendant company, the complaint set forth a copy of the lease, the rights of the plaintiff thereunder, the rights and liability of the defendant company, the provision for the payment of royalty, the possession by the defendant of the tract under the lease, the mining of the coal therefrom, and its refusal to account or pay for the coal mined. The complaint also showed a chain of title from the commonwealth to the plaintiff. The defendant by its affidavit of defense admitted the existence of the lease and its possession, but alleged that the tract in question did not belong to the plaintiff or the original lessor, and that it purchased the tract from other parties after the date of the lease, and denied that it obtained any right thereto under the lease, but showed no chain of title in the defendant from the commonwealth. Such affidavit of defense was held to be deficient, and that it was not enough for the defendant to make a bald assertion and that it had a title in fee simple to the land in dispute, without setting forth the chain of title upon which it relied.

Lazarus *v.* Lehigh & Wilkesbarre Coal Co., (Penn.) 77 Atlantic, 817. July 1910.

Recent Publications

EIGHTH ANNUAL REPORT OF THE BUREAU OF SCIENCE, MANILA. By Richard P. Strong. 62 pp.; index. Manila, 1910.

NINTH ANNUAL REPORT OF THE DIRECTOR OF THE BUREAU OF SCIENCE, MANILA. By Paul C. Freer. 70 pp.; index. Manila, 1911.

REPORT OF THE COMMISSIONER OF CORPORATIONS ON THE TRANSPORTATION OF PETROLEUM. 512 pp.; maps, index. Washington, 1906.

ROCKS OF CAPE COLVILLE PENINSULA, Vol. I and II. By W. J. Sollas. 289 and 211 pp.; ill., index. Wellington, New Zealand, 1905.

THE BREMEN OIL FIELD. By J. A. Bownocker. Geological Survey of Ohio, Series 4, Bull. 12. 68 pp., ill., maps, index. Columbus, 1910.

PRELIMINARY STUDY OF FOREST CONDITIONS IN TENNESSEE. By R. Clifford Hall. Tenn. Geol. Surv. Series, No. 10-A. 56 pp.; ill. Nashville, 1910.

REPORT OF THE STATE GEOLOGIST ON MINERAL INDUSTRIES AND GEOLOGY OF CERTAIN AREAS OF VERMONT, 1909, 1910. By George H. Perkins. 361 pp.; ill., maps, index. Bellows Falls, 1910.

SILVER, COPPER, LEAD, AND ZINC IN THE CENTRAL STATES IN 1909. By B. S. Butler and C. E. Siebenthal. From 'Mineral Resources of the United States, 1909'. 41 pp. Washington, 1911.

PROCEEDINGS OF THIRD ANNUAL DRAINAGE CONVENTION. Compiled by Joseph Hyde Pratt. North Carolina Geological and Economic Survey, Economic Paper No. 21. 67 pp.; ill., maps. Raleigh, 1911.

A GEOLOGIC RECONNAISSANCE IN SOUTHEASTERN SEWARD PENINSULA AND THE NORTON BAY-NULATO REGION, ALASKA. By Philip S. Smith and H. M. Eakin. U. S. Geol. Surv. Bull. 449. 146 pp.; ill., maps, index. Washington, 1911.

SURFACE WATER-SUPPLY OF THE UNITED STATES, 1909; HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS. By Robert Follansbee, A. H. Norton, and R. H. Bolster. U. S. Geol. Surv. Water-Supply Paper 265. 231 pp.; ill., index. Washington, 1911.

Daniels Saftey Blasting Cap

There have been many efforts of late years to improve the ordinary detonating cap and at the same time to retain simplicity. The Daniels Safety Blasting Cap is being put on the market with the claim that it fulfills all the requirements of safety, is waterproof, will not crimp, and that misfires will not occur. On account of the Daniels cap having a slight shoulder within ½ in. of the top, a question on one or two occasions has been prompted regarding its insertion into the stick of dynamite. It is as readily placed into the stick as any ordinary cap, to the shoulder, which is all the distance necessary, and is the distance thoroughly in accord with the recommendations of the U. S. Government, that "when a fuse and detonator are used in loading, care should be taken that the detonator is not completely buried in the explosive, for as the fuse burns and fire rushes from its end some of it may blow out over the top of the detonator and set fire to the explosive about it before the detonator is set off. This has been a common cause of inferior and dangerous explosions."

Full information concerning the Daniels cap will be given by the manufacturers, Daniels Safety Mining Cap Mfg. Co., 333 Postal Telegraph building, Chicago.

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EDITORIAL

A FEDERAL income tax law, though it has met with favor, can not be enacted this year, as the number of States which have endorsed the amendment is but thirty one, thirty five being required.

USING FIRE to fight fire is a traditional method of procedure, and a bill has accordingly been introduced in the German Reichstag to create a government monopoly of the oil business, in order to forestall private monopoly.

THE WATER-SUPPLY of New York is some forty million gallons less than at this time last year. New securities issued during the last six months amount to $180,000,000 more than in the same period of 1910. Find the hydraulic equivalent of one share.

SMALLPOX at Dawson has led to a strict quarantine. Passengers for Fairbanks and points down the Yukon are being transferred from boat to boat in the river, without entering the town. The requirement that all persons entering Alaska shall be vaccinated has, however, been rescinded except in the case of passengers traveling second class.

THE TREATY between Great Britain and Japan, recently renewed for a further ten-year period, provides that neither country shall be called upon to engage in war with a nation with which an arbitration treaty is in force. This has little more than academic value, for it was not within the bounds of possibility that the material interests involved in the alliance of the Anglo-Saxon and Oriental would ever have prevailed to bring on conflict between Great Britain and the United States. Business is business—but blood is thicker than water.

THE RAND is as unfailing a source of interest as of gold. During June the production rose above all previous levels, with the stupendous total for the month of 684,300 ounces, and the end is not yet. On a following page we have the pleasure of presenting an abstract of the James Forrest Lecture for 1911, recently delivered before the Institution of Civil Engineers. Mr. F. H. Hatch has been so closely identified with the advance of Rand practice that his presentation of present accomplishment and prophecies of progress is of unusual interest.

MUTUAL BANK insurance has been advocated at a recent meeting of the Wisconsin Bankers' Association, and it was proposed to organize a corporation for that purpose. Mr. Albert J. Beveridge has pointed out the advantages of the Canadian system of banking, where the increased use of credit and business confidence offers an advantage over our own more restricted methods comparable to the advance which the latter shows over the Chinese system of accepting coins only at what is practically a bullion valuation. The United States has grown enormously in the last hundred years, and the clothing provided for the boy often proves but ill-adapted to the needs of the man.

HOT WAVES are sources of much discomfort, and the one which has recently swept over the Central and Eastern United States has been extraordinarily oppressive, so much so that manufacturing and business houses were temporarily closed in some cities. In others, ice sold for ten times its usual price, and in all the toll of deaths among the children of the poor has been heavy.

BRITISH COLUMBIA has proved so attractive a field for American capital that our British cousins have felt some alarm. Some years since, Mr. A. R. Calquhoun prophesied that British Columbia was destined to produce a superior race of Englishmen, but Oriental immigration and American capital seem to have complicated the progress of orthogenesis. The most interesting situation of recent years was that of the past month in London. The Coronation attracted universal attention, while the Imperial Conference had but little interest for press and public. Yet the most loyal Briton would perforce admit that the relative national importance of the two events is exactly in reverse ratio. Great Britain's children have grown to the stature of manhood; their needs of a right demand a hearing. The new spirit in Imperial policy is evidenced by the Australian resolution providing that the rights of any Dominion shall not be infringed by a conspiracy of other Dominions. Oversea problems do not always admit the solution most readily applied at home. Canadians and Australians have met the forces of nature and tamed them to their service; their problems of larger development will be as adequately solved.

BUSINESS GEOLOGY, as distinguished from economic geology, is the term suggested by a friend to the well directed underground study of mineral deposits. The scientist does not scruple to sacrifice time, money, and health in his search for truth; the business man, seeking to apply truth to material ends, properly weighs the value of all three. Often a careful study of a situation will reveal methods by which all essential information can be obtained at but a fraction of the cost of the most obvious method of search. Mapping is an art that is unobtrusive, lacking the dramatic features of driving drifts and cross-cuts, or the sinking of diamond-drill holes. Yet often by careful mapping more accurate and illuminating information can be obtained than by the physical method; the more so if the geological engineer can not personally examine each bit of evidence disclosed by exploratory work. Significant features may thus be overlooked, and a large part of the value of the work lost. An old aphorism runs, "A poor workman always complains of his tools." Conversely, poor tools, skilfully applied, will produce astonishingly good results. The demands of business call for the maximum of production, the last horse-power of the engine, the last cubic yard of the dredge and steam-shovel, and maximum results from the minimum of work.

The Porcupine Fire

Last week the series of fires which had been devastating the province of Ontario culminated in an outbreak which has swept a large area centring about Porcupine. The early reports of loss of life were, as usual, much exaggerated, but many died in the effort to save property in the path of the flames. Those who took refuge in mine workings were suffocated by the gases of combustion; others took refuge in the lake and were drowned. The loss of surface equipment has apparently been almost complete; reports from the Dome, where the fire seems to have raged most fiercely, being to the effect that only the heavy portions of machinery, mortars, tube-mill shells, and large pumps, survived the flames, while the heavy Merrill presses were almost uninjured, the concrete foundations having suffered more. The Hollinger mill had already been destroyed by a previous fire, so that only the progress made in rebuilding has there been lost. At the other properties losses are heavy, but since no deep shafts have yet been sunk, exploration being confined to drilling and surface work, the loss is not so serious as it would have been at a later period of development. Like most disasters, it is not without its compensating advantages, for the area thus cleared will be easier to prospect, though this has been dearly bought. No word has yet been received as to the amount of damage which the railroad has suffered, an important factor in forecasting the effect of the fire upon the development of the area. Not improbably reconstruction will hinge upon ability to secure timber; the local supply has been destroyed, and much must be done before another winter lends its aid to the northern method of getting out lumber. Reconstruction must, therefore, depend upon lumber shipped from stock over the railroad, which will add greatly to the expense of rebuilding. Porcupine, though its possibilities were, like those of all new mining districts, greatly exaggerated at the beginning of prospecting, possesses deposits of demonstrated value, of which the development will be but hindered by the unfortunate outbreaks of forest fire. The undergrowth having been burned away, subsequent fires can scarcely occur, so that further damage seems now remote.

The Mexican Unrest

The situation in Mexico, from a commercial standpoint, is now quite as serious as at any time during the revolution. While hostilities were in progress every effort was made to prevent unnecessary interference with the conduct of business, and it is indeed remarkable how successful these efforts were. With the advent of peace more disturbed conditions have arisen, strikes have been declared, and large and important plants have been obliged to close. This is but a natural outcome of a civil war, as was instanced by the disturbed conditions during the reconstruction period following our own Civil War. A strong hand is needed to control the situation; during a period of readjustment this can not always be instantly applied where needed. The slaughter of the Chinese at Torreon is an indication of one of the chief causes of Mexican unrest. In many parts of Mexico, trading is in the hands of Chinese merchants, and large industries are in the hands of foreign investors, backed by foreign capital. It is but natural that Mexicans, seeing the growth resulting from foreign initiative, should feel pangs of jealousy, one of the most human of vices. It is no less ill-advised, however. The development of natural wealth by the citizens of a country is the best course to follow, but lacking local initiative and capital, development by outside capital and energy is better than to have it lie dormant for an indefinite period. No one would seriously contend that it would be good policy for a man to bury a million dollars in the ground, to be dug up by his grandchildren. He should securely invest it, rather, so that the grandchildren may receive it, tripled by its accrued profits. Yet there are not lacking those who advocate the holding of natural wealth until it can be developed in accordance with theoretic standards of efficiency. This is not a defence of reckless squandering of natural resources, but rather an attempt to point out the possibility of erring upon both sides of the line. Foreign enterprise in Mexico has not been an economic loss to the Republic; out of it has come the schooling of the natives in methods of industry and an increase of knowledge of resources and methods of exploitation, that is cheaply purchased at the expense of dividends returned to foreign shareholders. The profits from the increased amount of money in circulation and more steady employment, may easily be greater than those resulting from exploitation of natural resources by other methods. Much the same problem is faced by the mine owner whose work upon a small scale affords him but a small margin of profit. It is only natural that when, after having transferred a controlling interest in his mine for a substantial consideration, he beholds large profits accruing to others, he should exhibit a tendency to overlook the fact that his own profits are much greater than before. Mexico is not a tree with but one peach upon it, great fields for exploitation by native *entrepreneurs* still exist, and the wealth brought to Mexico by foreign enterprise will be a welcome asset in their development.

The development of foreign enterprise in Mexico offers a curious parallel to the growth of foreign organisms in the body, the antitoxin developed in this case being the funded knowledge of the Mexican people which has accrued through their intercourse with foreigners. Americans and English have brought with them an atmosphere of progress, and an air of enlightenment, that being breathed, must needs have marked effect. From it has arisen a demand for greater political and industrial freedom that, making itself heard but uncertainly at first, has now become unmistakable. In the adjustment to new conditions some discomfort will be felt; Republics and children alike are subject to 'growing pains.' The best interests of Mexico are not to be found in the hampering of foreign enterprise, nor is it likely, judging from previous experience, that the real leaders of Mexico will mistakenly believe the line of progress to be in that direction.

Merging Professional Societies

Consolidation of the Mining and Metallurgical Society and of the American Institute of Mining Engineers is now under consideration, committees having been appointed from the two societies to discuss the matter. On many accounts it is to be hoped that a feasible plan of uniting the two organizations may result from the negotiations. We have recently reviewed the work of the Mining and Metallurgical Society and the newer plans for the American Institute of Mining Engineers. It is clear that the council of the Institute is now willing, to a large degree, at least, to take up the work, neglect of which led to the formation of the new society. Whether the whole program of the latter can be in some manner incorporated into that of the Institute is not certain, but we see no insuperable difficulties. The Mining and Metallurgical Society has attempted three things in particular: the setting of higher standards of membership, the promotion of acquaintance and coöperation, and the provision of means for formulating and expressing opinion in reference to public matters affecting the profession. The Institute, by providing for the organization of local sections, has frankly adopted one of the essential features of the younger society. In maintaining a distinction, however nominal it has actually become, between members and associates, it recognizes differences in grade of membership. It would not seem foreign to its constitution to establish still further grades, such as are recognized by the majority of the leading professional societies. An engineer who has served seven years 'in a position of responsibility' may fittingly be called upon to assume larger responsibilities in a professional society, and his opinion is entitled to more weight than is that of a young graduate, or any of those whose main activity is in lines but secondarily related to mining; such as civil, mechanical, or electrical engineering proper, manufacture and sale of machinery, selling mining securities, or practising mining, etc. There should be a place in the Institute for all these, and indeed, for everyone connected with mining, but there should also be some gradation of responsibility and authority corresponding to experience and demonstrated ability. If some plan be adopted, and many suggest themselves, of bringing together out of the large membership of the Institute those who by experience and training are better qualified to express an opinion, no harm can come to the Institute and great good may result to the country and the profession by providing means for formulating and announcing such opinions. At present any such action is specifically prohibited by the constitution of the Institute, but if it be agreed that the action is desirable, the constitution can easily be amended. It is not certain that the particular plan adopted by the Mining and Metallurgical Society is the best, but with the experience of the last three years as a guide, a satisfactory scheme should be evolved. It is well known that if, three years ago, the council of the Institute had been willing to adopt its present attitude, the Mining and Metallurgical Society would not have been formed. In bringing the older institution to adopt the essentials of their program, its projectors and supporters will do a greater piece of work than that of organizing and maintaining a new society. We believe the Institute can and should adopt the three essential features of the plan of the Mining and Metallurgical Society. That being done, the two should promptly be joined. If the object be accomplished, there can be no good in maintaining an unnecessary organization, but the members of the Mining and Metallurgical Society are entitled to insist upon the essentials of their program being adopted; the form and name are unimportant. Among various proposals for methods of merging the two societies, it has been suggested that the Institute adopt the existing local sections of the Mining and Metallurgical Society and provide for additional sections as demanded. That each section add to its membership as it will, but that no one be elected member of the local section who is not first a member of the Institute, and second, who does not have all the present qualifications for membership in the Mining and Metallurgical Society. The basis of this plan is the fact that the bond of union in a National society is less close than is a local one which meets frequently and brings its members into intimate contact. A man may readily have associates in a large society that he would not care to know intimately and meet frequently at dinner. It is undemocratic, but it is human nature. There is little question that the principal benefit that has come to members of the Mining and Metallurgical Society has flowed from the small, frequent, and intimate meetings of the local sections. If all the present membership of the Institute resident in any given district is to become at once entitled to membership in the existing local organizations, their character will be entirely changed. Whether for better or worse no one may surely predicate. We have no desire to embarrass the excellent committees now having the matter under consideration by advocating any specific plan. We would, however, urge the union of the societies, since otherwise rivalry and its perils seem ultimately inevitable.

As we are about to go to press, word is received that the joint committee has recommended affiliation to the extent of joint meetings, both of the parent organizations and of local sections, a closer union having been prevented by the insistence of the Mining and Metallurgical Society upon preserving its identity and organization. It is to be regretted that this has proved to be the case, though it, too, is human nature. It is not impossible that a period of joint action in the manner proposed may demonstrate that a merger is feasible, after all, or other lines of progress may develop. Some good has been accomplished.

The Rand Gold-Mining Industry and its Future

By F. H. Hatch

*One important result of the perfecting of the slime-treatment process, on the Rand, has been the introduction of fine grinding in tube-mills,[1] with consequent increased extraction and shortened treatment period. Further, the adoption of tube-mills has modified the function of the stamp-mill. The stamp-mill, which formerly was not only the sole means employed for the comminution of the ore (excepting, of course, a preliminary reduction in jaw-crushers), but also performed the function of an amalgamating machine, by the introduction of mercury into the mortar-boxes, is now, in most modern practice, restricted to a single stage in a continuous series of crushing operations. **The researches of Caldecott and other members of the** Mines Trials Committee, have shown that the maximum diameter permissible for the battery-feed is $1\frac{3}{4}$ in., and that tube-mills are most efficient when fed with ore discharged through a 9-mesh battery-screen having apertures of 0.27 in., or say $\frac{1}{4}$ in. The effective range of the stamp-mill is, therefore, from $1\frac{3}{4}$ to $\frac{1}{4}$ in. As a result, stamps are no longer employed for fine crushing, and amalgamation in the mortar-boxes has been completely abolished; even plate-amalgamation in front of the stamp-mills has in many cases been done away with. In the most modern mills of the Rand the plate area has been much reduced.[2] Some enthusiasts have gone so far as to suggest that amalgamation might be dispensed with altogether, and the gold equally efficiently, and more economically, recovered by an all-cyanide process, in which the ore would be initially crushed in cyanide solution, instead of water. But the difficulty, which at present appears insurmountable, is to find a means **of giving the coarse particles** of gold a sufficiently long **treatment to effect complete solution without unduly delaying the whole process.**

In the newest plants the amalgamating tables are assembled, **together with the precipitation boxes for the cyanide** solution, in a separate building (known as the reduction-house) to which the tube-mill pulp and the enriched cyanide solutions are conducted. In this building the gold is recovered, away from grease and oil, and under conditions which render amalgam-stealing (so serious a source of leakage in the past) practically impossible. Furthermore, the running time is increased, since the stamps no longer **have to be hung up while the plates are being dressed.**

Concurrently with the limitation of the effective range of the stamp-mill, the weight of individual stamps has been increased by lengthening the heads, until, with the 2000-lb. stamp of the new mill of the City Deep mine, the economic limit of the cam-lifted gravity stamp appears to have been reached. The advantages of heavy over light stamps are thus summarized by Caldecott:[3] (1) Reduction of initial capital expenditure in erecting a lesser number of stamps and a smaller building to contain them. (2) Less shafting, belts, and other moving parts to maintain. (3) Less labor for dressing plates, lubricating moving parts, changing screens, and other work incidental to milling operations. **The capital charge of a modern reduction plant per ton** milled is one-third of what it was fifteen years ago, and the total ore-treatment cost is about 3s. 6d. per ton, the recovery being from 93 to 96%, according to the grade of the ore.

The stamp-duty (or tonnage crushed per stamp in 24 hr.), which twenty years ago, in the days of the 900-lb. stamp and fine-mesh discharge screening, did not exceed 3 tons, has gradually grown to an average of 7.45 tons for the whole Rand in 1910; and recent experiments have shown that by crushing to an aperture of 0.284 in. and by introducing an elimination screen to 'by-pass' the fine material from the rock-breakers direct to the tube-mills, it can be raised to as much as 26 tons per stamp.[4] W. A. Caldecott and E. H. Johnson now propose to break the mill ore-feed down to $\frac{3}{4}$ in. cube (maximum) and to separate 50% of the total for direct tube-milling.[5] This will still further increase the stamp-duty. It is obvious that under the conditions now obtaining, 'stamp-duty' has come to have very little meaning as a measure of milling capacity. The bulk of the work is done by tube-mills. In most modern plants one tube-mill (22 by $5\frac{1}{2}$ ft.) is being installed to every ten heavy stamps; and the latter only reduce 30% of the mill ore-feed to the required fineness.

MAP OF SOUTH AFRICAN GOLDFIELDS.

Now that the stamp-mill has been shown to be a crushing machine, representing only one stage in a series of successive comminuting operations, namely, (1) by rock-breakers, (2) by heavy stamps, (3) by tube-mills, it may be questioned[6] whether the work of the stamps (reduction, say, from 1 in. to $\frac{1}{4}$ in.) could not be equally well done either by rolls or by roller-mills of the Chilean type, or perhaps by a combination of both. This combination is favored in the United States. According to Philip Argall, 6-ft. **Chilean mills running at 33 r.p.m., on Cripple Creek** ores, **will reduce 4 tons per hour, 60% of which will pass a** 150-mesh (0.003-in.) aperture, the feed having been previously rolled to pass a $\frac{3}{8}$-in. aperture. In this case, rolls **and Chilean mills do the work of stamps and tube-mills on the Rand.**

The charge is sometimes made that the Rand metallurgists are unduly conservative, and that they are averse to the introduction of new processes, which may even have been shown to be successful elsewhere. But this conservatism is justified; the scale of operations on the Rand is so enormous that even minor changes in existing practice cannot be risked, without prolonged investigation and actual trial, under regular working conditions on the spot. The seriousness of even a small loss per ton, which might result from an unwise change of practice, is shown by the fact that on one of the largest plants a difference of one-tenth of 1 dwt per ton is equivalent to £18,000 worth of gold per annum. Before leaving this part of the subject, I will give some details of one of the latest mills erected on the Rand, which will serve to illustrate the methods employed for the mechanical handling of the ore at the surface.

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*Abstract of the James Forrest Lecture for 1911, delivered before the Institution of Civil Engineers.

[1] First introduced on the Rand by J. R. Williams, in 1904. See *Journal* Chem. Met. and Min. Soc., S. A., Vol. VI, 1906, p. 373.

[2] The Simmer & Jack plant has now only eighteen stationary plates in the tube-mill circuit in place of the sixty-four battery plates and thirty shaking tube-mill plates. Dowling, *Trans.* Inst. Min. Met., Bull. 79, 1911.

[3] *Trans.* Inst. Min. Met., Vol. XIX, 1909-10, p. 71.

[4] E. H. Johnson, *Journal* Chem. Met. and Min. Soc., S. A., Vol. XI, 1910, p. 165.

[5] Letter of W. A. Caldecott to the author.

[6] This question has been raised by Philip Argall, *Eng. & Min. Journal*, Jan. 7, 1911, p. 44. See also H. Bayldon, 'Notes on Chilean Mills,' Inst. Min. Met. Bull. Bull. 75, 1910, p. 21, and S. J. Speak, *ibid.* Bull. 77, 1910, p. 5.

The City Deep mill is designed to handle 65,000 tons of ore per month, and is equipped with two hundred 2000-lb. stamps and nine 22 by 5½ ft. tube-mills, each unit of ten stamps being operated by a 50-hp. motor, and each tube-mill by a 100-hp. motor. The ore from the mine, delivered at the shaft-head in 5-ton skips, is divided into two classes by screening through grizzlies, the bars of which are set about 2¼ in. apart; the fine material is conveyed by a 20-in. belt direct to the main ore-bin, the coarse is taken by four 30-in. inclined sorting belts to the crushers, which are placed on the top of the main ore-bin, each belt feeding three 12 by 24-in. jaw crushers. The return portion of each sorting belt receives the rejected 'waste' and delivers it to a 20-in. belt (common to the four sorting belts) which conveys it to the waste-dump. The main ore-bin, which has a capacity of 1000 tons and is constructed of reinforced concrete, discharges through heavy doors, operated by compressed air, into 40-ton trucks for transport to the mill. The ore train is drawn by a 25-ton electric locomotive, operating, through overhead transmission, on the 2000-volt, 50-cycle, 3-phase current furnished by the power company. The trucks are fitted with automatic discharge doors.

In the stamp battery the ore is crushed to pass a 10-mesh discharge screen. The resulting pulp, after elevation by a 12-in. Robeson-Davidson sand pump, is classified in cones, and the coarse product delivered to the tube-mills. The product from the tube-mills, together with the overflow from the classifying cones, is conducted to amalgamating tables in the gold-recovery house. In this house are also placed the extractor boxes for the enriched cyanide solution, the clean-up machinery, and the refinery; so that all the operations connected with the recovery of the gold are performed in one building under the immediate supervision of the ore-reduction officer. The pulp from the amalgamating tables is again elevated by a Robeson pump and classified, the sand being collected in six vats[8] of reinforced concrete. A 24-in. conveyor-belt running under the centre line of these vats, takes the sand, excavated from them by a Blaisdell excavator, elevates it and delivers it by means of a belt, running at right angles, to the top of the sand-leaching plant, which comprises two rows of six vats[9] each. The sand is fed in by a Blaisdell distributor, and after leaching is discharged by a Blaisdell excavator through central chutes to two 24-in. conveyor-belts, one under each row of vats. A short cross-belt delivers it to a 24-in. inclined belt, which conveys it to the residue-dump. This belt is carried on a steel cantilever frame, the end of which is 100 ft. above the surface of the ground. The slimes are collected in four conical-bottom collectors[10] built of reinforced concrete. They are treated in two steel conical-bottom air-agitation vats, 32 ft. diameter and 38 ft. deep, and washed in eight steel conical-bottom wash vats, 40 ft. in diameter by 16½ ft. and 24½ ft. deep.

In the plant just described it will be observed that from the moment the ore is delivered at the shaft-head until the residues, containing only 5% of the original gold content, are finally deposited on the dump, the various products are conveyed from point to point, either by water, moving under the influence of gravity supplemented by sludge-pumps, or by purely mechanical appliances. In other words, native labor has been practically eliminated from the surface operations of the City Deep mine.

The search after labor-saving devices has been forced on the mine-owners by the fact that, in spite of a substantial growth, the supply of native labor has never equaled the demand, a position which has been accentuated by the repatriation of the Chinese. Shortly before the outbreak of the Boer War in 1899, the natives employed in the gold mines numbered 97,000. In January 1903, six months after peace had been declared, the number was 44,000. In January 1904 it had risen to 68,000, and by January 1905 to 83,000. In January 1910 it reached 163,000, and in January 1911 185,000. The number of natives employed in the gold mines at the end of April this year was 194,328, the largest number of colored laborers ever employed on the Witwatersrand mines. As to the present requirements, I cannot do better than quote from H. H. Webb's report to the Consolidated Gold Fields, dated October 1, 1910. In estimating for the next twelve months he writes: "To make up the present shortage in the operating mines and fulfil the requirements of the expanding companies, amalgamations, and new companies coming on, will call for probably another 70,000 natives at least, in addition to those already employed."

NATIVE LABORERS RESTING ON SUNDAY.

Efforts are being made to attract the native to the mines by improving the conditions under which he lives, both on and off shift. One important innovation has been the curtailment of night-work. Thus, in the mines under the control of the Consolidated Gold Fields, only 7.4% of the total colored laborers working underground at the end of 1910 were employed on night shift. This method of working the mine with one instead of two shifts has been found to have many advantages, from both a hygienic and an economic point of view. To mention only one, the condition of the air in the mines has much improved by the limitation of machine-drilling and blasting to once in 24 hours; and by the fact that there is an interval of about 14 hours between shifts, during which the smoke can clear away and the workings cool down. Another step in the right direction has been the provision of shelters at the shaft-head, and the erection of covered ways between the shaft-head and the compound, for use in inclement weather,

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[7] Taken from a description given in the *Journal* of the Chem. Met. and Min. Soc. S. A., Sept. 1910. One of the first installations of this kind was made at the New Kleinfontein mine by E. J. Way, by whom it has been described in the *Proc.* Inst. Mech. Eng., 1907, p. 969.

[8] 50 ft. diameter by 10 ft. deep.

[9] The vats measure 56 ft. in diameter by 12 ft. deep, and are of steel set on a floor and supports of reinforced concrete.

[10] Of 60 ft. diameter by 10 ft. and 16 ft. deep.

The 'boys' come up from their work hot, tired, and dirty; the protection thus afforded them from the bitterly cold winds that blow during the winter months, and the warm shower bath that is now insisted on in many mines, will do much to mitigate the pneumonia scourge that used to be so prevalent among native miners on the Rand.

Efforts have been made to solve the dust problem underground. With few exceptions, the Witwatersrand mines are dry mines, and the processes of machine-drilling, blasting, and shoveling consequently create and distribute through the air great quantities of fine dust. Fortunately, the gold mines enjoy an important distinction from coal mines in regard to this phenomenon, owing to the fact that the dust is non-inflammable and therefore does not lead to explosions. But the inhalation of the dust-laden air causes a peculiar disease, known as miners' phthisis or silicosis, as it is also termed—a deadly complaint which is responsible for a high mortality among the white miners, and to a less degree among the native laborers. By the proper application of water at the point of origin, the formation of dust can be prevented to a large extent; and several ingenious devices have been invented for catching the dust from the upward holes, into which water cannot be poured from a can, in the manner usually adopted with downward holes.[11] The chief difficulty, however, appears to be to get the men to use the dust-arresters, and to water down the stopes and other working places after blasting. By better supervision and a stricter enforcement of regulations, such difficulties will doubtless be overcome; and, with the disappearance of this serious evil, the conditions under which the men work underground will be scarcely less healthy than on the surface.

This brings me to the question of ventilation. In the early days of the Rand, and, indeed, until quite recently, it has not been found necessary to employ any artificial system of ventilation, the numerous shafts and outlets to the surface of the outcrop mines having sufficed to maintain an ample supply of fresh air. But with deeper levels (the Village Deep mine is already working at a vertical depth of 4000 ft.), fewer communications with the surface, and an increased rock temperature, artificial ventilation is destined to play an ever more and more important part in the future. Stuart Martin[12] gives it as his opinion that it will be impossible to work the deep levels economically without carefully thought-out schemes of ventilation, and that to secure success it will be necessary to have shafts with small frictional resistance and large air space, and to carry the air current through special ventilating roads.

The quantity of pure air to be supplied per minute, per man employed underground, is fixed by law at 70 cu. ft. This being a standard difficult to enforce, the South African Mining Regulations Commission, in a report published in 1910, proposes, as a substitute, the quality standard of a maximum of 20 parts by volume of carbon dioxide per 10,000 parts of air. Of this, 4 parts is an allowance for the CO_2 normally present in the atmosphere, 3 parts are allowed for the CO_2 produced by the burning of candles, and there is a further allowance of 5 parts for the CO_2 possibly given off from the country rock, leaving 8 parts per 10,000 as a legal limit for the noxious CO_2 due to the vitiation of the air by blasting, human emanations, etc. Under the proposed regulations, provision is to be made on each mine for a permanently up-cast and a permanently down-cast shaft, by the use of ventilating fans or otherwise, and the current of fresh air so produced is to be split by regulating doors at every level, where work is carried on, in proportion to its requirements. Further, the courses of pure supply and foul return are to be kept distinct by bratticing; and short circuiting is to be prevented by disused drifts and stopes.

The ventilation problem has already been seriously attacked on the Rand, and ventilating fans, varying in capacity from 50,000 cu. ft. per minute, at 1-in. water gauge, to 250,000 cu. ft. at 4-in. water gauge, have been installed at the East Rand Proprietary, at the Simmer Deep, at the Village Deep, at the Langlaagte Royal shaft of the Crown mines, and at several other mines of the Eckstein-Rand mines group. In splitting the air-current, the numerous dikes of igneous rock that traverse the Witwatersrand mines in a north and south direction (across the strike), can be made to serve as natural brattices, since they divide the mines into air-tight compartments. The levels which penetrate these dikes must be permanently closed, or, if used for tramming purposes, closed by double swinging-doors.

The ventilation of the mines is hampered by the small air-space and large frictional resistance of the rectangular timbered shafts at present in use on the Rand. For this reason many of the deeper shafts of the future will, no doubt, be of the circular type, with either brick or concrete lining, as is the common practice in the collieries of this country.[13] Main levels and underground inclined shafts will also be driven in the foot-wall. These will serve as intakes for the air-current, and, being in solid ground, will reduce the loss of air by short-circuiting to a minimum. Since these main ventilating roads, instead of following the irregular course of the reef-plane, are driven straight, they will also be admirably adapted for cheap mechanical transport.[14]

The ore broken in the stopes has, in the past, been trammed by hand on light rails, from the stoping-boxes to the loading stations at the shaft, in cars of from 12 to 16 cu. ft. capacity. When the ore was being transported on every level, through tortuous and badly graded roads of the customary small dimensions, scarcely any other method was possible. It is true that the late Wager Bradford, some few years ago, did attempt the introduction, at the Langlaagte Deep, of a mono-rail system of tramming; and it was also tried by E. J. Way at the New Kleinfontein mine. It has not, however, been generally adopted, on account of the expense of installation.

Under the changed conditions now prevailing on the Rand, due to the enormously increased size of the properties brought about by recent amalgamations, and the consequent possibility of concentrating a large output at fewer main hoisting shafts than before,[15] the evolution of an entirely new system of underground transport is being accomplished. It is becoming recognized that the rock, broken in the stopes, can only be economically dealt with by handling it on a few main haulage-levels situated at great intervals apart and driven straight, from point to point, in the foot-wall of the reef. The rock mined above each haulage-level can be delivered through vertical or inclined chutes, and should it be necessary to feed the haulage with rock mined below the level, such rock can be raised through inclined roads by mechanical haulage or electric hoists.[16] These main haulage-roads (which, as already explained, are intended to serve also as the intake of the fresh-air current) can, on account of their economic importance, be constructed of large dimensions. They can also be carefully graded and equipped with heavy rails. Such a system is being carried into effect at the Crown mines, where the two main hoisting-shafts are to be connected at a vertical depth of 2200 ft., by a main haulage-level 14½ ft. wide. This gallery is being driven, in the foot-wall of the reef, from one end of the property to

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[11] Mr. Aymard's device for this purpose promises to be successful.

[12] *Journal* Chem. Met. and Min. Soc., S. A., Vol. XI, 1910, p. 214.

[13] Already a circular shaft of large dimensions is being sunk on the New Modderfontein mine.

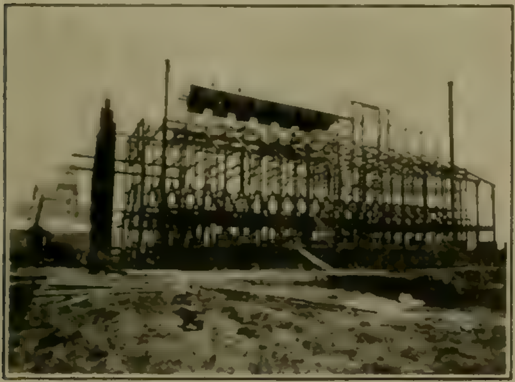
[14] See H. Stewart Martin, Chem. Met. and Min. Soc., S. A., Vol. XI, 1910, p. 214.

[15] Thus the Crown mines (late Crown Reef, Crown Deep, Robinson Central Deep, South Rand, Langlaagte Deep, Langlaagte Royal, and Paarl Central) are concentrating on two shafts the hoisting done, prior to the amalgamation, through seven shafts. Rand Mines Report for 1910.

[16] Compare 'The Kimberley System of Handling Large Quantities of Ground in the Minimum of Time', a paper read by Alpheus Williams at the Kimberley Meeting of the South African Institute of Engineers, 1910.

[illegible] and the plant [illegible] by [illegible] it will be operated by an electrically driven [illegible] so [illegible] that the ore may be hoisted [illegible] shaft [illegible] it is estimated that the [illegible] will be [illegible] from 9000 to 10,000 tons of ore per diem.[17] Other [illegible] will be driven [illegible] of [illegible] to take the [illegible] Similar work is being done at the New Modderfontein [illegible] and at the Modder B [illegible] system will become general.

Endless-rope haulage [illegible] be used with advantage where the roads are straight; where there are many curves it is preferable to draw the ore trains either by petrol locomotives as at the [illegible] Deep, or by electric locomotives as at the [illegible] Proprietary mine. With the latter system some difficulty is experienced in completely insulating the electric current lines, the raw and careless native [illegible] The bold policy of driving these straight haulage roads in the foot-wall of the reef, even before the orebody has been blocked out, as is being done at the Crown, New Modderfontein, and Modder B mines, is an interesting indication of the confidence of the Rand engineers in the relative permanence of the gold content of the banket [illegible], as compared with quartz veins. The big intervals at which the reef levels are now being driven is another indication of the same confidence.[19]



MILL OF BRAKPAN MINES LTD.

CROWN MINES MILL.

The handling of the broken rock in the stopes is, from an economic point of view, scarcely less important than haulage on the levels. Everything depends on the angle of dip of the reef. In many of the outcrop mines of the Central Rand the high dip of the reef permitted the rock broken in the stopes to find its way by gravity to the tramming level, where it was drawn off as required from the stope-bins; but with the dips of from 25° to 30° obtaining in most of the deep-level mines, the broken rock requires to be assisted down the stope floors by shoveling. Only in the extreme East Rand, where the reef lies very flat (dipping at from 8 to 10°) is it possible to fill the cars at the stope-faces and to run them thence direct to the tramming levels. Shoveling is uneconomical, and moreover, is detrimental to health on account of the dust it raises. Consequently, several attempts have been made to substitute for it some conveyor system of handling the broken rock. E. J. Way has described the method he employed at the New Kleinfontein mine, by which a very large reduction in the number of unskilled laborers employed in shoveling [illegible] in the stopes was effected.[20] Mr. Way's stope-conveyors are shaking chutes consisting of steel plates 18 in. wide and 8 ft. long, the ends simply [illegible] according to the [illegible] of the stope, from [illegible] ft. They are suspended by short chains from the roof and [illegible] to the working face of the stope, and are operated by one or more men, according to their length, who pull at ropes attached to the upper ends of the conveyors. Kept in motion by the jerks, the ore slides down the conveyor and is discharged at the lower end into stope-bins, or direct into cars at the tramming level. Being easily dismantled, the conveyors can be taken down before and put up after each blast. When the working face has advanced about 6 ft. they are hung in a new position close to the face of the stopes, a series of small holes being drilled in the roof to take the hook-bolts carrying the chains. Many of these shaking chutes are now in use on the Rand, and are usually hung from a rope stretched taut along the roof. Each chute length is attached by chains hooked on to clips permanently fastened to the rope at proper intervals. Before blasting, the chutes are unhooked from the rope, which, in most cases, can be left on the roof. When shifting to a new place, it is only necessary to attach the rope to the roof, by drilling a few holes in line, without having to keep the exact distance of the chute lengths.[21]

The breaking of the ore in the stopes is performed to a very large extent by hammer and jumper drill work, and since this work requires the largest proportion of the native labor employed on the Rand, it constitutes a serious problem, not only on account of the perennial difficulty of obtaining a sufficient supply of natives, but also on account of the time lost in lowering and raising such great numbers of men. The problem can be solved only by increasing the efficiency of the native laborer; or, in other words, by increasing the tonnage broken per native employed. Labor-saving devices for handling the ore when broken have already been dealt with. It remains to discuss the efficacy of machine-drills in stoping, as compared with hand labor.

(To be continued.)

TALC is usually marketed as rough from the mine, sawed into slabs, and made up into manufactured objects such as laundry tubs, or ground into powder. In 1910, 69% of the talc was ground and 21% made into slabs and manufactured. The product of New York is practically all ground. Vermont ranks second and produces both ground talc and soapstone. Virginia, the third in rank, produces some ground talc, but a large amount of soapstone, in the production of which it outranks all other States.

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[17] The greatest output of any existing shaft on the Rand today probably does not exceed 2000 tons per diem.

[18] E. J. Way, in a letter to the author, states that he is experimenting, with considerable success, on a conveyor-belt system of transporting ore. Each section of belt will be driven by a separate motor and will feed on to the next section by means of a specially designed chute.

[19] Thus in the New Modderfontein mine the reef-levels will be driven at 500 to 600 ft. apart, and the main haulage-levels, in the foot-wall of the reef, at 1700 to 2000 ft. apart. (Chairman's speech attached to Report for the year 1910.)

[20] Proc. Inst. Mech. Eng., 1907, p. 989. With seventy conveyors in use, Mr. Way employed 420 less men in the stopes than when shifting the rock by shoveling.

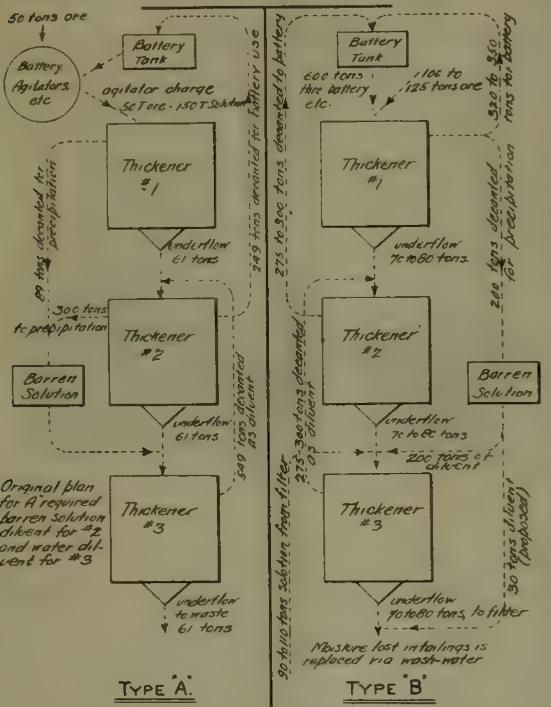
[21] Tom Johnson, *Journal* Chem. Met. and Min. Soc., S. A., Vol. X, 1910, p. 282.

Continuous Decantation

By Donald F. Irwin

Within recent years there has been a noticeable tendency toward continuous methods in metallurgy. In the cyaniding of slime, which is, in practically every case, accomplished by treatment of successive charges, an excellent field is offered for continuous processes, since the usual three units of the plant, collector, agitator, and filter, receive and discharge pulp intermittently. Furthermore, the widespread use of sliming methods offers a large field for experiment on this point.

I consider a fair standard of continuous operation to be the ability of any unit machine to receive, treat, and discharge its full proportion of mill pulp at all times, without temporarily diverting into another vat any portion thereof at any time. Successful continuous collection and decantation was developed by J. V. N. Dorr in South Dakota, and continuous agitation is well exemplified by the Esperanza mill under M. H. Kuryla. There are other machines than the Dorr thickener and the continuous battery of Pachuca tanks claiming to perform the same work, but it is conceded that these machines were the pioneers.


50 tons ore
Battery Agitators etc
Battery Tank
agitator charge 50 T ore - 150 T Solution
249 tons decanted for battery use
89 tons decanted for precipitation
Thickener #1
underflow 61 tons
300 tons to precipitation
Thickener #2
Barren Solution
underflow 61 tons
549 tons decanted as diluent
Original plan for A required barren solution diluent for #2 and water diluent for #3
Thickener #3
underflow to waste 61 tons
Type "A"
275 to 300 tons decanted to battery
Battery Tank
600 tons thru battery etc.
100 to 125 tons ore
320 to 350 tons for battery
Thickener #1
underflow 70 to 80 tons
200 tons decanted for precipitation
Thickener #2
Barren Solution
underflow 70 to 80 tons
275-300 tons decanted as diluent
200 tons of diluent
90 to 110 tons solution from filter
Thickener #3
30 tons diluent (proposed)
underflow 70 to 80 tons, to filter
Moisture lost in tailings is replaced via wash-water
Type "B"

Using the various types of equipment mentioned, it is now possible, at least theoretically, to feed ore in at the crusher, make a few adjustments, and then recline in the shade, while the plant operates automatically. For two reasons, at least, it is not possible at once to install such equipment in every plant. (1) There is very little information available on this subject, as there are few plants operating which embody the continuous process throughout. (2) Considerations of time and treatment and general suitability of the ore must be observed. If feasible, the continuous process is wonderfully attractive on the grounds of simplicity and cheapness, and with the belief that any information, though incomplete, will be of interest, some data follow, on the plant with which I am familiar, which uses this method.

As a basis of comparison, I have taken a similar scheme of treatment proposed by Ferdinand McCann, which appeared in the *Engineering and Mining Journal*, October 2, 1909. To facilitate comparison, a parallel diagram of both plants is appended. In both plants the fundamental idea is successive decantation, thickening, and increasing dilution through a tandem set of three Dorr thickeners. I will refer to the plant suggested by Mr. McCann as type A, and the other as type B. Both schemes of treatment require crushing in solution. Type B differs from A, in that the entire mill-flow goes to No. 1 thickener, instead of a thickened charge from an intermediate collector and agitator. This is done because the ready solubility of the metallic contents obviates necessity for agitation, although for the usual type of ore, an agitating equipment would doubtless be required.

For the foregoing reason, the quantity of solution, taken from No. 1 thickener for precipitation in type A is smaller than type B, but per ton of dry ore treated is nearly the same—1.8 tons in the one case, 2 tons in the other. However, type A requires additional precipitation of low-grade solution from No. 2 thickener—possibly 300 tons. Hence precipitated solution per ton of dry ore treated is 7.8 tons, at least, and McCann advocated a total of 11 tons. In type A, under the original plan, the reduction in value of solutions, between each tank (assuming perfect dilution) is 90%, a figure not attained in B, where figures based on routine operation show a reduction of 40.8% between No. 1 and No. 2, and 43.5% between No. 2 and No. 3.

The average content of the solutions decanted from No. 1 thickener in A and B respectively were 143 gm. of silver and $1.52 gold. The apparently less efficient work of B is explained by the diluent for No. 2 being the decanted solution from No. 3, instead of barren solution, and the diluent for No. 3 being barren solution, of satisfactorily low tenor, but not absolutely barren. Further, a vacuum-filter followed No. 3 in type B, the filtered solution being used as an additional diluent for the pulp flowing into No. 3 thickener.

In an article by L. B. Eames in the *Mexican Mining Journal*, September 1910, continuous decantation is discussed theoretically, and attention is called to possible additional dissolving of metals during the passage of pulp through the tanks. This is shown to be true in B; solution tonnage and assays for the period quoted showing $26 additional dissolved daily in No. 2 and $15.80 in No. 3. A substitution of a fourth thickener for the vacuum-filter in No. 3 would render the plant simpler in operation, but the additional indicated extraction of gold while passing through would be very small. Reckoning from the work of three thickeners it would be negligible, and the grade of solution would be little more than 10c. per ton, and possibly less. A well regulated thickener will discharge quartz slime pulp with 40 to 45% moisture, and a vacuum-filter of the leaf type will filter a cake carrying 30 to 35% moisture, requiring considerable additional water to sluice it away, in most cases probably not less than 50% in all. The value of replacing a fourth thickener by a filter can only be obtained by noting the daily loss of dissolved gold and cyanide in the underflow from the thickener, say 40 tons of solution, carrying 8 to 10c. gold and cyanide, or a total daily loss of about $12, say $4500 yearly, for a 100 to 120-ton plant. Against this can be set down the greater water consumption of a filter-plant (a substantial consideration in many places), the initial cost of the filter, and more rapid depreciation of a filter-plant. Perfect washing of cake is assumed. There is no doubt that a cheap, efficient, and compact filter could be used to advantage, but it must be all that, and with low power and labor requirements besides, for the power, labor, and maintenance cost on a thickener is very small indeed.

McCann makes no reference to the manner of transfer of pulp and solution in type A; this is doubtless the point needing the most care in operation. At plant B decanted solutions were raised by air-lifts and the pulp by diaphragm pumps. The dilution of the thickened pulp can be effectually done by placing baffles in the launder receiving pulp and solution. A small centrifugal pump handles the battery solution, and a small triplex pump raises the gold solution. In a large plant of this kind, handling several hundred tons of ore daily, units of 100 to 120 tons could be arranged as in type A or B, but with each tank placed successively lower than the preceding one. This would aid in pulp transfer, the limiting case would be when all tanks are discharged by gravity.

Transfer of the thickened pulp at a minimum expense for power and attendance is sought in several ways: one plant used air-lifts, another centrifugal pumps, a third diaphragm pumps, and a fourth discharges into sumps from which the pulp is drawn by bucket-elevators. Regulation of pulp and solution flow is not quickly disturbed when valves are once properly set and pumps are speeded correctly. Barring accidents, type B is a very smooth working plant. All the work of operation and current repairs is done by one man and a helper, a saving of one or two men over the average slime plant employing solution man, filter man, and pump man. On the other hand, should an accident occur, it needs immediate attention, and no long delay is admissible. In general, this type of plant is simple in operation, with low labor, power, and maintenance costs, and, when metallurgists generally are familiar with it, should become a popular and standard method of slime treatment.

Mine Bulkheads

By William H. Storms

In the development of a mine it not infrequently happens that a large quantity of water is unexpectedly encountered, and it becomes desirable, if not positively necessary, to stop the inrush of water, for the reason that the pump or other drainage machinery of the mine is inadequate to handle it, or it may be considered too expensive to continue to pump if the flow of water can be shut off. In such exigencies the construction of a bulkhead in that portion of the mine where the heavy flow of water has been found, is usually resorted to.

There is a wide divergence of opinion as to what sort of bulkhead is best suited to such conditions. Bulkheads have been successfully constructed of timber, of stone, of brick, of concrete, and of various combinations of these materials. Any of them will serve the purpose, provided the rock at the site of the bulkhead is sufficiently firm, impervious to water, and the static pressure is not too great. Where the column of water is high, the form of the construction, as well as the materials from which the dam is to be built, is of importance. Where the head is low, say less than 20 ft., a dam built of walls of a double thickness of 2-in. plank, with a centre of clay well tamped, will suffice in most cases; but if the head be much greater, something more substantial than plank must be employed. Clay is only useful in forming an impervious stratum; for, to be serviceable, it must have the most substantial kind of backing, timber, masonry, or concrete. It must be remembered that it is not so much the quantity of water back of the bulkhead as it is the height of the water column, for it is quite easy to build a dam which would hold back a flow of a hundred cubic feet a minute which has a head of only 10 ft., while to hold back a flow of but 5 cu. ft. per minute which has a static head of 300 ft. or more would require a very substantial structure. It is head, not volume, that counts.

In preparing to construct a mine bulkhead it is necessary, first, to select a place in the drift or cross-cut where the rocks are firm, and where the cross-sectional area of the opening is not too great. A dam in loose or fissured rock would prove to be unserviceable, if not a positive element of danger. Then, too, the smaller the cross-section the more feasible will the successful construction of the bulkhead be. Having selected as suitable a place as can be found for the purpose, the next thing to decide upon is the form of the dam. Under moderate heads, such as might be expected to develop within 60 or 80 ft. of the surface, a dam having a plane front and back will usually be strong enough for all purposes, if it be sufficiently thick; but if the site of the dam be more than 100 ft. below the surface, or there is any possibility that a column of water more than 100 ft high may develop, then it will be safer to construct the dam in the form of an arch, with the concave side outward. Channels from 18 to 40 in. deep should be cut in the top, bottom, and sides of the opening where the bulkhead is to be built, in order to give the dam a firm anchorage. The depth to which this channel is cut must be left to the judgment of the engineer in charge, or to whoever is to build it. In very firm hard rock it would be unnecessary to channel as deeply as in softer or fissured ground.

In cutting this channel the surrounding rock should be disturbed as little as possible. Heavy blasting must be avoided, as it is likely to shatter the surrounding rock so badly as to render the bulkhead useless, and perhaps even unsafe, should the water pressure become heavy. Some engineers prefer a wedge-shaped cut to a right-angled channel. The wedge cut is made so that it flares inwardly from the outer face of the dam. A mine-dam of this form, described by W. Kelly in Vol. XXVII, *Trans.* Amer. Inst. Min. Eng., was built in the Curry mine at Norway, Michigan. This dam was 780 ft. below the surface, and as it was not known to what height the column of water would rise, the dam and all pipes and fittings were designed to withstand a pressure of 350 lb. per square inch. The bulkhead was constructed of masonry, local sandstone being used, and great care taken that the joints were true, and that the pipes were properly placed. The wall was built in the form of an arch having a radius curve of 6 ft. and a thickness of 10 ft. The sides of the drift were trimmed out along lines approximately conforming to the radial lines of the arch at the sides of the dam, these lines being projected inward. This made the mass of masonry much wider and higher at the back than it was at the curved front. A 5-in. pipe fitted with a heavy flange was laid through the stone wall to drain the water under control, a suitable valve being provided for this purpose. A 20-in. pipe was similarly laid in the wall to serve the purpose of a manway. This was closed on the outside by a blind flange, 2½ in. thick, into which a small pipe was screwed and to which was attached a pressure gauge.

When the water pressure accumulated back of this dam it leaked so badly that the pipe was opened and the water allowed to drain off. A brick wall 22 in. thick was then built 26 in. beyond the inner face of the masonry bulkhead, and the space between filled with concrete, made of 4 parts of broken limestone, egg-size, and 3 parts cement mortar. The pipes were extended through this addition to the bulkhead, which was then 14 in. thick. Before closing the dam this time, three loads of horse manure were placed against the inner face of the brick wall, being held there by a partition of boards. After these precautions had been taken the bulkhead was found to be practically tight, although the pressure ran up to 277 lb. per square inch. This experience shows clearly the need for a very large factor for safety in the construction of mine bulkheads, particularly where the pressure is likely to be high. I have known of a number of mine dams that failed, from various causes, chiefly from insufficient strength, and which had to be rebuilt.

In the Juniper mine near Stent, California, a bulkhead was recently constructed in a foot-wall cross-cut at a depth of about 280 ft. below the surface, though it is probable that, owing to surface contour, the maximum head will never exceed 230 ft., which is equivalent to about 100 lb. pressure per square inch. This bulkhead is of concrete, and was built in the form of an arch, and is 4 ft. thick. Deep channels were cut in the top, bottom, and sides of the cross-cut, to secure a substantial anchorage for the concrete, which was then placed with care. A 6-in. pipe with a flange on the inner end was laid in the concrete, and a hopper-shaped manhole provided. To close this inwardly-flaring manhole, a tight-fitting door, made of two thicknesses of heavy timber bolted together at right angles, was hung on hinges. The door was made large enough to permit the passage of a small car, as it would be necessary to subsequently do mining in the area back of the dam. When the door was closed and drawn tight by means of bolts, it was discovered that the dam of concrete was itself practically impervious to water, few leaks developing, but through fissures in the surrounding rocks the water spurted with ever-increasing force as the column of water grew in height. About 30 cu. ft. of water per minute was flowing from the crosscut when the door was closed. Within a few hours the pressure was evidenced by the spurting of water through the rocks surrounding the dam, and the next day fully 10 cu. ft. per minute was passing the dam. To control this water a second dam will be built at a point about 60 ft. in front of the first one, and where the cross-section area is smaller and the rocks appear less fissured. This dam will also be of concrete.

In the construction of mine bulkheads that are to hold water, it is very necessary to not underestimate the quantity of water flowing past the site of the proposed dam, and to provide a pipe sufficiently large to carry all of it, and a little more. If a pipe larger than 5 or 6 in. diam. be required, it is better to put in two of smaller diameter than one large one, as the smaller pipes can be anchored with less difficulty, and it will be found later that if this suggestion be followed, no mistake will be made.

June Copper Review

By Misha E. Appelbaum

Throughout June copper continued to advance, on very large domestic buying and still more liberal purchases by European consumers. As a result, the market reached 12$\frac{5}{8}$c. for both lake and electrolytic. When the market reached this level, buying subsided somewhat and transactions took place at a slightly lower level, but at this writing, early in July, the market is again firmly entrenched on a 12$\frac{3}{8}$c. basis. The deliveries for the month of June showed an excellent European consumption, while the domestic deliveries were slightly less than in May; this, however, is usual during the month of June, for the principal consumers shut down for a few days to take an inventory at the end of the month.

The consumption for the month of July will very likely show a shrinkage, as, on account of the excessive heat, it has been impossible for the mills to run with full force, but the production, on the other hand, will also show a sharp shrinkage, as the output of the refineries will be materially lessened on account of climatic conditions. Inasmuch as Europe will, on account of its previous purchases, take a large quantity of copper during the month of July, I expect to see the surplus further reduced during the month by about 15,000,000 pounds.

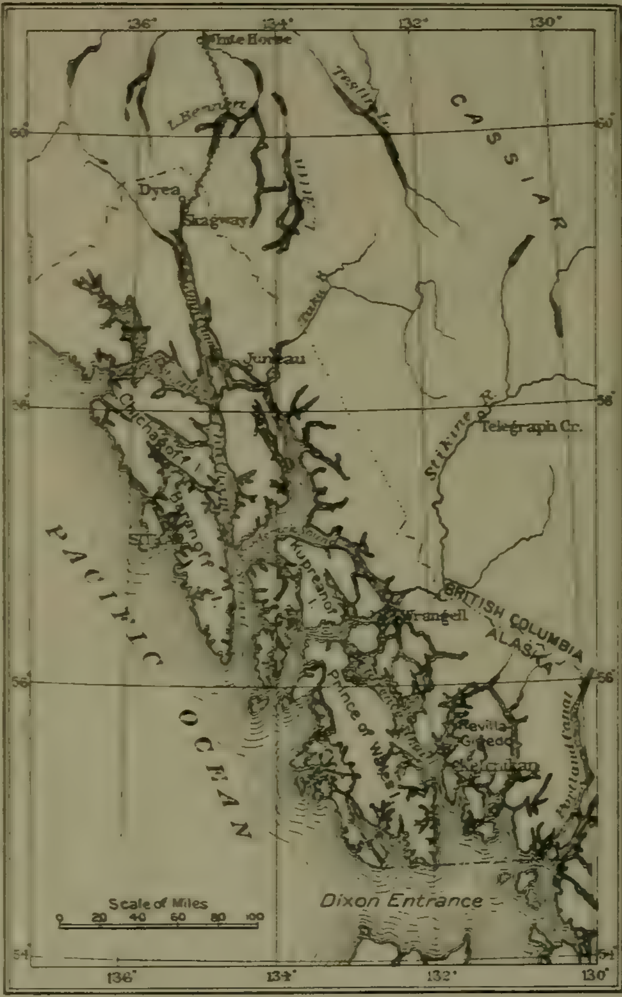
The surplus in this country on the first of July was 157,000,000 lb.; such a surplus is absolutely necessary to prevent a runaway market. The surplus in Europe has also been cut down materially and it would be possible to become enthusiastic over the prospects for higher prices were it not for the fact that production still continues at a record rate. Since the output of the new mines, though not very large, will add to the production, and small business has not yet assumed large proportions, I cannot see how the market can advance further, although, on the other hand, business prospects seem to be sufficiently encouraging to expect steady prices.

The consumption of compressed acetylene has become enormous in recent years. Small portable generators are not practicable in winter, as the water is apt to freeze, but a solution of acetone and acetylene will not freeze during the coldest weather. No automobile is considered complete without a cylinder of acetylene for lighting.

The Portland Canal District

By R. G. McConnell

*The Portland Canal district is situated in northern British Columbia, close to the Alaska boundary, at the head of Portland canal, one of the largest of the numerous fiords which indent the North Pacific coast. Portland canal cuts completely across the long granitic batholith which forms the central portion of the Coast range and reaches the mineralized sedimentary and intrusive rocks which border the batholith on the east. Bear river empties into the canal at its head, and the area examined includes the portion of the mineralized belt drained by that stream and its tributaries. Portland canal is a large deep inlet, easily navigable by the largest steamers. Stewart, the distributing point for the district, is situated at its head, and several steamship lines maintain regular communication between it and Prince Rupert, Vancouver, and other coast towns. A wagon-road has been built by the Provincial Government, from Stewart up Bear River valley to Bitter creek, a distance of about ten miles, and from it the principal showings are reached by trails constructed partly by the Government and partly by private companies. A railway up the valley is now being built.



MAP OF SOUTHEASTERN ALASKA.

The metalliferous character of the Portland Canal mining district was first discovered by a party of prospectors in

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*Abstract from the Summary Report of the Department of Mines, Canada, 1911.

1898, the year of the great Klondike rush. They were searching for placer deposits, but failing to find pay gravel turned their attention to prospecting for quartz. The Roosevelt and other claims on the south fork of Bitter creek were staked in 1899, and the Mountain Boy and American Girl on American creek in 1902. The Alaskan boundary at that time had not been defined, and the claims were first staked under United States laws, but were subsequently re-staked and recorded in British Columbia. The Red Cliff, which could hardly escape the notice of prospectors as the croppings show up prominently on the mountain side, was first staked in 1898, and has lapsed and been re-staked several times, the last time in 1908. While some prospecting and staking were done year by year, little actual mining work was attempted until 1907, when the Portland Canal Mining Co. commenced development work on the Little Joe and Lucky Seven claims on Glacier creek. The success met drew the attention of miners to the district, and during the last three or four seasons prospectors have swarmed over it, and little ground from Stewart far up Bear River valley, which shows any signs of mineralization, is now left unstaked. Only a few of the claims have been even roughly prospected, and on only two, the properties of the Portland Canal and the Red Cliff mining companies, is development much advanced. A number of companies, however, commenced systematic work during the past season.

The Portland Canal mining district is situated in the heart of the Coast range, in a region of intense glaciation, and its topography, while still bold and striking, has been toned down by moving ice, and much of the original ruggedness removed. It has been heavily glaciated up to a height of fully 5500 ft. above the sea, and the mountain slopes, below this level, although usually very steep, often rising in sheer unscalable cliffs, are, as a rule, comparatively smooth, except where scored and broken by narrow canyons carved out, in post-glacial times, by streams plunging down from the perennial snow and icefields above. The district embraces a number of high mountain groups and mountain ridges, separated by the deep valleys of Bear river and its numerous tributaries, but usually coalescing around the heads of these streams. The principal mountain divisions include the long, rather even ridge separating Bear river and its tributary American creek from the Salmon; a group of mountains between American creek and the upper part of Bear river; a range of high sharp peaks known as the Cambria range[1] bordering the upper part of Bitter creek; a broken ridgy group culminating in Mt. Gladstone between the north fork of Bitter creek and Bear river, and a group of high, snow covered, rather flat topped elevations between Bitter and Glacier creeks, for the highest point of which the name Mt. Dickie[2] is proposed.

The long ridge west of Bear river has a general elevation of about 5000 ft., but is surmounted by occasional irregularly distributed rocky peaks, some of which attain a height of over 6000 ft. One of the most prominent of these, situated nearly opposite the mouth of Bitter creek, is known as Mt. Dolly. The sharp-crested, angular-peaked Cambria range, the wildest portion of the district, rises in places to an elevation of over 8000 ft., and Mt. Otter, the highest point, to an elevation of 8800 ft. Mt. Gladstone, the highest point in the range bordering the upper part of Bear river on the south, has an elevation of 6800 ft., and Mt. Dickie, between Glacier and Bitter creeks, an elevation of nearly 6600 ft. The snow-covered mountain group of which Mt. Dickie forms the centre is exceedingly precipitous on the Bitter creek side, but falls away in easier slopes toward Bear river and Glacier creek. The dominant features of the mountain landscape, viewed from one of the higher elevations, are the steep valley slopes, the jagged peaks of the Cambria range, and the prevalence above an elevation of 4500 ft. of vast fields of snow and ice. These either terminate in long lines of ice cliffs from which huge masses are constantly falling, or form glaciers which descend the mountain slopes for some distance, and are then replaced by roaring torrents often deeply hidden in rocky canyons.

The rocks and rock formations represented in the Portland Canal district are classified tentatively as follows, in order of relative age:

1. Glacial deposits.
2. Basic dikes.
3. Felsitic dikes.
4. Coast Range granitic rocks.
5. Diorites (?).
6. Nass formation (tuffs, agglomerates, etc.).
7. Bear River formation (complex series of greenstones).
8. Bitter Creek formation (dark argillites).

No fossils were found in the district, and the age of the formations is uncertain. The last three are cut by granitic rock and felsitic dikes, and are, therefore, older than the Coast Range batholith usually referred to as Jurassic.

Economic Geology.—The Portland Canal district is remarkable for the widespread character of the mineralization it has undergone. This is manifested not only by the number of concentrated metalliferous deposits of varying sizes scattered throughout the region, even though they are so numerous that practically the whole district has been staked, but also by changes in and additions to the principal rock formations themselves. Secondary iron pyrite is everywhere present, and silicification on an unusually large scale has taken place. Large areas—in one instance a whole mountain mass—have been altered by this process into hard cherty rocks.

The district is situated immediately east of the great group of granitic rocks which form the central portion of the Coast range, and its mineralization is doubtless due to this fact. During the granitic invasion, the neighboring rocks, both sedimentary and intrusive, were intruded by dikes, crushed and broken, and rendered permeable to emanations, probably mostly in the form of silicious waters from the cooling magma. These waters either originally held the various metals in solution or leached them out in passing through the various rocks encountered and deposited them when heat and pressure lessened. The whole district is probably underlain in depth by granitic rocks, as dikes and stocks are numerous everywhere.

The deposits of the district may be generally grouped into two classes:

1. Veins (mostly quartz).
2. Irregular, replacement deposits.

Quartz Veins.—The quartz veins occur mostly in the Bitter Creek argillites, but in some instances were found traversing the massive Bear River greenstones. In the argillites they follow, in most cases, long zones of fissuring and crushing, often of considerable width, which while enlarging and pinching at intervals along the strike, are on the whole fairly regular. The walls are straight and well-defined in places, in others ragged and irregular. The quartz filling varies greatly in purity in different veins and along different portions of the same vein. Fragments of the broken country rock are almost invariably present in some quantity, and in places the vein consists of alternating bands of quartz and argillite, or of a brecciated mass of argillite cemented together by quartz. In some instances the line of the vein is marked only by stringers and lenses of quartz distributed irregularly through the argillites. The veins, with few exceptions, have a general northerly trend, approximately parallel to the direction of the eastern edge of the neighboring granitic batholith and to the strike of the enclosing argillites. The dip is usually westward toward the granite at angles varying from 20° to nearly vertical.

While most of the veins are comparatively small, usually from 2 to 4 ft. in width, a number are exceedingly strong and very persistent. The most notable of these is the vein on which the Portland Canal company's mine is situated, south of Glacier creek. This vein, while it cannot be continuously followed, as some stretches are concealed and others are inaccessible, is traceable by a succession of outcrops, some of considerable length, all following the same general direction for a distance of over two miles, and probably extends across Glacier creek to the Sunbeam claim, a total distance of nearly four miles. The quartz filling may be interrupted in places, but it is practically certain that the line of disturbance is continuous. In places several parallel veins are present. The width of the vein is commensurate with its length, ranging from 10 to over 60 ft., and probably averaging 20 ft. in the outcrops seen. The strike of the vein is northerly, and the dip is westerly at low angles, usually about 30 degrees.

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[1] Name proposed by miners interested in the vicinity.

[2] After the president of the Portland Canal Mining Company.

North of Glacier creek, the O. K., Portland Wonder, George E., and other claims are situated on veins following a line of strong fissuring, traceable for over a mile. On the George E., four well-defined veins, the largest 27 ft. in width, occur in the fissured zone. These veins are usually considered to be a continuation of the vein, or series of veins south of Glacier creek, but this, while probable, is not altogether certain, as the outcrops are separated by a concealed interval about half a mile in length. The dips in the veins north of Glacier creek are also somewhat steeper, and the direction is more easterly. Other large quartz veins occur on Bitter creek south of the Bromley glacier.

The principal metallic minerals in the large quartz veins are pyrite carrying gold, silver-bearing galena, zinc-blende, and occasionally notable quantities of native silver. Pyrite is always the most abundant mineral present, and in portions of the veins is often the only one. Where it occurs in masses it is usually associated with subordinate quantities of galena, and some blende. While practically only a beginning has so far been made in the exploration of the large quartz veins, enough has been done to show that the distribution of the metallic contents is extremely irregular. The veins are seldom entirely barren, and small bunches of ore are common, but concentrations large enough and rich enough to be of commercial value are rare. One such deposit is now being worked by the Portland Canal Mining Co., and others may be discovered as exploration proceeds. Several promising portions of the veins are now being investigated.

Small and medium-sized veins, that is, veins ranging from a few inches to 6 ft. in width, and occasionally even wider, are very common in the Bitter Creek slates, in the dioritic area at the head of Glacier creek, and also occur, though less frequently, in the Bear River greenstones, and in the granite. Some of these veins are very persistent, one on the middle fork of Glacier creek having been traced across three claims, and one on Hartley gulch for over 1000 ft. Few of them have been explored sufficiently to determine their extent. The gangue in the smaller veins is more varied than in the larger ones. Quartz is nearly always present, and a few of the veins consist entirely of that mineral. Others have calcite as the principal gangue, or a mixture of calcite and quartz, and occasionally the filling consists mostly of siderite.

The metallic content also shows great variation. In the dioritic area at the head of Glacier creek tetrahedrite in grains, bunches, and small lenses occurs in some of the veins, associated with galena, pyrite, blende, and stibnite. Lenses and stringers of nearly solid galena occur in veins at Bear River canyon, and at points east of American creek. Chalcopyrite, in bunches and lenses, usually accompanied by pyrite, blende, and galena, also occurs in a few croppings. The small veins, like the larger ones, are, as a rule, irregularly mineralized, shoots of ore, usually short, alternating with barren or comparatively barren stretches, and the bunchy character of the mineralization has already led to some disappointments. Very few of the veins, however, have had any considerable amount of work done on them, and a large number, some with promising outcrops of good ore, still await investigation.

Replacement Deposits.—In the massive and slightly schistose greenstones of the Bear River formation, the ore deposits occur characteristically in irregular, often ill-defined masses. A number of red patches, due to the oxidation of these masses, are plainly visible from the valley in the mountain slopes bordering Bear river and American creek. The shapes are variable, some are wide and blunt, others rounded or elliptical, and a few are elongated, resembling wide irregular veins. In some of their features these mineralized areas resemble contact metamorphic deposits, but the characteristic contact metamorphic minerals, such as garnet, epidote, augite, etc., which invariably accompany such deposits, are never present in quantity, and are usually altogether absent. Garnet, mostly in disseminated crystals, was seen at only two of the croppings visited. The gangue in the deposits is mostly the more or less altered country rock, although some quartz is usually present, and in places there is a considerable development of this mineral. Calcite and barite also occur, but are less common.

The deposits probably always occur in connection with lines of fissuring, or, as suggested by their irregular outlines, with broken areas, but this is not always evident. In some of them the relationship is plain, as they are bounded on one, or sometimes on both sides by fissures, and for portions of their courses, especially where the replacement is nearly complete, resemble, and practically are, veins. Traced farther, the space between the so-called walls becomes less well mineralized, and often passes into ordinary country rock. Transitions occur from this vein-like type, through occurrences partly bounded by walls, to others wholly lacking in definite boundaries other than those afforded by the gradual disappearance of the replacing minerals. The metallic minerals in the replacement deposits are generally similar to those in the veins, except that pyrrhotite is occasionally present in place of pyrite. The proportion of chalcopyrite is probably greater on the whole, and the proportion of galena less. Pyrite, often carrying some gold, is usually the principal mineral present. The pyrrhotite is always, so far as known, low grade. The associated minerals are chalcopyrite and galena in varying quantities, and usually a little blende. The chalcopyrite at the Red Cliff orebody, the only member of this class of deposits on which much development work has been done, is distributed in grains, bunches, and interbanded with pyrite through the whole mass of the lode, and forms a considerable part of it. In most of the occurrences examined, the copper and lead sulphides are present only in portions of the pyritized area, and in some are apparently absent altogether. The ultimate value of these large mineralized areas cannot safely be predicted: a number of them are inviting enough to warrant exploration, while others are hopelessly low grade, on the surface at least.

THE Hokkaido Colliery & Steamship Co. established a blast-furnace at Wanishi, Hokkaido, to produce pig iron to supply the Nippon Steel Works. Some 2,000,000 yen was invested in this establishment, and it was put into operation. The plan to use Hokkaido iron ore, which had been reported inexhaustible, was a complete failure, and there was trouble with the furnace, so business was suspended. Though repairs have been made, work has not been resumed. The ovens which furnished the coke used at this blast-furnace are five miles from Wanishi, which caused considerable inconvenience. It is now intended to establish the coke ovens in Wanishi, and the plant will again be started. As a supply of iron ore from Hokkaido cannot be depended on, the materials will be imported from China and Korea, as in the case of the steel works at Wakamatsu.

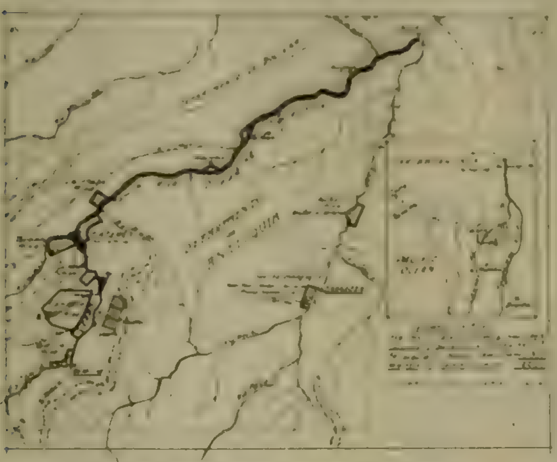
FLUORSPAR is a mineral of relatively low value as compared with the metallic ores mined under similar conditions in the West. Under the most favorable conditions, therefore, the margin of profit can never be expected to be large, and it requires exceptionally good management to conduct any spar operations profitably in the Western States. In 1909, 50,742 short tons of domestic fluorspar, including gravel, lump, and ground varieties, was marketed in the United States at an average value of $5.75 per short ton. Of this total, 40,808 short tons was sold as gravel and lump spar, at an average value of $4.72 per ton at the mines. Spar produced in Colorado and New Mexico sold unground at about the average price for the whole production of spar in the United States, including the ground variety.

Gold Dredging in Colombia

By Charles Janes

What are probably the first successful gold-dredging operations in Colombia are being carried on at the property of Mr. Pochet on the Nechi river, some distance below Zaragoza where the Pato mines, controlled by the Oroville Dredging Limited, are situated. These are shown on the accompanying map.

Mr. Pochet is operating a small dredge built in Belgium some years ago for another property, on which it proved unremunerative. The dredge, which is equipped with [illegible] ft. open-connected buckets, and operated under steam power, using wood fuel, was purchased by Mr. Pochet in 1910 and moved to its present situation. The following figures of operation are given by the management.


MAP OF CAUCA RIVER DISTRICT, COLOMBIA.

Pochet Dredge Operations. Seven Months

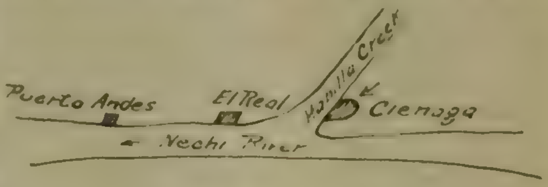
		Gm.
Clean up	August 9, 1910	8,000
	September 9	5,027
	October	9,115
	November	11,791
	December	10,300
	January	7,110
	February	11,592
	Total	62,935

Gold, average fineness	920
62,935 gm.	$38,200
Operating cost	13,200
Operating profit	$25,000

The expense for seven months, counting $400 per month for manager, and including labor and all supplies and repairs, was $13,200. The ground worked was estimated at 77,400 cu. yd., of an average depth of 27 ft. This indicates a yield of 49c. per cubic yard and a cost of 17c. per cubic yard. From February 7 to March 17, on account of low water on the Nechi river, they managed to get to bedrock, which was not possible during high water, and from 6200 yd. estimated to have been handled received $8700, or $1.24 per cubic yard. There was considerable loss of running time, hence the low yardage treated. The accompanying sketch gives an idea of the gravel in cross-section.

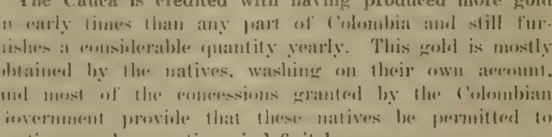
At the Pato mine of the Oroville Dredging Limited the new 8½-cu. ft., close-connected bucket dredge with steel hull, built by the Yuba Construction Co., is under construction. Most of the dredge parts are on the property at the present time, and the remainder are being brought in as fast as transportation facilities will permit. The property has over 400 acres of proved dredging ground containing [illegible] per cubic yard; the operating cost, according to recent statements of the management, will be under 8c. per cubic yard.

The Pato property was carefully prospected with Keystone drills by competent engineers, and was the first gold dredging in Colombia to be financed following sane methods of prospecting. Since the original report, it is stated that further areas have been proved, substantial buildings for the staff and workmen erected on California hill, which is 150 ft. in elevation above the river. Hydro-electric power will be used, though it is understood that it was found necessary to make a number of changes in the original plans of power installation and dam location. The operation of the dredge on this property is awaited with considerable interest by dredging men, and will mean much for the future of dredging operations in Colombia if it proves as successful as anticipated.



DREDGING GROUND, POCHET

One of the largest gold-mining concessions granted in Colombia is that of the Colombia Consolidated Goldfields, situated on the Cauca river from Caceres to the town of Nechi. This property was extensively prospected with Empire drills. The gravel is from 35 to 65 ft. deep, and financial arrangements have practically been completed for equipping and working the property on a large scale. In addition to the dredging ground there are considerable areas of gravel, from 25 to 125 ft. deep, that are said to be suitable for hydraulicking, plenty of water under good head and good dumping facilities being available. There are also a number of quartz veins on the concession, but on these, however, no development has as yet been attempted.



RIVER AND BENCH GRAVEL, NECHI RIVER.

The Cauca is credited with having produced more gold in early times than any part of Colombia and still furnishes a considerable quantity yearly. This gold is mostly obtained by the natives, washing on their own account, and most of the concessions granted by the Colombian Government provide that these natives be permitted to continue such operations indefinitely.

The western part of Colombia has recently been attracting considerable attention as a possible field for dredging operations. One company has a number of small parties investigating areas along the San Juan and tributaries of that river. Some years ago a dredge installation was made on the Atrato river near Quibdo, financed by Pittsburg and Philadelphia capital. Civil war interrupted the operations for a time, but it is understood, however, that they did not prove successful. This property is now under bond to New York interests, and is being examined with a view to installing a modern dredge. Other dredge installations have been made in Colombia, including one some distance south of the latter property. Information is not available at the present writing on these ventures, but it is understood that they were not a financial success.

The mining laws of Colombia are favorable to foreigners. The Government is now considered stable and anxious to help all legitimate mining enterprises as much as possible. There is an import tax of 1% upon all gold-mining machinery, and supplies are subjected to a small duty only. A placer claim is subject to a tax of $5 per claim annually, and in case of non-payment the mine is considered abandoned, and open for denouncement. Nothing is required by law in the way of annual labor on a claim, and until recently a mining property could be freed from all subsequent taxes by the payment of 20 years taxes, or $100 per claim in advance. This has been done with such properties as the Pato and Colombia Consolidated Goldfields. Mining claims have preferences to all timber and water rights in their vicinity, and in case of previous ownership of such rights, all questions are submitted to a board of appraisers. Some care should be exercised in taking up a property to see that both mining and agricultural rights are secured, otherwise some trouble may occur with the owner of agricultural rights in the future, especially when the mine becomes a producer.

The climate of Colombia naturally varies in different sections. Some districts are considered unhealthy for foreigners to live in, and in others Northerners have lived for a number of years without any ill effects. It may be said that many of the conditions under which miners must live are trying, but with proper precautions, such as suitable houses, clearing away the jungle in the neighborhood of living quarters, fighting the mosquito, good food, and a sane manner of living, there is no reason why health cannot be maintained. A strong constitution will be found a valuable asset for a Northern man going to any tropical country.

Historic Iron Deposits

Bulletin 470, of the United States Geological Survey, on the iron ores in the Montevallo-Columbiana region, Alabama, is of historic interest. Actual operations in this section were begun in 1844 with the construction of a furnace having a daily capacity of five tons of cold-blast charcoal pig iron, and work has been practically continuous since that time. The iron made here early acquired a high reputation, and as a result of a comparative test of Alabama, Georgia, and Tennessee irons made at Columbus, Georgia, in 1852, an order for 1000 tons was given, the largest ever placed in Alabama up to that time. A rolling mill was completed in Alabama in 1860, in which armor plates were made for the Confederate Government. The *Merrimac*, which for a time created such consternation among the Union warships and which later was a participant in the memorable battle with the *Monitor*, was armored with these plates. In 1863 a larger furnace was built, with a daily capacity of 30 tons. This was equipped with warm-blast ovens and was the first furnace to make warm-blast charcoal iron in Alabama. This furnace was burned in 1865 at the time of Wilson's raid. The output of the two furnaces at Shelby at the present time is about 25,000 tons per year.

June Production of the Rand

Recent advices are to the effect that a new record has been made by an average daily output of 22,810 oz. Remembering that June is a short month, the achievement is even more notable. The table below gives the average production in ounces per day, from January to June, for the last five years:

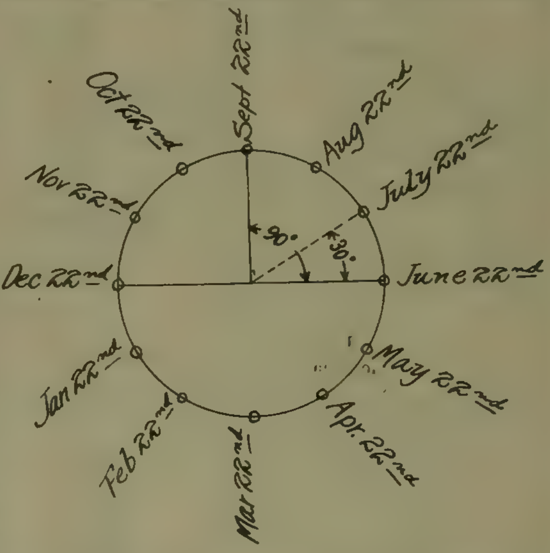
	1911.	1910.	1909.	1908.	1907.
January	21,100	19,400	19,840	18,070	17,340
February	21,780	20,560	20,180	19,350	17,620
March	21,800	19,600	19,600	18,540	17,370
April	22,230	20,630	20,230	18,860	17,900
May	22,100	20,450	20,140	18,770	17,050
June	22,810	20,830	20,570	19,160	16,180
6 mo. average	21,970	20,240	20,090	18,790	17,240
% increase	8.5	0.7	6.9	8.9	.....

Azimuth Determinations Without an Ephemeris

By G. N. Pfeiffer

Descriptions have been published of methods of making observations on the sun for the meridian when either the date or the current year's ephemeris has been lost. A method of determining the meridian by equal altitudes, either of the sun or of any fixed star, under these difficulties, or when no ephemeris is available, is given below.

The method of finding the meridian by equal altitudes is simply to observe the azimuth and altitude of any fixed star at any time before it has passed the meridian and again when it has passed the meridian and has the same altitude as at the first observation. This second observation will be as much west of the meridian as the first observation was east of the meridian. In practice it is common to set the transit over a station, set a peg in line with the first observation, and to set another peg marking the second observation: bisecting this angle gives the meridian. As it is often inconvenient to make observations at night, this same method can be applied to the sun during the day if the correction is made for the changing declination of the sun. The change in declination between the two observations is added to the altitude when the sun is coming north, and subtracted from the altitude when the sun is going south. If no ephemeris is available, the hourly change in declination is not known. All surveyors should know that the hourly change on June 22 and December 22, when the sun is farthest from the equator, is practically nothing, while the hourly change on March 22 and September 22 is practically one minute of arc per hour of time, and it is almost as easy to remember that the hourly change is fifty seconds of arc per hour of time when the sun is one month from the equator; and thirty seconds of arc per hour of time when the sun is two months from the equator. This can be deduced in the following way: assume 12 months to represent the circumference of a circle whose radius is the greatest hourly change in declination, when the sun is over the equator. From June 22 to September 22 is 90°. The hourly change is from zero to the maximum in 90°, so it may be assumed that the change is according to the sine, without serious error. July 22 is one month, or 30°, from June 22, so the hourly change will be 60″, sine 30° = 30″, which is approximately correct.



To show how reliable the method is when the change in declination from the morning to the afternoon observation is added to the altitude for increasing north declination, I have made some calculations which are given below.

1	2	3	4	5	6	7.	8	9	10
44°30'	23°26' N	2 7"	64°	1hr. 12 5 min	52°1'6"	+4'22"	+17'30"	-3'44"	-15'3"
44°30'	23°26' N	2.7"	30°	4hr 11min	94°23'5"	+1'31"	+5'57"	-0'54"	-3'45"
44°30'	0°0'	59 3"	43°30'	1hr 0 7min	21°9'54"	+5'19"	+21'14"	-5'12"	-20'53"
44°30'	0°0'	59 3"	20°	4hr 5 3min.	69°20'34"	+1'36"	+6'22"	-1'13"	-4'47"
44°30'	23°26' S	2 0"	20°30'	1hr 1 3min.	15°0'46"	+5'14"	+20'57"	-5'14"	-21'01"
44°30'	23°26' S.	2. 0"	10°	3hr 4 1min.	42°9'26"	+1'56"	+7'49"	-1'40"	-6'40"

When making these calculations only six place logarithms were available, so some slight errors may exist.

Column 1. Latitude of the observation.

Column 2. Declination of the sun.

Column 3. Hourly change in declination of the sun.

Column 4. Altitude of the sun at the time of the observation.

Column 5. Time the sun is from the meridian.

Column 6. Bearing or azimuth of the sun.

Column 7. The error in the sun's azimuth when declination is taken 1′ too great.

Column 8. The error in the sun's azimuth when the declination is taken 4′ too great.

Column 9. The error in the sun's azimuth, when altitude is taken 1′ too great.

Column 10. The error in the sun's azimuth when altitude is taken 4′ too great.

Consider the third determination, the third line of the above table, made in latitude 44 30′ north about 11 a.m. local time. The altitude of the sun for the first observation was 40°30′ and a peg was set in the same vertical plane as the sun. Upon looking up the declination in the ephemeris it was found to be exactly zero and that the hourly change was 59.3″. From this the bearing of the peg set was calculated to be 21°9′54″ east of south. Suppose the sun did not change its declination; then when it again reached the same altitude of 43°30′, about 1 p.m. local time, it would be 21°9′54″ west of south. On the contrary, if at the time of the second observation the sun's declination was 0°1′ north and no allowance was made for this change, then the bearing of the second peg would be 21°15′13″ west of south, or an error of 5′19″; in the same way, if the declination was 0°4′ north the bearing of the second peg would be 21°31′8″ west of south, or an error of 21′14″. Since the hourly change is very nearly 1′ per hour, and the time between the observations was two hours the change in declination was practically 0°2′. The error was only ½ of 21′14″ or 10′37″, which gives a bearing of 21°20′31″ west of south. Again, assuming the sun does not change its declination, but that a mistake of 0°4′ was made in the altitude, setting off 43°34′ instead of 43°30′ for the afternoon observation, the sun would reach this altitude too soon by 20′53″, or when it has a bearing of 20°49′01″. In the same way, if the error in altitude were only 2′, then the horizontal error would be ½ of 20′53″ or 10′27″, which gives a bearing of 20°59′27″. Applying both errors simultaneously, their algebraic sum is 0′10″, or a bearing of 21°10′4″ west of south. Bisecting the angle between the pegs halves this error, the meridian as determined is 0′5″ west of south of the true meridian. This shows that a practical way of allowing for the change in declination is to increase the altitude by the same amount when the sun is coming north.

The drawbacks to this method are:

(*a*) When taken on the sun it is not correct unless allowance is made for the change in declination.

(*b*) The sun cannot be used in high latitudes.

(*c*) It is often not convenient to wait in one spot to make the second observation.

(*d*) If a star is used the second observation may be made on some other star by mistake.

(*e*) The sun or star may be obscured by a cloud at the time of the second observation.

The advantages are:

(*a*) Except in high latitudes an observation on the sun affords the degree of accuracy required by engineers.

(*b*) When the observation is made at night several stars can be used independently as a check.

(*c*) No corrections are necessary from standard time to mean local time and from mean local time to apparent local time.

(*d*) In high latitudes a star can be used.

(*e*) When no ephemeris is at hand this is a convenient method.

Platoro, Colorado

By Charles S. Barnes

This district has many large well defined fissure veins, as much as 34 ft. of ore running $8 to $11 per ton in gold and silver (with streaks of high grade in shoots), that are now attracting the attention of mining men. Owing to the refractory nature of the ore, milling, until recently, has been out of the question, and only the ore from the 'high-grade streaks' could be handled. These have been mined on many properties, and ore shipped to the Denver smelters for treatment has returned as high as $300 to $800 per ton; one property alone having shipped $350,000 worth of ore, while others have shipped, in varying amounts, up to $200,000 worth. While this high-grade ore was being mined, thousands of tons of low-grade ore have been developed, one property having 500,000 tons of $11 ore. Owing to the isolation of this district and ignorance upon the part of the property owners regarding improvements in methods of treating refractory ores, the camp has been dormant for a number of years. But recent mill-tests show conclusively that a high recovery can be made by the use of cyanide treatment.

The best illustration of what can be accomplished by installing mills to treat these ores is shown by the success of the Liberty Bell company of Telluride, Colo., upon an ore that is similar in character and gold and silver content. Consequently, "where others have blazed the trail we can safely follow." Certain large properties are to resume operations on an extensive scale, just as soon as preliminaries can be arranged. Many other promising claims, with more or less development, can be had at reasonable prices. This district offers exceptional opportunities for capital, with its large bodies of low-grade milling ore, both developed and undeveloped.

Timber in West Africa

Much trouble is experienced in West Africa from the rapid rotting of timber. The foundations for stamp-mills are usually made of concrete as a base, but in the Wassau mill the mortar-blocks were of imported pitch pine, which speedily rotted, giving much trouble during the last two years' running. In other cases, such as the 50-stamp mill of the Taquah mine, the main base was of concrete, on which were laid cast-iron anvil-blocks to receive the mortar-boxes; the longitudinal sills, strake sills, mill-posts, and ore-bins were of wood. The mill started in July 1907, but the timbers are rapidly decaying, and indeed are now being replaced. The present manager is preparing to use steel girders and reinforced concrete in place of timber, so that when the full 50 stamps resume crushing there should be no further trouble about foundations during the life of the mill. Pine timbers last fairly well in West Africa, as in other regions, if they can be kept either quite dry or else completely under water, but as neither of these conditions can be fulfilled in a stamp-mill foundation, other material must be utilized in construction work. Even battery-posts fail quickly if made of wood, while the dampness in the ore is generally sufficient to ensure speedy destruction of a wooden bin. Local timber would be more enduring; Kaku, Kwisaba, and Odum furnish excellent wood, and might give much better results if the trees were 'rung' a year or so before felling, so that the timber could season in an erect position as it stands; but there is no doubt that steel and reinforced concrete will in the end prove most economical. It is found in ore-bins, for example, that pitch pine of 12 by 12 in. section usually rots completely in about four years. But there is no reason why the ore-bins both at the 'bank' and in the mill should not be constructed completely of steel. In all the principal mines the practice, until recently, has been to timber the shafts with 8 by 8-in. pitch pine, a custom which is still followed in some places, but steel sets are now being generally used with great advantage.

Excavation at the Panama Canal

*Some important changes have been made in the method of excavating hydraulically in the lower lockpit at Miraflores, and in the Canal prism south of that point. Heretofore, the plan has been to dislodge the material in the sides and at the bottom of the excavation by monitors, which sluiced it to where the dredge pumps, mounted on concrete barges, could lift it into the fill of the west dam, or elsewhere, as desired. This plan provided for settling the concrete barges into sumps, and it is owing principally to the difficulty experienced in getting the barges in a suitable working position that it has been decided to abandon them. Stumps and the trunks of old trees that had become buried in the soil covering the site of the hydraulic operations in the lower lock at some previous period were among the obstacles encountered in settling the barges effectively.

Under the new arrangement, sumps will be created to various depths in the area to be excavated, and the pumps removed to positions alongside. This will do away with any need for the three concrete barges built expressly for mounting the dredge pumps and motor equipment, and one of them has already been dynamited and removed. It is proposed to break up a second one due to the difficulty of getting it out of its present position, but the third may be removed and used elsewhere.

The depth has reached a stage that permits a change in the method of working the hydraulic monitors, or giants. Instead of directing the play of the water against the surface of the material, the process of undercutting, which will allow the overhead mass to fall in as the work proceeds, will, in future, be employed. Dredge pump No. 2 has been shipped to the Gorgona shops for repairs, and it is proposed to install temporarily in its place the relay pump originally purchased for relaying the material into the fill of the dam. The relay pump will be placed directly in front of Cocoli hill. The face of this hill contains a great many small boulders which the relay pump is particularly well adapted to handle, inasmuch as its impeller admits pieces of rock 8 inches in size, compared with 6-in. pieces, the maximum size handled by the other pumps. It is estimated that the greater proportion of the boulder material found in this locality can be sluiced and pumped out in this manner. The sump where the relay is to be situated will be the main one; it will be sunk to 55 ft. below sea-level, and the dredge pump will occupy a position on a bench alongside, about 25 ft. below sea-level.

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*From the *Canal Record,* June 21, 1911.

Gold Deposits of Bokhara

St. Petersburg Correspondence

The question of the discovery of gold in the Russian Central Asiatic provinces, particularly in Turkestan and Bokhara, has cropped up as a matter of common interest from time to time. The Khanate of Bokhara has been most carefully investigated from this point of view, and important work has been carried on in the search for gold in that area by such men as B. A. Zhoravko-Tokorsky, Leva, S. L. Nikolai, and others. Turkestan has not been so carefully explored as Bokhara. The general impression was that from the information received as to the gold deposits of Turkestan, an important development of the gold industry in that area was not to be expected. Recently the tendency to stake out claims in Russian Turkestan has become brisker, and even St. Petersburg citizens have taken a lively interest in the possibilities of this area. It is said that, although the prospects are only moderate, there is a chance of a gold mining region being developed there.

At the conference that took place at the end of last year on the part of the Permanent Consultative Committee of Gold and Platinum Producers on the situation of the gold industry in Russia and the possibilities of further development, several persons stated that the industrial importance of the gold deposits in Turkestan could not be considered as definitely disproved, but that results of investigations in Bokhara have proved fairly satisfactory. It may be hoped that with the development of civilization and the clarifying of the political situation in that country, particularly with the introduction of means of communication, the gold industry will develop rapidly.

Readers of the *Mining and Scientific Press* will remember that a statement on the goldfields of Turkestan was published in these columns on October 1, 1910. Important gold deposits have been found in the Khanate of Bokhara by B. A. Zhoravko-Tokorsky, who for many years carried on the investigation and exploitation of these deposits. Extensive prospecting work was undertaken in the valley of the river Saphet-Darya in the year 1896. The mountain stream Saphet-Darya runs for about 15 to 18 versts,* falling into the river Yak-Su. Its source is in the upper hills, Chazret and Pa. In the upper reach of the Saphet-Darya a narrow, deep gorge is formed which is made up of conglomerates, and these conglomerates are proved to be auriferous. The conglomerates of Saphet-Darya are exceedingly solid and deep, measuring several hundred sagenes. They weather easily and they form gold alluvium which is deposited in the valley. The gold is found exclusively in the form of flakes (flaky gold) which sometimes amount to 50 dolya and even one zolotnik per 100 poods of earth, and flakes of 10 to 12 dolya are to be found with considerable frequency. Allotments in the valley of the Saphet-Darya to Russian subjects, Zhoravko-Tokorsky, N. I. Borovsky, and P. I. Reinhard, have been made, of gold-bearing ground measuring 350,000 to 500,000 sagenes each, to which they have obtained full title until such time as the allotments shall have been completely worked out, or may be recognized by the owners as not worth working at all.

Seeing that the gold deposits are found within the limits of the Khanate of Bokhara, the producers have found it convenient to enter into an agreement with the Bokhara Government respecting the method of exploiting the allotments made over to them. All the gold produced is delivered to the Bokhara Government in the person of the Beka (Governor), who pays to the producer 5 roubles 25 copecks ($2.78) for each zolotnik of pure gold so delivered. In the form of dues the Bokhara Government retains 5% of

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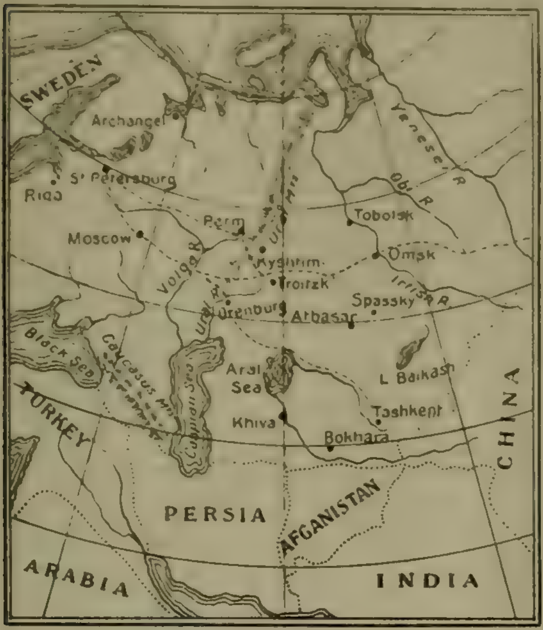
*1 verst = 3500 feet.
1 sagene = 7 feet.
1 pood = 36.11 pounds.
1 zolotnik = 0.137 oz. Troy.
1 dolya = 0.00143 oz. Troy.
1 rouble = $0.515.
1 dessiatine = 2400 sq. sagenes.

the gross production of gold, and, besides this, charges two roubles per dessiatine per annum as rental of the allotment. On delivering the gold to the Government the latter pays the producer about two-thirds the value of the gold in money. The receipt of the Government for the gold is handed by the producer to the Russian political agent in Bokhara, through whom the Bokhara Government effects a final settlement of the account with the producer.

Prospecting work and exploitation of gold deposits in the valley of the Saphet-Darya have shown that the auriferous ground begins at the surface, but that the gold content is there rather poor: about two-fifths dolya of gold per 100 poods of sand. At first the bed shows sulphides and pebbles to the depth of about 7 ft. Then there is a stratum about 2 to 2½ sagenes (14 to 17 ft.) of clayey red sand. Below this stratum there is water. Beyond the reddish sand there is a stratum of black sand of variable thickness. The black sand has a very fair content of gold. Beneath this again there is a red sand, mixed with clay. Both these beds are about 14 to 17 ft. thick, and the content of gold in them amounts to 24 dolya per 100 poods in the upper layers, and in the lower about one zolotnik per 100 poods of sand. The succeeding bed, of about 21 ft. thick, is clay and pebble, and contains 7 to 8 dolya of gold per 100 poods of pebbles, and covers a bed of sand which is very rich in gold, making not less than 6 zolotniks per 100 poods of sand. Their rich content of gold, however, is not easily worked because of the strong flow of water. The water can easily be removed by digging trenches in the lower part of the river's route, but this work has not yet been done for want of money. In the year 1910 Mr. Zhoravko-Tokorsky went to Tashkent for the purpose, among other things, of getting money to carry on the work of leading away the water from the gold deposits.



MAP OF WESTERN SIBERIA.

From all that has been shown, it is clearly established that the gold industry in the valleys of the Saphet-Darya and Yak-Su is being industriously developed, and will yield a substantial revenue both to the Khanate of Bokhara and to Russia, the suzerain power.

THE MINERAL DEPOSITS of the Bear River range, Idaho, have been known and prospected for 15 to 20 years and the prospect pits are numerous. The lead ores consist of galena with small amounts of cerussite and wulfenite in a gangue of iron-stained calcite and dolomite, and are found at Swan creek, Utah, and near St. Charles and Paris, Idaho. The copper ores consist mainly of the carbonates, azurite and malachite, in quartz veins. Shipments of ore have been made from two localities, and comprised somewhat less than 100 tons of part lead and part copper ore and about 500 tons of high grade concentrate.

June Copper Production

The output of the Lake Superior copper mines for June is estimated at 19,529,000 lb. fine copper, which is 629,883 lb. less than in the previous month and 652,272 lb. larger than in June 1910. Production by months since January 1 compares as follows:

	1911.	1910.
January	17,614,385	19,200,127
February	17,084,911	18,558,345
March	19,674,764	20,062,442
April	18,359,157	19,473,479
May	20,158,883	19,077,536
June	19,529,000	18,876,728

The May output was the largest since November 1910, due principally to the increase in the output of the Calumet & Hecla properties. The detailed figures for June are as follows:

	June Output (lb.).	Daily Tons Crushed.	Lb. Copper per ton.	Copper, %.
Calumet	6,472,649	9,000	28.5	1.425
Champion	1,597,400	2,400	25.6	1.280
Wolverine	862,000	1,300	25.5	1.275
Ahmeek	1,560,455	2,000	25.0	1.250
Baltic	1,542,800	2,500	24.0	1.200
Superior	310,991	600	21.0	1.050
Allouez	379,780	800	20.0	1.000
Hancock	116,641	230	19.5	0.975
Trimountain	608,000	1,200	19.5	0.975
Tamarack	509,335	1,400	18.5	0.925
Isle Royale	543,159	1,100	18.5	0.925
Mass	129,500	280	18.5	0.925
Osceola	1,605,020	3,800	16.0	0.800
Mohawk	1,080,000	2,600	16.0	0.800
Quincy	1,833,200	4,500	15.5	0.775
Centennial	128,005	300	13.5	0.675
Franklin	103,600	300	13.3	0.665
Victoria	140,000	500	11.2	0.560

Wolverine, which in May had 29.3 lb. copper per ton of ore, fell back into third place in June with a return of 25.5 lb. The June production of the Utah Copper Co. was 7,908,685 lb., compared with 8,360,000 in June 1910. The output last month represents a reduction of 954,215 lb., compared with the record output of 8,862,900 lb. last May. The production compares as follows:

	1911.	1910.
January	6,707,116	4,745,066
February	7,329,326	5,798,819
March	7,260,267	8,100,000
April	8,169,248	7,902,643
May	8,391,870	8,862,900
June	7,908,685	8,360,000
Total	45,766,512	43,869,428

The June production of the Nevada Consolidated was 5,307,400 lb. The comparative production by months is as follows:

	1911.	1910.
January	5,268,954	3,074,458
February	4,992,533	5,115,823
March	5,932,259	5,339,466
April	5,298,632	5,822,351
May	5,277,355	5,500,000
June	5,307,400	6,100,000
Total	32,077,133	30,951,998

Discussion

Readers of the Mining and Scientific Press are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Overvaluation of Prospects

The Editor:

Sir—Your editorial, 'Selling Prospects,' of July 8 is comprehensive and to the point. My business is that of bonding, developing, buying, and selling prospects and mines; it brings me into close contact with the prospector, and his ignorance in estimating the value of his holdings and the price he asks, out of all proportion to the showing made, is a serious obstacle in the making of new mines. An undeveloped prospect is not a mine; it is not even a probable mine; it can only be a possible mine. A mine is a property that has its orebodies exposed underground in such wise that the different blocks of ore can be examined and sampled on more than two sides at stated distances, and the ore must be of a quality and quantity to pay a fair profit over all expenses, including purchase price, taxes, and interest on the money invested for a term of several years. A probable mine is a partly developed prospect that has the orebodies exposed at least on two sides at a depth of approximately 100 ft. below the surface, and the ore must be of a grade to pay all expenses of mining and treatment and leave a fair profit. A possible mine is what the majority of prospectors have to sell, and which they style a mine. It consists of one or more 10 to 20-ft. holes in the ground, and sometimes a location notice, while the ore in most instances is composed of the common sulphide, optimism in big chunks. I have found that a large number of prospectors have no confidence in their claims and will not develop them even when in a position to do so. The best men to do business with are those that have prospected widely, have read up on economic geology, know what constitutes a mine, and realize that the day of the sucker is past. Large investors do not buy undeveloped properties, and as a great many prospectors can not open up their claims sufficiently to interest capital, the need for an intermediate or middle man is created. He is either a mining man himself and does his own selecting; or else a man that knows little about mining, but engages an engineer who is competent and makes a specialty of such work. Having found the right property, he bonds for a reasonable figure without cash payment, develops the property, and, if the showing warrants it, pays the purchase price when the bond expires. Conversely, if results are bad, the bondee is out the money expended, while the prospector, without cost to himself, learned a good deal about his property, a knowledge which is very seldom desired, however. This is one of the safest and most rapid ways of making honest money in mining, provided the man employed in making the selection is capable. The price paid for a good prospect is so much less than that paid for a mine, that one can afford to lose once, or even twice, if the third attempt is a winner. The amount of ore yet to be extracted is much greater in case of a prospect than in that of a partly worked out mine. While the prospect has parted with none of its ore, its capabilities are all held in reserve and its whole life is still before it. The reason the prospector experiences difficulties in selling is not that he has no market for his wares if they have genuine merit, not that investors are shy of risking their money, as witness the number of mining men in the field searching for good properties, but because of his demand to be paid a fortune for some orebody that he claims is somewhere in the ground, but which, in nine cases out of ten, is situated in his imagination. Much has been written on sampling and how the eye unconsciously directs the hand to pick the best ore, but it remained for a chance acquaintance of mine to solve this puzzling problem. He told me, in all seriousness, that he simply shuts both eyes and grabs samples right and left from his dump. How he would manage to sample with a bandage over his eyes, deponent sayeth not.

R. L. Mann.

Cazadero, California, July 18.

Errors in Mine Sampling

The Editor:

Sir—There are numerous factors which tend to cause error in sampling the ore in a mine, most of them of a physical character, though some may be charged to what may be termed the personal equation. This latter is more likely to become an important factor where the person doing the sampling is familiar with the ore. That is, where the sampler is able to distinguish between rich and low-grade ore by its appearance. He may not intentionally take other than what he considers to be a representative sample, but if he be sampling for the owner he is likely to favor the richer ore, whereas, if he represent a possible purchaser, he is as likely to get a full share of the poorer ore, in order not to 'salt himself.' In each case he almost inadvertently introduces a factor of safety, which is perhaps intended for self-protection, as much as for anything else. If the ore is of fairly uniform grade across the entire width of the vein, and the walls are rather soft and likely to break away liberally when stoping is in progress, the sampler usually takes due cognizance of this important fact, and, with a liberality equaling that of nature itself, he includes all the wall-rock in the sample that the situation appears to demand, in order to be on the safe side, or, on the other hand, he as carefully avoids it, if representing the seller, arguing that a careful miner would eliminate the waste as far as possible when mining this ore. This is merely a human weakness, and in most cases is done with no intent to deceive. The influence of physical conditions is often of far greater importance. In some mines the ore is rather loose and crumbling, its principal value being found in the softer portions of the vein. Blows from the pick, hammer, or 'jigger' shake the ground adjacent to the channel as it is cut, and this soft material is jarred loose, falling upon the canvas, thus enriching the sample. In such cases greater accuracy is secured by taking large samples. If the vein be very hard and the valuable mineral occurs mostly in seams or in isolated bunches, then samples that are fairly representative can only be secured by taking very large quantities, and it may be necessary to blast in order to get the desired result. Such veins are by no means uncommon, but the taking of samples in veins where the minerals are 'spotty' requires considerable judgment. The object to be attained is a sample exactly representative of the ore as it occurs in the mine. The most accurate samples can be taken where the rock is rather soft, but not too soft, and where the sampler can cut a channel of uniform section, cutting only that which he wishes to take. But such ideal conditions for sampling seldom obtain.

In some cases the only safe method of ascertaining the value of a vein is by actually stoping and milling the ore, or sending it to a smelter, as no hand samples taken can be depended upon to give accurate results, or to even approach them unless the quantity taken in each sample be so large that it cannot be satisfactorily manipulated on a good sized canvas by two men. I have known of instances where samples were taken in such large quantity that they had to be divided into two or more portions to be worked down separately, finally mixing the several 'quarters' and calling the result one sample. This is all right if the cutting down be carefully done, but if one portion is cut, say three times, and another portion is cut four times, before the several 'quarters' are mixed, the sample is worthless, as then the ratio of one portion to the others is destroyed. Sampling ore is a purely mechanical performance, but it requires great care nevertheless, for the sources of error are many, aside from possible salting, and the sampler must use good judgment and proceed methodically to secure reliable results.

W. H. Storms.

Berkeley, California, July 20.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

TO SOFTEN SMALL FILES cover them with oil and hold them over a fire until the oil blazes. As soon as the flame runs all over the file, plunge it into water.

A GLUE that will resist moisture is made of 1 lb. of glue, melted in 2 qt. of skimmed milk. The addition of powdered chalk to common glue makes it much stronger.

TO THAW out frozen water pipes pack them with unslaked lime and wrap up in old rags or carpet. Pour water over the portions thus covered and the heat generated will melt the ice in the pipes.

BAUXITE has but little market on the Pacific Coast as yet, as there are no companies engaged in the production of aluminum in any of the Western States. A small local market for bauxite for other uses is slowly developing.

IRON may be securely cemented to marble by the use of the following preparation: Plaster of paris, 30 parts; iron filings, 10 parts, sal ammoniac, 1 part; mix to a fluid state with vinegar and use immediately, as it hardens rapidly.

A BLACK INK for rubber stamps is composed of nigrosine 3 parts, water 15 parts, alcohol 15 parts, glycerine 70 parts. Dissolve the nigrosine in the alcohol, add the glycerine previously mixed with water, and rub well together.

PLATINUM has frequently been found in association with nickel-bearing copper ores, occurring in ultrabasic rocks; pyroxenites and peridotites, for example. But there is no other reason to expect that actinolite would be likely to carry platinum.

A FORMULA for making white metal for motor bearings, which has given excellent results on heavy high-speed service, consists of 48 lb. of tin, 4 lb. of copper, and 1 lb. of antimony. The copper and tin are melted first, and then the antimony is added.

TO CUT THIN BRASS, first draw a line with a quill pen dipped in a strong alcoholic solution of corrosive sublimate. Let it dry, and then go over the line with the pen dipped in nitric acid, when the metal may be broken like glass cut with a diamond.

KAOLIN DEPOSITS should be located as placers, as they are usually worked by open-cuts and the larger claim gives the necessary room. It would be difficult to identify the 'apex' of a kaolin deposit in most cases, and it is therefore customary to locate such deposits as placers.

ROSIN may be prepared for soldering bright tin by the following method. Take 1½ lb. olive oil, 1½ lb. tallow, and 12 oz. pulverized rosin. Mix these ingredients and let them boil up. When cool, add 1⅜ pt. water saturated with pulverized sal ammoniac, stirring constantly.

CHISELS may be tempered by using the following formula: To 3 gal. water add 3 oz. nitric acid, 3 oz. sal volatile, 3 oz. sal ammoniac, 3 oz. alum, 6 oz. salt, with a double handful of hoof pairings. Heat the tool to a cherry red. This has put new life in steel that has apparently been burned, and is used to temper chisels for cutting French buhrstones.

NITRE can be extracted from nitre-bearing earth, on a small scale, by simply leaching the earth with water and evaporating the resulting solution, taking care to first filter or clarify it. The resulting product would be somewhat impure, but would find a ready market among manufacturers of chemicals, who would purify it.

HARDENING an ordinary drill in sulphuric acid makes an edge that will cut tempered steel or facilitate cutting hard rock. The acid should be poured into a flat bottomed vessel to a depth of about ⅛ of an inch. The point of the drill is heated to a dull cherry red, and dipped in the acid to that depth. This makes the point extremely hard, while the rest remains soft. If the point breaks, reharden, but with a little less acid in the vessel. After hardening a drill in this manner, wipe off the acid, if any remains on the point of the drill, before it attacks the metal and destroys the cutting edge.

ASBESTOS is all of secondary origin, and may be derived by alteration from various rocks, generally rich in olivine or pyroxene. Some of it, however, is derived from impure limestone. Rocks originally rich in olivine are by far the most important source. They alter to serpentine, and under favorable conditions give rise to asbestos. The purer the serpentine the more likely it is to contain asbestos, especially if the serpentine has been greatly fractured and intruded by granitic dikes, as in the vicinity of Thetford, Canada. Rocks and conditions similar to those of the asbestos region of Canada, but much less rich in asbestos, occur near Lowell, Vermont, and Casper, Wyoming, where prospecting and mining operations are now being carried on.

TO protect wood from decay the tissue must be protected from the invasion of the spores of the fungi which give rise to decay, or it must be so altered by chemical change that it will no longer be a suitable medium for their growth. Certain chemicals have the property of protecting wood from decay, but the trouble is to bring them into sufficient contact with the cellular tissue of the wood and then to make the contact a permanent one. To this end the substance used must not evaporate at ordinary temperature nor be soluble in water, hence aqueous solutions of antiseptic chemicals will not avail when the treated wood cannot be protected from moisture; neither will the light oils give more than temporary protection, even when combined with the powerful antiseptic coal tar acids, for they evaporate in a short time and the temporary protection ceases. It therefore follows that the heavy oils, insoluble in water, that do not evaporate at ordinary atmospheric temperatures, combined with powerful chemicals, which are both antiseptics and germicides, are the ideal and rational preservatives for wood.

ROOFS of sheds and other structures requiring lightness of construction combined with fire-resisting qualities are often made of a combination of structural steel shapes with a corrugated-iron roof. In this way a roof can be obtained which is made entirely of metal that can be easily removed if occasion should require. It often happens, though, that there is no adequate means of fastening sheets to the iron. If the sheets were riveted directly to the angle irons, the expansion and contraction would tend to make the rivet hole enlarge continually. However, the following type of fastening has been found to work satisfactorily in many cases where corrugated sheets were fastened to iron angles. A piece of strap iron is riveted at one end to the ridge of the corrugation on the under side, and passed under the angle iron, and then again riveted to the ridge of the corrugation at the other end. In this way expansion of the sheet is allowed for, and at the same time there is little or no danger of water passing through the rivet hole. With roofs of this character it is often the practice to make the span between purlins of considerable length, as the corrugations give to the roof a stiffness which will support a fairly heavy weight of snow.

Special Correspondence

JOHANNESBURG, TRANSVAAL

April Gold Production.—South African Coal.—The Middelburg District.—Tin Mines of the Rand.—Messina Copper Field.

The Transvaal output of gold for the month of April, according to the Mines Department, was £2,823,121 in value, as compared with £2,883,332 in March. For a 30-day month this is considered satisfactory, and probably another record gold output will soon be forthcoming. The number of tons milled was only 40 tons short of 2,000,000, and this should be reached when May results are known; at all events, with the additional stamps dropped at Randfontein and the new mill started at Brakpan, that level now must have been exceeded, especially as the Meyer & Charlton mine again enters the list of producers this month. At Johannesburg there is a tendency to compare other mining industries with that of gold, and so it is that we hear of the Transvaal coal-mining industry being fast reduced to a pennyweight basis, the average value of coal at the collieries coming out last month at only 4s. 9d. per ton, and further reductions in the selling price are likely.

Middelburg has become the principal coal-mining district of the Transvaal, and supplies quite three-fourths of the whole coal output of the province, but there are not wanting signs that before long the coal centre of the Transvaal will have to be moved again. The Witbank company and the Cassel company are examining new areas, and, generally speaking, there are few new areas containing coal of standard quality along the Pretoria-Delagoa bay line available for future working. The price at the mine in the Middelburg district was last month 4s. 7d. per ton, but that of the outside districts was even lower, by a penny per ton. The Consolidated Gold Fields of South Africa has opened a large colliery at Breyten, in the eastern Transvaal, some 150 miles away from the Rand, and within twelve months of commencing mining operations is turning out nearly a thousand tons per day. Some commotion has been caused in the local coal trade through this action of the Consolidated Gold Fields, especially as it has led to a revision of the railway rates for the carriage of coal from these outside districts, thus enabling them to compete more effectually with the Middelburg collieries. It is, however, to these more distant fields that the Rand will soon have to look for its future coal supplies, as the untouched coal areas in reserve and within easy reach of the railway in the Middelburg district are somewhat limited. It is anticipated, however, that the changing over from steam to electricity at the gold mines will reduce the coal consumption on the Rand by nearly a third. However disagreeable a fact this may be to the existing collieries, it will be to the permanent advantage of the gold mines and the Rand, for, after all, the coal resources of the Transvaal are not by any means as superabundant as commonly supposed.

The estimated value of the mineral output of the Transvaal during April, excluding gold, diamonds, and coal, was £63,415, an amount apparently small, but, nevertheless, a record output. Of this total, tin ore comprised no less than £48,281, and, as before remarked, the tin-mining industry here is progressing, helped by the prevailing high price of tin and the promising outlook of the northern tin-fields. Had today's discoveries been made six years ago, the tin boom of that time would have established a sound tin-mining industry, but the engineers called in to report upon the discoveries made six years ago overrated their value and importance, with the result that speculators all look askance at the more promising discoveries made today farther north in the Waterburg district. The copper ore exported in April was only valued at £4328, but much better things are confidently looked for in the Messina copper field, once the sanctioned line of railway becomes available for traffic. Already the Messina company has made arrangements to secure more working capital, so that the property can be worked on a much larger scale, and the other companies interested in that field are also making preparations to commence work.

LONDON

New Move at Carn Brea & Tincroft.—Progress in West Africa.—Taquah Ore Reserve.—Abosso Yearly Report.—Additional Equipment.

A notable alteration of policy has recently taken place at the Carn Brea & Tincroft mine in Cornwall. I have often referred in this column to the past and current history of this old tin mine and have shown that it just manages nowadays to jog along, sometimes making a loss and sometimes a small profit. Six months ago R. Arthur Thomas of Dolcoath examined the property and pointed out the fatuous practice of mixing clean tin ore with tin ore containing much wolfram and stamping the whole lot in one battery, instead of treating them separately. He advised them to alter their practice, and to buy a Wetherill magnetic separator for the tin-wolfram ore. Lord Clifden, one of the ground landlords, put up the money for this purpose, and as he is already a large shareholder, he has been able during the last few months to obtain virtual control of the property. On the death of John Penhall, the manager, two months ago, he insisted that the management must be put in the hands of a more experienced man than a local Cornish mine captain, and secured the appointment of Edward S. King as consulting engineer. Mr. King is well known in Australia as a capable and enlightened engineer, and if he is given funds and opportunity he ought to put the mines on quite a different basis. Already he has created a mild sensation by advertising for tenders for supplies, following on the same track as Mr. Battens at the Grenville. This change of policy has made Frank Harvey and J. C. Daubuz sever their connection with the company and resign their directorships. Mr. Harvey came to the rescue of the company twenty years ago when there was a likelihood of the mines being closed, and bought a large number of shares. But he is a merchant and much of the mine supplies were bought through his firm. Mr. King will find some difficulties in his way when fighting for a free market, but if he is backed by the Clifden interests he should come out all right.

News from West Africa usually emanates from London. On the spot nothing is known at first hand of intentions, policy, or results of operations. During the last year or two some of the big mines have suspended mining and milling operations and have done much development work. For instance, two years ago at the Prestea Block A a large amount of additional working capital was provided by Wernher, Beit & Co. and the Consolidated Gold Fields of South Africa, and H. F. Marriott was appointed consulting engineer. It was decided to build a new treatment plant containing 110 stamps; 60 of these have been erected and 40 of them started work at the beginning of May. On December 31 last the ore reserve was figured at 678,859 tons, averaging just over 10 dwt. per ton. The main shaft is down 624 ft. and the Appantoo shaft 724. The company publishes a vertical section showing the ore blocked out, with notes of the tonnage and content. Important recent events have been the completion of the railway to the coast and the absorption of the adjoining Prestea Mines property. The railway had been long delayed owing to the difficulty of building a bridge over the Ancobra river, which is continually subject to floods. The mine has had a good deal of bad luck. For one thing, the supply pump at the Ancobra river broke down, and in the meantime water for the mill has to be obtained from the mine. Then the steel stack fell during erection. The boiler plant was in a forward state, and the steel stack, 140 ft. high by 8 ft. diameter and about 30 tons weight, was being lifted into place when a derrick canted, throwing the whole weight onto one block, which gave way, so that the stack fell right across the boiler-house, and the whole of the middle section collapsed as if made of paper. The roof of the boiler house was badly crushed, but being a steel building it fortunately prevented the stack from falling on the boilers beneath. The repair of the stack will cost hundreds of pounds besides delaying the completion of the boiler plant.

Mining and milling have also been suspended at the Taquah since June 1910. This mine is one of the Oceana Consolidated group, and the company working it also owns a large share in the Abosso company, farther north on the same line of banket deposit. For some years both of these mines were under the management of G. A. Stockfeld. A few months ago Mr. Stockfeld's services were transferred to the West African Trust, a development company belonging to the same group, and J. W. Newbery succeeded him. R. Recknagel and S. R. Adams then examined the mine, re-estimated the ore reserves, and made suggestions for the modification of mining methods and the improvement of the power plant. Two months ago W. R. Feldtmann was appointed consulting engineer. In June 1910 a serious accident occurred in the main shaft, and mining operations had to be suspended. It was decided not to resume mining and milling, but to push ahead with development work. On February 28 last, Mr. Recknagel estimated the ore reserve at 102,370 tons, averaging 78s. 3d. per ton; he rejected 107,370 tons which he considered unprofitable.

The latest information about the Abosso above mentioned is contained in the yearly report for the period ended June 30, 1910. During that time 77,623 tons of ore was sent to the mill, and by amalgamation and cyanidation 41,125 oz. gold was recovered, worth £174,834, or 45s. per ton. The working profit was £51,196, out of which £14,310 has been written off for depreciation and for shaft extensions, and £5894 has been paid in taxes, leaving a net profit of £30,991. The year commenced with a balance of £31,203, and dividends amounting to £60,000 have been distributed during the year, being at the rate of 15%, leaving a balance carried forward of £22,194. An additional 50 stamps are now being erected, as also is an electrical pumping plant at the main shaft. When the latter is at work sinking will be re-commenced. On February 28 Mr. Recknagel estimated the ore reserve at 284,028 tons averaging 47s. 3d. per ton, and 58,210 tons averaging 19s. 9d. per ton.

BUTTE, MONTANA

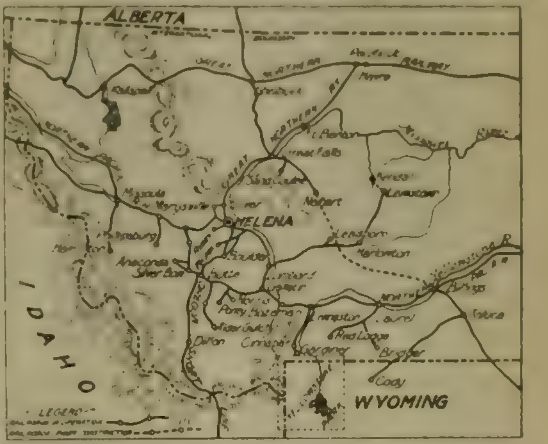
Smelter Fume Commission.—Use of Compressed Air at the Anaconda. — Georgetown District. — Sinking at Pilot Butte.

A commission of experts and scientists, appointed by Attorney General Wickersham to investigate the smelter-fume question at Anaconda, has been at work for a week, but of course the members have given no intimation of their opinions. Of the three members of the commission, one is supposed to represent the 'smoke farmers,' another the Anaconda company, and the third the Government. They will attempt to decide whether or not some system can be installed to prevent the injury complained of by the farmers.

By the first of August the Diamond-Bell mine of the Anaconda company will be operated by compressed-air power. The Mountain View mine has been using the new power with splendid success for two months. As soon as the Diamond-Bell is started the High Ore will be shut down, and the change from steam to compressed air will be made there. Officers of the Anaconda company say the saving on the cost of production using the new power will prove more than had been estimated, and the economy greater than had been guaranteed by the manufacturers who are installing the plant. The Anaconda company has decided not to build a railroad from Anaconda to the Georgetown gold-mining district, claiming that the tonnage in sight is not sufficient to warrant the extension. As the district is almost inaccessible by wagon, the decision of the Anaconda company will practically put an end to development work there at present. Some of the companies organized to operate in the Georgetown district may conclude to build a branch line to connect with the Anaconda road at the town of Anaconda.

The new surface plant of the Tuolumne company has been received from the Nordberg company, and it is expected that the new hoist will be in operation by October 1. The engine weighs 88,000 lb. and has a capacity of 1000 tons in six hours. It is officially stated that the company has no intention of increasing its dividends this year, and not for some time thereafter unless there is a decided improvement in the metal market. Very little work is now being done in the property of the Davis-Daly company in Butte. A few men engaged in development work in the Colorado mine comprise the extent of operations.

The Pilot Butte Mining Co. has pumped the water from the shaft and has resumed sinking. The cross-cut from the Blackrock mine on the 1600-ft. level has been extended 150 ft., and 410 ft. more will take the cross-cut to a point under the Pilot shaft. Raising and sinking will be carried on at the same time. The old Gagnon mine hoist and surface plant are being torn down, the old shaft having been abandoned as a working shaft. The mine has been connected with the Original mine of the Anaconda company and the Gagnon is now being mined through that property. The new Gagnon shaft has reached a depth of 1750 ft.; when completed down to the 2300-ft. level and connected it will be used to work a portion of the property.



MAP OF MONTANA.

NEW YORK

The Copper Market.—Production of Utah Copper.—Giroux Shipments. — Sale of Gill Holdings. — Tharsis Copper. — Kerr Lake Dividend. — Cobalt Central.—Porcupine Fire.—Shut-down of A. S. & R. Plants.

The report of the Copper Producers' Association covering the month of June was made public July 8, and the expected and much-talked-of decline in surplus stock was made apparent. The decrease in surplus was 8,561,768 lb. June production was 124,554,232 lb., which is well up toward the high mark for the short months, being just about the full per diem output. It is not to be wondered at that the market has failed to show any signs of stimulation. It is impossible to compare the present conditions governing the copper situation with conditions prevailing ten years ago, or even five years ago. The consumers are not overlooking the fact that the porphyries could make money on 10c. copper, if forced to sell at that price.

Some of the important people in the metal market are beginning to scold the public for its present attitude and to insist that attention should be directed to the enormous consumption rather than to the production. A New York metal man, whose position is an important one, states that consumers are refusing to carry stocks on hand. He says in part: "I know of one large consumer who has heretofore carried forty to fifty million pounds of copper in stock, who today has but a few million pounds on hand and who now buys a million pounds at a time."

This illustration is typical of the consumers' stand, and their belief that they can get cheap copper at any time is based on the knowledge that the low-grade milling coppers cannot curtail or limit production, but must continue to make and market their production at whatever profit can be had. An instance of the factors in production which influence the consumer, is the adding of three new shovels by the Utah Copper Co. for stripping on the Boston Consolidated. The recovery of copper at the Utah plants is now said to be higher than the mills have ever made before. From time to time, there has been a great deal of stress laid upon the eventual inevitable needs of the Orient for copper as telephone and telegraph lines, electric light and railway systems spread over the land. Evidently the celestials do not intend to pay all of the tribute to the 'foreigner.' The Chinese Government has sent the Chinese supervisor of mining and smelting operations to Butte to study the Washoe smelter and prepare for the installation of modern mining and smelting methods in China.

The report covering June operations at the Greene Cananea, while showing a considerably smaller output, is still very encouraging. Greene Cananea has dragged and dragged in the market, and the holders of the shares have long been weary. The reconstruction of the Greene Cananea plant has been completed, and the important feature of the present showing is a 9c. cost. If the metal market justifies placing the property on full production, it is now in shape to turn out some 50,000,000 lb. annually. At present it is producing just a little more than 50% of this amount. If a 9c. cost can be maintained, Greene Cananea ought to make, on the present output, with copper at 12½c., about $1 per share, equal to approximately 9% on the present market price of the shares.

It is being said over town that Giroux is soon to begin shipments to the Tooele smelter. A conference is said to have been arranged for a settlement of the freight rate that Giroux will have to pay to the Nevada Northern, and by this means indirectly to the Nevada Consolidated. Giroux has been very much of an enigma for the Eastern shareholders. Whatever the mining problems encountered by the management may have been, a policy of reticence has been maintained and shareholders have been mostly left to surmise. There is a report that native copper has been found on the 1400-ft. level. It seems to be quite the prevailing order of things that plants should be increased in capacity while in course of construction. Nearly all of the large plants erected recently in the low-grade mining camps have been enlarged almost before foundations have been completed. The International S. & R. Co. is following this innovation in adding its lead stack to the plant at Tooele; original plans contemplated the construction of two furnaces, now a third furnace is to be added, and the first two will be blown in probably in October.

The holdings of the late John Gill in the Arizona Copper Co. have been sold. Mr. Gill was chairman of the board of the Arizona for many years and owned some 150,000 shares of stock. One half of this stock was bought by interests connected with the Tharsis Sulphur & Copper Co., Ltd.; the remainder was sold through a Glasgow brokerage house to individual parties for investment. An early report on the Arizona properties is expected from the secretary, Y. J. [illegible], and the company's engineers who visited the property last spring. If the report as to ore reserves and the future outlook is favorable, it is rumored that some £200,000 will be raised by debenture issues, and the funds expended in the erection of a modern plant which will include all of the latest improvements in handling and reducing ores. The Tharsis company, which now is more closely associated with the Arizona, is one of the oldest copper producers in the world and operates the [illegible] in Huelva, Spain. The Scotch management has retained the primitive methods of ore treatment. The ore is piled in heaps and sprinkled, weathering and leaching follows, the leach-water going into timber sluices and the copper in solution being deposited on pig iron. The management has paid dividends of nearly 20% per annum for almost half a century, a dividend record hardly equalled by any other copper mine in the world.

Kerr Lake is one of the first big dividend payers in Cobalt to reduce its dividend rate. The company has been paying 50c. quarterly, the same as Goldfield Consolidated and Amalgamated Copper. The declaration for the current quarter, however, reduces the disbursement to 40c. There has been very little litigation in Cobalt concerning ownership of orebodies, as Canadian mining laws are not obstructed by any obnoxious apex theory, but the Kerr Lake company has been made defendant in a suit by the Hargraves Silver Mines, Ltd., claiming $150,000 for ore wrongfully taken from the Hargraves ground adjoining the Kerr Lake. Kerr Lake makes silver at a cost of about 13c. per ounce and has been earning little more than its dividend for the past eighteen months or so. An important innovation made by this company is the recent installation of three jigs to handle low grade ores of 50 oz. per ton, or better, the concentrate from the jigs to go to the Nova Scotia mill.

A syndicate of Philadelphia holders of Cobalt Central has made the first deposit with the liquidator on the purchase price of the Standard Cobalt properties. The Standard properties were controlled through stock ownership by the Cobalt Central Mines Co. There are some other claims belonging to the Cobalt Central, but present plans are apparently hazy as to whether the Pennsylvania holders are to form a new organization, or endeavor to rehabilitate the Cobalt Central. The shareholders in the old company have been bombarded and importuned for a contribution by various committees and factions until they have mostly lost interest in such plans. At present both the new syndicate and a faction in the old company are making separate appeals.

The previous fires which have visited Porcupine, while disastrous enough, have been dwarfed by that which swept through the forest and devoured the camp this week. An area of some two miles in width and twenty-five miles in length was swept by the flames with a terrific loss of life and property. The Dome and the properties immediately adjoining suffered most heavily. The townsite of South Porcupine was directly in the path of the flames, and the people were forced to take refuge in the lake, where many were suffocated or partly suffocated, and drowned. Pottsville and Golden City were also burned. Best estimates at present give the loss of lives at 200, mostly foreigners, many of whom were so little known as to make identification impossible. Many miners and workers at the various camps in the forest took refuge in the shallow shafts which have been sunk and were later found dead from suffocation. The disaster, undoubtedly bound to come sooner or later, will retard progress for the coming summer. The loss of life is terrible. So far as the physical effect on the camp is concerned, it will not be wholly detrimental. The burned-over part of the camp will have no bush fires next summer and a great deal of exploration work will be made easier. There was a severe break in the New York market in Porcupine issues, but trading was restricted owing to the action of the Toronto Exchange in closing for the day.

The shutting down of the plants of the American Smelting & Refining Co. at Chihuahua and Aguascalientes has been a matter of some discussion, but it is authoritatively announced that such action is due altogether to unsettled labor conditions, and mines and smelters are alike waiting for the prevailing unrest to wear itself out. It is reported that [illegible] men have struck at the Chihuahua smelter, and that at Mapimi, in Durango, 400 men have struck demanding an increase in the rate of pay. At Velardeña men now receiving $1.25 are demanding $2 per day.

MEXICO

The Potrero Gusher—Large Daily Flow—Tampico Pipe-Line—Long-Term Contract—Oil Resources of Mexico.

For the first time since it was brought under control, several months ago, the mammoth gusher of the Pearson oil interests, in the Potrero de Llano field, State of Veracruz, Mexico, was recently allowed to perform for twenty minutes for officials of the Texas Oil Co. and the Gulf Refining Co. It required the efforts of three men to open the gate valve, and a column of oil shot into the air to a height of 400 ft. The flow was estimated at 100,000 bbl. daily. The party that witnessed the performance of the gusher was composed of J. R. Sharp, J. C. McCue, J. C. Daring, and S. Bates, of the Texas Oil Co.; J. F. Fisher, E. T. Gatterell, and J. H. Tucker, of the Gulf Refining Co., and Thomas J. Ryder, general manager for the Mexican Eagle Oil Co., the marketing concern of the Pearson interests. The American oil men have been examining the Pearson holdings, and it is announced that plans are being made for the erection of storage at some point in Veracruz, and the purchase of crude oil from the Pearson and other wells for American markets. The probable purchase of the Pearson properties has been rumored, and it is admitted that the examination may have such a result.

With the possible exception of the Dos Bocas gusher, also brought in by the Pearson interests in the State of Veracruz, and which burned out, the Potrero gusher is the greatest in the history of the oil industry. The big Midway gusher ranks as an infant in comparison. The well came in on December 26 last, and before it was brought under control the flow was estimated as high as 170,000 bbl. daily. The gusher flooded the surrounding country and sent an enormous quantity of oil down the Tuxpan river into the Gulf of Mexico. People living in that section of Veracruz protested to President Diaz, declaring that lands were being ruined, waterways rendered unfit for navigation and the watering of cattle, and properties threatened with destruction by fire. In reply to the protest, Lord Cowdray, head of the Pearson interests, stated that payment would be made for all losses sustained, and later this was done.

Bringing the gusher under control was a herculean task, and weeks were consumed in accomplishing it. With the object of saving the production, earth storage was hurriedly provided, and subsequently the stream of oil was directed into the reservoir. Finally, after repeated efforts, the monster was brought under control, and the flow shut off. The valve holding the gusher has a strength of 2400 lb. to the square inch, and the pressure of the well is estimated at less than 1000 lb. per square inch. The oil in the Potrero reservoir is estimated at 3,000,000 bbl. The petroleum lake is fully a mile around, and at places the oil is 30 ft. deep. This was the fourth well drilled by the Pearson interests in the Potrero field. In all, six wells have been brought in there. No. 1 and 2 are intermittent gushers.

MEXICO.

Two stretches of 6-in. pipe-line have been built to give the Potrero field connection with the Gulf port of Tampico. One links the field with the Tamiahua lagoon, and the other extends from the lagoon to Tampico. Barges carry the oil between the pipe-line stations on the lagoon. The present pipe-lines are to be connected by the building of another link, and the construction of an 8-in. pipe-line from the field to the Gulf port of Tuxpan has been ordered. At Tuxpan the Pearsons have storage for oil from the Furbero field of the Oil Fields of Mexico company, a long-term contract covering the Furbero production up to 12,000 bbl. daily. Under this contract the Pearsons built a pipe-line and railroad from the field to Tuxpan. Oil is shipped in tank steamers from Tuxpan to the Minititlan refinery of the Pearson interests, on the Tehuantepec isthmus.

POTRERO GUSHER.

The Potrero gusher, and the success of the Huasteca Petroleum Co. in the Juan Casiano field of Veracruz, have turned the attention of oil men to Mexico's possibilities. The Huasteca is a subsidiary of the Mexican Petroleum Co., Ltd., of which Edward L. Doheny, of Los Angeles, is the head, and it recently made the first shipment of Mexican crude oil to the United States, the Standard tank steamer *Captain Lucas* carrying 32,000 bbl. to Sabine Pass, Texas. The Doheny concern has two gushers and several flowing wells in the Juan Casiano fields, and has an 8-in. pipe-line from the field to Tampico. Materials for a second pipe-line have been ordered. Huasteca oil is being delivered to the Waters-Pierce refinery at Tampico and to the plant of the Mexican National Gas Co., another Doheny concern, in Mexico City. Also, it is being mixed with oil from the Ebano wells of the Mexican Petroleum Co. of California, another subsidiary of the Mexican Petroleum Co., Ltd., for delivery to the National Railways of Mexico for use in the locomotives of the merger system. According to a recent report, the Huasteca has entered into a contract to supply 6,000,000 bbl. of fuel oil for use by the Southern Pacific interests on their Texas lines. The Southern Pacific has long been using fuel oil from California on its lines.

General Mining News

ALASKA

Fairbanks District

It has been estimated that the placer mines tributary to Fairbanks will output not less than $5,000,000 for the season 1910-11, and may reach $6,000,000 if the quartz mines be included. The Chena custom mill is running steadily in the southern outskirts of Fairbanks. The results obtained in the operation of this mill are said to have greatly stimulated confidence in quartz mining in the district. The mines of the district are prepared to supply all the ore the Chena mill can crush, and it is expected some of the companies will build mills this year.

A story comes from Goodnews bay, a short distance south of the mouth of the Kuskokwim river, to the effect that rich beach diggings have been discovered at Goodnews, similar to those at Nome. There have been several disappointments in that vicinity in the past, and details of this alleged new discovery are very meagre.

It has been announced at Dawson that hereafter all gold that is the output of quartz mines in Yukon Territory will be exempt from the payment of the royalty that is assessed against the product of the placer mines, and may be taken out of the Territory free of tax. The order abolishing the duty came from Ottawa and is official. The purpose of the order is to encourage the mining of quartz in the Yukon, and as an incentive to all activities connected with the industry. The remission amounts to 2.5%, the tax collected hitherto in the form of an export tax upon all gold dust and bullion when it crossed the border.

PLACER MINING NEAR FAIRBANKS, ALASKA.

Prospecting is being industriously followed on American creek, Hot Springs district, in the Fairbanks region. Some of the miners are said to have found very good pay gravel. One Fairbanks miner is said to have 4 ft. of dirt that washes 4 cents to the pan. Discoveries have also been made on Colorado creek, a tributary of the American.

A discovery of galena is announced as having been made by J. P. Nirich in a vein on Twin creek. It is reported the ore is worth over $100 per ton in lead, silver, and gold. Ninety tons of ore from Bedrock creek, near Fairbanks, which was milled returned $110 per ton.

ARIZONA

A despatch from Phoenix states that the value of the output of the mines of Arizona for 1910 was $42,229,282, which was $717,462 less than for the preceding year. There was a notable increase in gold and zinc, but decreases in copper, lead, silver, iron, and sulphur. The figures are the sworn returns to the auditor of the Territory, just compiled, being the basis of mine taxation for the current year.

Cochise County

For the six months ended June 30 last, there was shipped from Courtland, by the Great Western Copper Co., 191 cars of ore. This company is employing 75 men in and about its mines.

Graham County

The property of the Frisco Placer Mining Co. is 7 miles from Morenci, where there is from 3 to 12 ft. of gravel said to contain 50 cents per yard in gold. A plant of 250 yards daily capacity has been installed. The gravel is brought to the bins above the plant by means of cables, to which is attached a large plow and a number of scrapers, the plow loosening the material, the scrapers picking it up and bringing it in. Many Mexicans will be necessary here because of the boulders, but the ground will be moved rapidly. There is so much iron in this material it clogs the sluices. A jig has been put in to handle the material coming from the trommels, which takes out this iron, and the sand passes down into and through the sluices. It is a wet plant beginning with the first trommel. About 500 gal. of water per minute is necessary, this being supplied by a centrifugal pump, operated by a gasoline engine, which also furnishes motive power for the entire plant.

Mohave County

The Gold Road mine shipped $34,000 in 8 days recently. The mill is treating 300 tons of ore daily. S. R. Porter has bought the Lealand mines, in San Francisco district. The mill, which is 11 miles from the mines, is to be removed to the property and a water-supply provided. It is reported that a company has been organized to furnish a water-supply to the Tom Reed and other mines of that vicinity. The water is to be pumped from shafts to be sunk near Spears lake. The Minnesota-Connors mine, at Chloride, is again in operation and development will proceed in the mine, instead of on the old dumps as heretofore.

Pima County

It is reported that the Guggenheims are investigating the extensive mining properties of the Tombstone Con. Mines Co. at Tombstone. This report further says that they will also purchase from the Development Company of America, which is the parent corporation of the Tombstone Consolidated Mines Co., all of its other properties in Arizona, including the Imperial Copper Co., the Imperial Mines Co., the Saddle Mountain Mining Co., and the Christmas mines in northern Arizona.

According to report, Tucson is to have a smelter, to be built by the Pioneer Smelting & Refining Co. The site for this new enterprise is near Twin Buttes and is 18 miles from Tucson. Work has been commenced and materials are being taken to the smelter site as rapidly as possible. It is hoped to have everything in readiness to blow-in in December. There are several mines in the vicinity of the smelter, including the Twin Buttes and Helvetia.

CALIFORNIA

Amador County

(Special Correspondence.)—The South Eureka Mining Co. has commenced the unwatering of the Oneida mine, adjoining the South Eureka on the south. It is understood that the South Eureka people have decided to install a new milling plant, provided developments in the Oneida prove satisfactory. It is said that the South Eureka company paid $100,000 for the Oneida group. At the Central Eureka the mill is running on good ore from below the 1200-ft. level, and it is said the June clean-up netted the company $7000. Grading for machinery is under way at the South Amador. A shipment of electrical equipment is expected to arrive shortly. This property embraces the Amador Queen, Doyle, and other claims, comprising a total area of 100 acres a short distance south of Jackson. J. McSorley is superintendent. The South Jackson Gold Mining Co. has commenced sinking a 3-compartment shaft, using a windlass until the recently ordered hoist arrives. It is planned to sink the shaft to a depth of 1000 ft. The property embraces three claims. The Bay State mine, four miles from Plymouth, was purchased recently by A. Levinsky of Stockton, understood to be representing the creditors, for $40,000. The property was sold at public auction to satisfy judgments held by the Stockton Savings Bank, B. Levaggi, and others.

Jackson, July 15.

Butte County

(Special Correspondence.) The Triumph Gold Mining Co. at Lumpkin, one of the large producing mines in the earlier days, has been taken over by M. B. Sears and associates of San Jose. Mining is advanced by means of two tunnels, which run in on a large blanket vein of quartz and gouge. A two-stamp Hendy mill has been running to test the ore during development, which has been found to be a free-milling ore with no complications. A new Beers 6 ft. Chilean mill has been ordered from Sacramento, to be placed within the next 60 days, so that the capacity may be increased to 20 tons per day. Stoping and handling the entire ore supply from the tunnel will be one of the big items of economical operation in conjunction with the use of cheap water power. J. R. Sears is superintendent.

Lumpkin, July 11.

Calaveras County

Twenty more stamps in the 60-stamp mill of the Lightner Gold M. Co. at Angels have been put in operation, making a total of 40 now dropping. The remaining 20 will be put in use in the near future.

It is reported at San Andreas that the Easy Bird mine, which has been idle for some time, is to resume operations. A shaft will be sunk. The mine is equipped with a mill.

Kern County

Lakeview No. 2 went into the sand at 2630 ft. at 1:30 o'clock on the afternoon of the 11th inst., and for an hour sent out a big stream of oil and gas, roaring like the old one and attracting the attention of everyone on the field. It sanded up, leaving 700 bbl. of oil in the sump. Bailing was started in a short time, but up to this time the flow has not resumed. The well is in the southwest corner of the southwest quarter of section 34, 32-24, about 2000 ft. northeast from No. 1, and is 400 ft. deeper than the gusher.

The average recovery for 12 tons of ore cleaned up at the Red Dog mill from the Santa Ana mine was $53 per ton. The ore was mined from the Sanderson shaft. The La Crosse Mining Co. has resumed operations and men have been put to work by Ed. Higgins, the superintendent. The company has taken options on the Santa Ana mine and the Stanford Mining & Reduction Co.'s plant at Johannesburg. Burke and Buys have extracted several tons of good ore from the Wedge mine. The best rock was taken from the 100-ft. level.

The Butte mine is shipping steadily to the Red Dog mill. Jesse Jewitt and William Atkinson are stoping rich ore on the 300-ft. level of the Pearl Wedge. Operations are being carried on with the aid of machine-drills.

The recently discovered orebody on the Miller and Watchman lease of the King Solomon is developing. The east drift is in 25 ft., showing 18 in. of ore in places.

The new shaft on the Twin Brothers claim of the Consolidated Mines Co. is down 60 ft. The ore at this depth, while good, is not of sufficiently high grade to warrant shipping to the mill.

Mariposa County

A 20-stamp mill is nearing completion on the Oro Rico mine at Penon Blanco, 3 miles north of Coulterville. The Hasloe mine, 7 miles east of Coulterville, is idle and the machinery is being removed. The mine has been operated for some time past by a company of which H. P. Dalton, assessor of Alameda county, was the recognized head. Work on the Bondurant mine, near the Hasloe, continues without interruption. This is one of the oldest mines of the district, and has been worked at intervals for many years.

The Heaston mine at Jerseydale, 10 miles east of Mariposa, is working 15 men. The mill has been running about a month.

Mono County

The Hess mine, 15 miles north of Adin, is in operation, with a 10-stamp mill running. This is a new enterprise and is reported to be making a success.

Nevada County

(Special Correspondence.) J. M. O'Brien last week closed the deal for the Champion mines at Nevada City. The first payment was made and he immediately put the North Star Mines Co. into full and exclusive possession of the property. The assistant superintendent of the North Star was in San Francisco on Monday to purchase new equipment for the property. This group consists of about 45 claims with a record of $25,000,000 production. Mr. O'Brien is now operating the Tightner mine, at Alleghany, in Sierra county.

Nevada City, July 15.

(Special Correspondence.) The estimated production of the Grass Valley mining district for the first half of 1911 is placed at $1,000,000. Of this the North Star produced about $510,000, and the Empire $400,000. The other chief producers were the Pennsylvania and Sultana groups. The unwatering of the shaft at the Holbrook drift mine, at Deadman's Flat, is progressing rapidly. The 70-ft. shaft will be sunk 35 ft. deeper to strike the bedrock, near which the ancient gravel channel is expected to be intersected. A gasoline hoist and Cornish pump were recently placed in position. The North Star Mines Co., which, though J. M. O'Brien, bought the Champion mines at Nevada City, will drive a drift from the 1000-ft. level, with four or five more at various other stations. The contract for a stamp-mill has been let to the Martin Foundry of Nevada City, but it is said that no attempt will be made to operate the mill until a large quantity of ore has been developed. A. D. Foote, general manager for the North Star Mines Co., will have personal charge of the Champion operations, with his son, Arthur B. Foote, as assistant. A survey of the water facilities of the Delhi mine is being made by Edward C. Uren, engineer, to determine the amount available for the operation of an electric-power plant. The Delhi was recently compelled to close because of lack of water for power. The property is controlled by the St. Gothard Gold Mining Co. Hamilton Eddie is superintendent.

Grass Valley, July 15.

The Alta drift mine, near Rough and Ready, has been bought by O. Scribner of San Francisco, who will open the old mine and work it systematically.

At the Pittsburg mine a 200-ft. winze is to be sunk to open the shoot of ore discovered on the south side of the shaft several weeks ago. The work of cutting the station for the engine on the 1300-ft. level is almost completed. When finished the engine will be installed and the other equipment will be put in place.

The Delhi Mining Co., owning the Delhi mine in the northern part of the county, near Columbia hill, is having surveys made to bring water into that camp. The company owns two valuable water rights, and these are to be repaired and improved, when there will be power for distribution in addition to that required by the Delhi mine.

Sierra County

J. M. O'Brien is operating the Tightner mine, at Alleghany, with the first long-distance hydro-electric power line, built by the Middle Yuba Electric Co. The plan is proving highly satisfactory, and is being watched by many mining men.

Reduction machinery has been ordered from Sacramento for installation at the Sovereign quartz mine, near Downieville. Two Beer's rollers, concentrators, and a complete cyanide plant are to be running by August 15 at the latest. F. O. Richardson is manager. The pay-shoot is at least 100 ft. long, it is reported, and a drift driven 50 ft. north shows good ore all the way. The Gibraltar's shaft is reported close to the gravel channel. It is down 303 feet.

Siskiyou County

The water-supply upon which placer mines depend in this region is already beginning to run short, and some of the mines are running on limited time and others are shut down until the fall rains come.

Trinity County

It is reported that the Bullychoop mine near Indian creek is to be reopened by a new company. The property is well equipped with machinery and is said to have a large amount of low-grade ore available.

Tuolumne County

(Special Correspondence.)—In the Black Oak mine, being operated by Charles E. Knox, S. A. Knapp, and John Bryant, the vein north of the big fault found on the fifteenth level (1500 ft. deep) has been followed by drifts to a point 210 ft. north of the fault. The vein shows an average width of 4½ ft. and averages $32 per ton. A cross-cut is being driven on the fourteenth level to cut this vein 120 ft. above the fifteenth level and to connect with a raise being made in the ore from the fifteenth to the fourteenth level.

Soulsbyville, July 15.

The Nautilus Gold Mining Co. has filed articles of incorporation. The company intends to operate the Haskins gravel mine, by driving under Table mountain. The operators of the Tappie mine near Tuttletown have found rich ore in that property. The quartz is said to be very rich in gold, but the extent of the discovery is as yet undetermined.

A company has been organized to bore for oil in the vicinity of Oakdale, between Warnerville and the Tuolumne river. The sinking of the first well will be commenced within a very short time. The company has secured a lease on 2000 acres of land for this purpose.

COLORADO

Clear Creek County

(Special Correspondence.)—Work is under way in the Oregon tunnel on Griffith mountain. Within 50 ft. it is expected a vein will be reached, supposed to be the extension of the Aetna. N. Williams is manager. The Kirtley mine on Leavenworth mountain will soon be among the shippers. Driving is in progress on an 8-in. streak of silver-lead ore, worth $78 per ton. E. S. Weaver is manager. The Black Prince mine on Pendleton mountain is the scene of an important discovery, a 4-ft. vein of ore having been uncovered that assays $40 per ton in gold and silver. Frank Winters is owner. Work was resumed this week upon the American Sisters mine, situated on Columbia mountain. The shaft is being unwatered and within a few days machine-drills will be used, as it is announced that sinking will be started. J. J. White is manager. Erickson & Co., leasing on the Smuggler mine, Brown mountain, are sending out heavy shipments of smelting ore, the average value being $40 per ton in silver and lead.

Georgetown, July 11.

(Special Correspondence.)—A streak of ore 7 in. wide has been cut in the shaft of the Neptune mine that assays $100 per ton in gold, silver, lead, and copper. J. M. Osborn is owner. The Dickson group of 13 lode claims has been taken over by the Cumberland G. M. & L. Co. The 100-ft. shaft has been unwatered and development started. J. I. Davis, of Pueblo, is manager. The shaft on the Powder House vein, near the portal of the Burns-Moore adit, is being unwatered, and driving is to be started east and west from the first level. J. M. Shaller is manager.

Idaho Springs, July 11.

Dolores County

The discovery of coarse gold on Dolores river 7 miles from Rico is reported, and numerous claims have been staked off. The field is said to be extensive and entirely unworked.

Gilpin County

(Special Correspondence.)—The shaft on the Santiago mine, in Russell district, has attained a depth of 250 ft. Sherman Harris is manager. A streak of talc 12 in. wide has been uncovered in the Elk Park adit that assays $79 per ton in gold. McCreer Bros. are owners. Wood Bros. have taken a bond and lease on the Lotus property and are cleaning out the adit preparatory to starting development. The property was at one time a producer. Development is in progress on the Central City mine and shipments will start soon. R. R. Demeter is manager. Heavy shipments are going out from the Anchor mine, being consigned to the Golden smelter.

Central City, July 15.

Lake County

THE TOMBOY MINE, NEAR TELLURIDE, COLORADO.

An important discovery of high-grade lead ore has recently been made in the Helena mine at Leadville, thus demonstrating that not all the ore has been found in this district of 34 years of continued success.

C. J. Moore has consolidated a large group of mines in the vicinity of the Clear Grit group and will begin the extensive development of the property. An adit 2500 ft. in length will be driven to develop the veins. In Leadville district many of the old mines are being reopened. The latest to be leased is the Rattling Jack on Breece hill east of the Ibex property and adjoining it. This fraction of ground has been leased at different times and generally some ore was found, but not in the large bodies which have been uncovered in the neighboring ground. A large amount of work has been done on the property on account of its close proximity to the Jonny. The new lease has been granted to W. E. Hollister and associates. An electric hoist has been placed and men are putting it in position. W. E. Hollister and associates are working a lease in the Ibex ground and probably have made as much money as any of the lessees during the past year and a half. They have been following the extension of the ore-shoot out of which Cortellini and Kyle made a large amount of money.

Ouray County

Negotiations are pending for the transfer of the famous Virginius mine and others of the Revenue group by the

Tomboy company at Telluride. The great veins of the Virginius group have been extensively operated through the Revenue tunnel, the portal of which is on the Ouray side of the lofty range. The evident intention is to work the Revenue group at first through the Ophir tunnel, which is near the Tomboy mill, and later to make deeper connections with the Revenue workings. The Revenue is credited with a production of over $15,000,000.

Al Conyers is developing a tungsten claim between Silverton and Gladstone, and reports that he has 4 to 8 ft. of ore that assays 61% tungstic acid.

TELLER COUNTY

The Cripple Creek Mohawk Mining Co. is preparing to build a mill of 75 tons daily capacity to be situated in the district. This company is operating a number of leases and ships the better grade of ore, but it has a large amount of ore which it is thought will yield a good profit if milled at the mines. The Rose Nicol Gold Mining Co. has shipped a car of milling ore to Colorado City from its mine on Battle mountain. The Saint Thomas mine on Beacon hill is to be operated by Charles Crowder, lessee. It joins the Gold Dollar mine. An ore-house is being built at the Jo Dandy on Raven hill. During June the Ajax Mining Co. shipped 1500 tons of $30 ore. A new mill for this company is about completed and will probably begin operations about August 1.

IDAHO

SHOSHONE COUNTY

(Special Correspondence.)—Two shifts at work on the 1000-ft. extension, which the Moonlight Mining Co. is driving on the Trade Dollar tunnel, to intersect its vein at a depth of 600 ft. below the old workings, are advancing 5 ft. per day. The Moonlight property adjoins the Hercules mine in the Coeur d'Alene. The company has a lease for 40 years on the Trade Dollar tunnel. The Gold Hunter mill near Mullan has resumed after a shut-down to increase its capacity from 150 to 300 tons per day. A sorting plant is being installed and will be ready in 30 days. The Hunter is in excellent condition.

Six acres of mineral land in the Yreka district in the Coeur d'Alene is the basis of an action filed at Wallace by the Caledonia Mining Co. against the Bunker Hill & Sullivan Mining & Concentrating Co. The Caledonia company claims the property under prior location and alleges that the disputed land was staked in 1887 as the O'Connor lode, to which it has acquired title. The Bunker Hill company applied last April for a patent to the United States Land Office for the Check and Wardner claims, which are surveyed to include the O'Conner claim.

It is reported that there are more men working in the mines in the Mullan district than in years. The Morning and Hunter mines are operating at a profit, and the Carbonate Hill, the Reindeer, and several others are in good condition.

Wardner, July 14.

MISSOURI

JASPER COUNTY

In extending a drift to the north of the Goodenough mine, on a sub-lease of the St. Louis-Joplin land, Wilcox and Rhodes have opened a rich run of blende and lead, that had been shown in the drill clippings which showed the ore to contain 7.8% blende and lead, the former predominating. The company is also drilling to the south of the shaft to determine the extent of the ore formation. The mine lies northwest of the Wilcox mines, and is in virgin territory. The nearest development is that of the Wilcox mines. The ore comes in at a depth of 174 ft. and continues to a depth of 200 ft., and a big pile of mill rock is accumulating.

Good ore has been found at a depth of 65 ft. in the Kramer mine at Cave Springs near Joplin. The ore has been penetrated to a depth of 10 ft. and carries 7 to 8% zinc. Southwest of Joplin a good run of ore has been found in the Grand Central at a depth of 160 ft. The ore is 20 ft. thick.

NEVADA

ESMERALDA COUNTY

Another effort is being made to find the downward continuation of the pay-shoot on the Blue Bull claim, if one exists. W. C. Cossar has re-commenced work on this ground after a long idleness. The workings are 400 ft. deep, but the new work is only 50 ft. below the surface, where an encouraging prospect has been found.

The shaft of the Florence American is to be sunk from 700 to 800 ft., when further search will be made for the ore-shoot that was worked several years ago in the upper levels of the adjoining Florence mine.

The development of mines, both old and new, in Tonopah continues without interruption, Montana Tonopah and Belmont being in the lead. A new company has been organized to develop ground presumed to contain the extension of the main vein of the Belmont mine. To prospect for this a deep shaft will be necessary, as the 'outcrop' of the vein is buried beneath about 1000 ft. of later volcanic rock. The property is known as the Halifax.

The work of building the new mill for the Belmont Mining Co. at Tonopah has commenced, the Young Construction Co. of Los Angeles having the contract. The mill will have a capacity of 450 tons daily. Water is to be pumped to the mill. The new plant is expected to be in operation next spring.

HUMBOLDT COUNTY

The Stall brothers are to extend their adit in their Canyon creek property near National an additional 200 ft., it now being in 300 ft. It is hoped this work will reach the vein, from the outcrop of which rich float silver ore was found some time since. An adit on the Neversweat mine on Buckskin mountain has run into rich silver ore. This ore was found 115 ft. below the surface. A discovery of good ore has been made in what is known as the Prout lease in the National Mining Co.'s property at some distance from any other known ore.

LINCOLN COUNTY

A recent deal has brought together at Pioche the Nevada-Utah, the Ohio-Kentucky, and the Consolidated Pioche companies. Negotiations regarding these properties have failed before, but it is reported that this time the papers have been signed. The Nevada-Utah, it is said, now holds about 1000 acres of the heart of the Pioche camp.

NYE COUNTY

The official report of the Round Mountain Mining Co. shows that during the quarter ended May 31 the company mined and milled 8559 tons of ore at a total cost of $54,715.27, a cost per ton of $6.39. From the ore milled was recovered gold to the value of $85,196.24, or $9.95 per ton, from which was netted a profit of $3.56 per ton, or a total profit of $30,480.97. On May 31 the company had cash on hand and bullion in transit of $89,154.85. The installation of the milling machinery is completed. The new mill has been in operation since July 5, and has increased the tonnage from 100 to approximately 150 tons per day, which will reduce the cost per ton. Mine conditions generally are much the same as reported on March 1. The development of one of the veins mentioned in the last report as having been opened in the 700-ft. crosscut has commenced. Sufficient work has not yet been done to determine its worth, but it is now producing 10 tons per day of a little higher value per ton than the average mine-run of ore.

STOREY COUNTY

During the second week in July the Union and Mexican mines produced ore having an assay value of $28,958.57, of which the Mexican produced $17,093.67 in 4 days. The Ophir in the same period produced 295 tons of ore of an average assay value of $40.22 per ton.

The most important recent development in the Mexican mine was the extension of an east cross-cut through a dike into ore on the hanging-wall side. This demonstrates that the ore-bearing formation is even wider than had been anticipated. This is on the 2500-ft. level, and preparations are being made to sink a winze below that level where a small electric hoist will be used. Stoping continues on the 2400-ft. level, and a stope is being opened on the 2500-ft. level. The joint cross-cut on the Mexican-Union line is going ahead in low-grade ore. The outlook is described as most promising. Construction on the New Mexican mill is about to be commenced. The sump of the C. & C. shaft, below the 2650-ft. station, is being cleaned out and an east cross-cut will be driven from the level. These workings are far to the west of the contact along which the Mexican-Union orebody is being developed. On the Gould & Curry arrangements are being made to ventilate the upper workings in the Geyer lease where there is a large amount of low-grade ore. Lessees on the Monte Cristo are shipping ore to the Fischer mill in Six-Mile canyon. At the Ward shaft the usual operations are under way, to control the water and permit further prospecting.

NEW MEXICO

Socorro County

During the latter half of June the bullion product of the Socorro mines amounted to about 34,000 oz. Ore treated for the month was about 4100 tons, the decrease being caused by breakdowns at the power-plant. The mill continues its better than 92% recovery. Drifts on both the 600-ft. and 700-ft. levels are being pushed. The Ernestine Mining Co.'s bullion clean-up for the last ten days of June was 9522 oz., with 5 tons of high-grade concentrate. Last week's tonnage was 564, with 38 sacks of concentrate. The mill was closed down for the celebration on the 4th and 5th, causing the lessened ore treatment. The plant now has an abundance of water. At the Deadwood mines the greater part of the ore treated comes from the third level, which doubles the value of the mill-feed. A representative of the De La Vergne Engine Co. is on the ground, adding a new attachment to the engine, which is said to be a very material improvement. Preparations are being made to do considerable development on the Trilby group of claims, with a view to treating the ore in one of the local mills. Good progress is being made in driving the lower adit of the Gold Dust mines, which will intersect the vein at a depth of some 800 ft. from its outcrop. Drifts along the vein of the Maud Mining Co. have been started from the new two-compartment working shaft.

PENNSYLVANIA

Allegheny County

(Special Correspondence.)—The School of Mines of the University of Pittsburg was reorganized in 1908. Since then the results have been such that within three years a new mining building, costing $175,000, has been erected, equipped, and occupied. The attendance has been raised from 8 to 72, the faculty increased from 2 to 18, and the graduating class from 1 to 18. Its graduates now number 32, against 7 during the 13 preceding years. The Governor of the State has recently approved a bill giving a $400,000 appropriation to the Schools of Mines and Engineering.

Pittsburg, July 15.

UTAH

Salt Lake County

(Special Correspondence.)—Plans are being considered for the reopening of the once noted Emma mine near Alta. The property, sold to an English company for several millions of dollars in the early 70s, is now owned by Jesse Knight, of Provo, and his associates. What is known as the Snake Creek tunnel is being driven steadily forward, its object being to furnish a drainage and haulage outlet for the western portion of the Park City district. On July 2 the adit was in 3423 ft., an advance of 251 ft. having been made during June. The Daly-Judge mine will be greatly benefited by this drainage adit, as it will make more cheaply available much ore which is below the drainage level. The Ontario company is increasing its working force. The Daly West has paid its second quarterly dividend of $54,000 for this year, making a total of $6,201,000 to date. The Silver King is developing a fine body of ore that was recently discovered. The Thompson and West Quincy companies have been merged under the title of the Thompson-Quincy company. Development is progressing. This property will be benefited by the extension of the Ontario drainage tunnel. It is reported that 2000 men are at work in the Park City district. The Scott Hill group of mines, that for 27 years has been idle, has been bonded to the Barry Coxe Mining Co., and development has been commenced.

Alta, July 15.

WASHINGTON

Ferry County

(Special Correspondence.)—Large reserves of ore are being opened in the Surprise and Lone Pine mines by the Republic Mines Corporation. In driving the Jim Clark adit on the Surprise 42 ft. of ore was intersected which assays $8 per ton. Shipments were made to the Tacoma smelter that must have assayed over $12 per ton to cover the expenses of mining, transportation, and treatment. A drift has been driven on it about 50 ft. The vein on this level has been explored 300 ft. northerly and about 200 ft. southerly. The samples assayed June 6 are reported as follows: $12, $51, $37, $42, $1, $2, $39, and $93. The last mentioned came from 35 ft. across the foot-wall side of the Bonanza shoot, below the intermediate level, which is between the 120 and 200-ft. levels. The shoot has been stoped about 12 ft. in width, and from 5 to 8 ft. of ore still remains on the foot-wall side of the shoot, in place. It is believed that this unbroken ore will average in value about $35 per ton. Some of the rock shows gold. The winze below this level is being sunk at the rate of 5 ft. daily with two machines. On the intermediate level a drift runs 100 ft. northerly and 400 ft. southerly from the winze, and three drills are used for stoping ore. On the 200-ft. level the vein has been developed about 300 ft. in length, and the samples are reported to assay from $14 to $40 per ton. The main incline shaft is down 215 ft. where ground is being broken for a station. A raise is being made from the 600-ft. level, which connects with the 500-ft. level of the Quilp mine, following up on the rake of the pay-shoot.

CANADA

British Columbia

It is announced that T. W. Beam has an option on the Nugget mine on Sheep creek near Nelson. The property is being thoroughly investigated by engineers. It is equipped with a small mill.

MEXICO

Sonora

The Cananea Con. Copper Co. has resumed the development of the Puertocitos mine in the west end of the camp. Some recent prospecting has met with very satisfactory results, and extensive operations there are now expected. The mineral zone is 800 ft. wide with a band 200 ft. wide in the centre, which is thought to run through the mountain, and is probably the same as the mass of ore found on the farther side of the hill. The ore deposit is nearly flat and is mined in a series of benches. This property is seven miles by rail from the smelters. Official reports show that a great many denouncements have been made in Sonora this season, which is an unmistakable indication of an increasing interest in mining in this State. The El Triunfo company has shipped a carload of high-grade matte to the El Paso smelter which is the product of the wood-burning reverberatory-furnace at Arizpe.

The Aguascalientes smelter, one of the largest in the world, of the American Smelting & Refining Co. has been shut down indefinitely. There were eight copper and two lead furnaces and four copper converters, with a capacity of 1500 tons daily. The smelter at Chihuahua has been ordered closed down indefinitely. Large mines, of the same company, at Santa Eulalia, producing silver-lead carbonates, silicates, and calcareous ores, also have been ordered closed. There are seven shafts there.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

G. H. Garrey is in San Francisco.

J. H. Curle was in San Francisco.

F. H. [illegible] has returned to San Francisco.

F. F. [illegible] was in San Francisco early this week.

J. B. Farish was at the St. Francis, in San Francisco.

Frank B. [illegible], Jr., is making a brief visit to the Comstock.

E. B. Gage of Phoenix, Arizona, is at the St. Francis, San Francisco.

Scott Turner is traveling through Norway. He will also visit Spitzbergen.

C. S. Herzig was at Manaos, Brazil, during June, and has gone to Iquitos.

Robert H. Richards has gone to Houghton, Michigan, on a month's professional work.

T. H. Minor, who is interested in oil properties at Bakersfield, is in San Francisco.

Sidney L. Galpin, of Cornell University, is doing summer work in geology in western Virginia.

L. A. McIntosh, superintendent of the Midas mine, Shasta county, is stopping at the Stewart hotel, San Francisco.

Francis A. Crampton has resigned from the position of chief engineer for the Arizona Copper Belt Mining Company.

W. R. Feldtmann has taken into partnership James A. Macteak and H. L. Sargent. The name of the new firm is W. R. Feldtmann & Co.

J. W. Finch has returned to Denver from Telluride, where he has been carrying on extensive investigations for the Liberty Bell and Smuggler Union mines.

Fred V. Burns has resigned as mine superintendent for the Veta Colorada M. & S. Co., to accept the position as manager for the Bueno Fé Mining Co. at Ojuelos, Jalisco.

George D. Hubbard, head of the department of geology at Oberlin College, has charge of the work in geology and geography at Ohio State University during the summer session.

F. Rutherford, assistant superintendent at the Copper Queen smelter at Douglas, has resigned to take the position of superintendent of the smelter at the Detroit Copper Mining Company.

Frank L. Sizer, superintendent for the Balaklala Con. Copper Co., will resume consulting work, now that the Balaklala smelter is closed, but for the present he is at Coram, Shasta county, California.

Obituary

Among those whose lives were lost in the forest fire at Porcupine were Robert Alvin Weiss, engineer in charge of the West Dome for F. A. Heinze, and his wife and little daughter. Mr. Weiss was an engineer of considerable experience.

Nicholas Densmore, a prominent contractor and mining man, died, June 10, of smallpox in the little village of Umala, near the Chacarilla copper mines of Bolivia, where he had gone on business relating to some important mining claims in which he was interested. Mr. Densmore was a native of Minnesota, but spent the greater part of his life in railroad construction, and for the past fifteen years had been in South America. For the past three years he had devoted his time entirely to his mining interests in the Quimza Cruz mountains and the Chacarilla copper region. So far his associate, Joseph Bolan, has been unable to get into communication with any relatives of the deceased.

Market Reports

LOCAL METAL PRICES

San Francisco, July 20.

Antimony	11–12½c	Quicksilver (flask)	$40
Electrolytic Copper	14–15½c	Tin	47–48½c
Pig Lead	4.75–5.70	Spelter	7–7½c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50–9.75, large $7.50–8.50

METAL PRICES

By wire from New York

Average daily prices in cents per pound

Date	Electrolytic Copper.	Lead	Spelter.	Silver, per oz.
July 13	12.48	4.60	5.69	62⅞
" 14	12.48	4.60	5.69	62⅞
" 15	12.48	4.50	5.69	62⅞
" 16	Sunday		No market.	
" 17	12.48	4.60	5.69	62⅞
" 18	12.48	4.50	5.69	62⅞
" 19	12.48	4.60	5.69	62⅞

ANGLO-AMERICAN SHARES.

Cabled from London.

	July 13. £ s. d.	July 20. £ s. d.
Camp Bird	1 9 6	1 9 3
El Oro	1 3 9	1 3 9
Esperanza	1 13 4½	1 16 3
Dolores	1 6 0	1 6 0
Oroville Dredging	0 6 0	0 6 0
Mexico Mines	7 12 6	7 12 6
Tomboy	0 18 1½	0 19 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing prices, July 20.		Closing prices, July 20.
Amalgamated Copper	$ 69⅝	La Rose	$ 4
A. S. & R. Co.	81¼	Mason Valley	9
Braden Copper	5	Miami Copper	21⅜
B. C. Copper Co.	4⅞	Mines Co. of America	5⅜
Butte Coalition	18⅝	Nevada Con	19⅝
Chino	23⅛	Nevada Utah	¾
Davis Daly	⅞	Nipissing	8¾
Doble	1⅞	Ohio Copper	1⅝
Dolores	5	Ray Central	1⅝
First National	1¼	Ray Con	17¼
Foley O'Brien	1¼	South Utah	¾
Giroux	6⅝	Superior & Pittsburg	16⅜
Goldfield Con	6⁵⁄₁₆	Tenn. Copper	41¾
Greene-Cananea	7¼	Trinity	4⅛
Guanajuato Con	¾	Tuolumne Copper	4⅜
Hollinger	12⅞	United Copper	2¼
Inspiration	8⅜	Utah Copper	60
Kerr Lake	5⅜	Yukon Gold	4

COPPER SHARES—BOSTON.

	Closing prices, July 20.		Closing prices, July 20.
Adventure	$ 7	Mohawk	$ 46
Allouez	30	North Butte	33
Atlantic	6	Old Dominion	46⅜
Calumet & Arizona	58	Osceola	101
Calumet & Hecla	450	Parrot	11
Centennial	12	Santa Fe	1¼
Copper Range	60	Shannon	10¾
Daly West	5⅝	Superior & Pittsburg	16⅜
Franklin	11⅞	Tamarack	34
Granby	38	Trinity	4
Greene Cananea, ctf.	7	Utah Con	17
Isle-Royale	17	Victoria	1⅝
La Salle	3½	Winona	8
Mass Copper	8	Wolverine	111

(By courtesy of J. C. Wilson, Mills Building.)

NEVADA STOCKS.

San Francisco, July 20.

Atlanta	$ .15	Mayflower	$ .05
Belcher	.50	Mexican	4.12
Belmont	6.65	Midway	.17
B. & B.	.35	Montana Tonopah	.68
Booth	.08	Nevada Hills	3.70
Chollar	.17	Ophir	2.12
Combination Fraction	.10	Pittsburg Silver Peak	.85
Con. Virginia	1.10	Round Mountain	.60
Florence	1.82	Sandstorm Kendall	.07
Goldfield Con	5.70	Savage	.19
Gould & Curry	.16	Tonopah Extension	.91
Jim Butler	.28	Tonopah of Nevada	5.87
Jumbo Extension	.19	Union	1.55
MacNamara	.18	West End	.57

(By courtesy of San Francisco Stock Exchange.)

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS.

Life Insurance—Visiting Mine Not a Forfeiture

A condition in a benefit insurance certificate containing a prohibition against the insured engaging in prospecting or mining, is not violated and the insurance is not forfeited by merely visiting a mine.

Butler *v.* Supreme Court, etc., Independent Order of Foresters, (Washington), 110 Pacific, 1007.

Recovery for Willful Violation of the Mining Statute

In an action for the death of a coal miner under the Illinois statute, an instruction to the effect that a recovery could be had for any injury or death of which the willful violation of the mining statute by the mine-owner was the proximate cause, was not misleading as authorizing a recovery for any violation of such mining statute, regardless whether such violation was alleged in the complaint, where other instructions stated fully that there could be a recovery only for violations of a statute as charged in the complaint.

Belskis *v.* Dering Coal Co., (Illinois) 92 Southeastern, 575.

Taxation of Minerals

The statute of Kansas providing for the taxation of strata of minerals in land the title to which has been vested in persons other than the owner of the surface, applies to oil and gas as well as to solid minerals; and under this statute where the different strata are severed by a conveyance or otherwise, each stratum is subject to be taxed separately as real property, and it is the duty of the owner not only to record the instrument which conveys the property to him within the time specified, but also to see that it is duly listed for taxation at the proper time. On this principle, an instrument called a lease, by which the owner of the land grants, conveys, and warrants to another all the coal, oil, and gas under a certain tract of land, operates to sever the coal, oil, and gas from the remainder of the land and the interest segregated and conveyed is subject to be separately taxed, and it was the duty of the owner of such interest to list it for taxation.

Mound City Brick & Gas Co. *v.* Goodspeed Gas & Oil Co., (Kan.) 109 Pacific, 1002.

Purchase of Mining Claim by Mortgagee as a Trustee

A mortgagee of an unpatented mining claim agreed with the judgment creditor of the mortgagor to foreclose his mortgage and purchase the claim, and to hold the title in trust to protect the parties under their liens, and to do at his own expense the necessary assessment work to maintain his title. Pursuant to such agreement he foreclosed his mortgage and purchased the claim at a foreclosure sale and executed an instrument reciting that as trustee for himself and the judgment creditors he had so purchased the claim. Under this agreement the mortgagee was vested with the legal title in trust and could not abandon the performance of his duty as trustee without rendering himself liable to the judgment creditors, though he could convey his interest which he had individually in the subject matter of the trust. Neither could he substitute another in his place as trustee without the consent of the beneficiary, but must proceed in the execution of the trust, and he is not permitted to terminate it by his own act or default. And where he failed to do the assessment work according to the agreement, the judgment creditor, the beneficiary, could himself do the assessment work and tack the expense on to his lien. But where such mortgagee as such trustee employed one of the judgment creditors to supervise the assessment work at a monthly salary, the claim of such creditor for salary and for any damages while in the performance of such duty was personal against the mortgagee alone, and recoverable only in an action at law.

Anderson *v.* Phegley, (Oregon) 110 Pacific, 975.

Recent Publications

ANNUAL REPORT CALIFORNIA DEVELOPMENT BOARD. Pp. 80, ill., maps, index. San Francisco, 1911.

REPORT OF THE VICTORIA SLUDGE ABATEMENT BOARD FOR THE YEAR 1910. 25 pp.; ill. Melbourne, 1911.

THE RED PLAGUE. *Transactions* of the Commonwealth Club of California, Vol. VI, No. 1. Pp. 82. San Francisco, 1911.

GEOLOGY OF THE PEGMATITES AND ASSOCIATED ROCKS OF MAINE. By Edson S. Bastin. U. S. Geol. Surv. Bull. 445. Washington, 1911. Pp. 152, ill., maps, index.

GLACIERS OF PORT WELLS, PRINCE WILLIAM SOUND. By U. S. Grant and D. F. Higgins. Bull. 43, American Geographical Society. Pp. 17, ill. New York, 1911.

PRELIMINARY REPORT ON THE CLAYS AND CLAY INDUSTRY OF OKLAHOMA. By L. C. Snider. Oklahoma Geological Survey. Pp. 270, ill., maps, index. Norman, 1911.

POLITICAL AND SOCIAL PROGRESS IN LATIN-AMERICA. *The Annals* of the American Academy of Political and Social Science, No. 124, May 1911. Pp. 806, index. Philadelphia, 1911.

THE LIVING WAGE OF WOMEN WORKERS. Supplement to *The Annals* of the American Academy of Political and Social Science, May 1911. Pp. 90, index. Philadelphia, 1911.

RESULTS OF SPIRIT LEVELING IN THE STATE OF WASHINGTON, 1896 TO 1910 INCLUSIVE. By R. B. Marshall. U. S. Geol. Surv. Bull. 457. Washington, 1911. Pp. 147, ill., index.

GEOLOGY OF THE NEW YORK CITY (CATSKILL) AQUEDUCT. By Charles P. Berkey. Bull. 146, New York State Museum, 1911. 283 pp.; maps, ill. In the construction of the Catskill aqueduct the board of engineers used commendable foresight in engaging the services of a board of consulting geologists, J. F. Kemp, W. O. Crosby, and C. P. Berkey. With their aid the difficult problem of crossing the Hudson river canyon is being successfully solved, as well as many other geologic engineering problems. Mr. Berkey, by arrangement between the Board of Water Supply and the State Geologist, has been enabled to present in this volume the results of the notable geologic work of the board, which will be of equal interest to geologists and civil engineers.

The following publications of the United States Geological Survey have recently been received: 'Some Stream Waters of the Western United States,' by Herman Stabler; Water-Supply Paper 274, pp. 188, index, 1911. 'Results of Spirit Leveling in Kansas and Nebraska,' by R. B. Marshall; Bull. 473, pp. 42, index, ill., 1911. 'Results of Spirit Leveling in North Dakota,' by R. B. Marshall; Bull. 469, pp. 22, index, 1911. 'Results of Spirit Leveling in New Mexico,' by R. B. Marshall; Bull. 464, pp. 53, index, 1911. 'Results of Spirit Leveling in Arizona,' by R. B. Marshall; Bull. 463, pp. 94, index, 1911. 'Results of Spirit Leveling in Arkansas, Louisiana, and Mississippi,' by R. B. Marshall; Bull. 458, pp. 79, index, 1911. 'Lander and Salt Creek Oil Fields, Wyoming,' by F. G. Woodruff and C. H. Wegemann; Bull. 452, pp. 87, ill., maps, index, 1911. 'Geology and Underground Waters of Southern Minnesota,' by C. W. Hall, O. E. Meinzer, and M. L. Fuller; Water-Supply Paper 256, pp. 406, ill., maps, index, 1911. 'Burgettstown-Carnegie Folio, Pennsylvania, No. 177,' by E. W. Shaw and M. J. Munn; Geologic Atlas, 1911. 'Birmingham Folio, Alabama, No. 175,' by Charles Butts; Geological Atlas, 1910.

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EDITORIAL

AFTER August 1 the home of the *Mining and Scientific Press* will be at 420 Market street, San Francisco, but a short half block from the sites where for twenty five years it was domiciled. Driven from Market street in 1906 by the fire which swept away our offices, we took refuge in Berkeley for a year, returning to San Francisco as soon as circumstances would permit. Our growing needs now demand more commodious and suitable quarters than were available during the period of reconstruction, and we return to a neighborhood full of associations. Perhaps the best feature of the change is that it makes us more accessible to our friends, our most valued possession. At 420 Market street the latch string will always be out.

CONDITIONS in Haiti are much disturbed. President Simon is likely to be deposed, and it is not impossible that foreign intervention may be necessary.

INTERNATIONAL LOANS seem a popular method of securing international amity. A $2,000,000 international loan is now to be made to the Republic of Liberia, in which Germany will participate.

FURTHER evidence of the useful service being rendered the mining industry by the Bureau of Mines is afforded by the appointment of Mr. F. G. Cottrell to take charge of a special investigation of the smelter fume problem. Mr. Cottrell is well known from the notable work he has already done upon this problem in private research, and the Bureau of Mines is to be complimented upon its choice.

DISCREDIT is cast upon European journalism by an article which recently appeared over the signature of A. Polli, editor of the *St. Petersburger Politische Korrespondenz*. One quotation will suffice: "Americans have captured the sympathy of the Chinese by the return of the Boxer indemnity, *in which their demands were much larger than those of other nations*, and were, to their surprise, at once paid in full." The italics are ours; comment is superfluous. The term 'yellow journalism' is of American origin, but the deep saffron variety of the article is produced abroad, apparently.

DECISIONS by the courts of New South Wales sustaining the patents of the Minerals Separation, Ltd., in the suit brought by the owners of the Elmore process, are of interest to many mine owners in America, the more so since the former company has recently opened an office in the United States under the management of Mr. E. H. Nutter. Flotation processes are of much interest, but the legal entanglements involved in the basic patents have been so protracted that outside of Australia the most notable results so far have been the separation of friends. In Australia much good work has been done, and there is every reason to believe that in many districts in America, especially in Colorado, ores exist to which flotation processes can be applied with advantage. Further developments will be awaited with interest.

A NEW FIELD for the 'Get-Rich-Quick Wallingfords' has been opened up by the discovery of a commercially practicable method for manufacturing paper from bamboo pulp. Heretofore the bleaching process, by means of caustic soda, has been very expensive, but this method has been obviated. A bamboo field can be cut-over annually for an indefinite period and yields a cheap, strong fibre easily collected for transportation. The Panama zone and Porto Rico offer great possibilities in bamboo culture. Aside from the probable organization of innumerable 'bamboo paper companies', the increasing demand for paper-pulp and the diminution of the forests lend great interest to this new source of paper production.

ANOTHER instance of German progressivism is seen in the proposal to appoint technical ambassadors to foreign capitals, with the rank of councillors of legation, whose duty will be to watch technical progress in the country to which they are accredited. It is to be hoped that the United States may follow, even though far behind. The present American consular reports are, to quote Leclere's phrase, used in another connection, "*remplis d'inutilites et d'inexactitudes.*" Until recently the United States had no commercial attachés to her Oriental legations, though no petty European country was too poor to afford such an official. The recent appointment of a well known commercial journalist as commercial attaché to the legation at Peking is a notable step in advance. Further progress is desirable.

THE SITUATION in the financial centres of the East becomes, if possible, more complex. The present month shows a tremendous disbursement of dividends, and the latter part of last month saw a revival of stock market activity, which in some quarters was said to be 'window dressing.' That this analysis was correct is shown by the fact that on one day of the past week the trading on the New York Stock Exchange fell away to smaller volume than on any full day in the past eight years. The larger pools and the heavier operators, alarmed at this exposure of utter lack of public interest, rallied to the support of the market, not as to prices, but as to the total of trading, and complete stagnation has been so averted. The mining situation in New York is equally complex. The open market for mining shares on the New York Curb promised at one time to grow into an institution of great importance. Now this market is dying, losing prestige, and the traders are forced upon a ruinous basis; living or trying to live by trading upon each other, as distinguished from trading for the account of legitimate customers. This market place is now shunned by those who have stocks to distribute, and in a way the mining interest in New York suffers on account of this state of affairs. The Porcupine issues launched in New York have nearly all stuck on the ways, and the trading, so far as any distribution is concerned, is wholly negligible.

DIFFERENT views of the same subject are of much interest. Mr. W. S. Kenyon, senator from Iowa, in a speech in the Senate, made the following observations on American living conditions: "We are living in an extravagant age. We are money mad and racing through life at a neck-breaking pace, piling up fortune on fortune, men worth millions striving for more, never stopping to think there is no pocket in the shroud. The rich are flaunting their riches in the faces of the poor. We see a $120,000 organ at the opening of a millionaire's home in New York and a long line of hungry men at midnight in the same city, constituting the bread line. Girls working in stores for $5 a week, and the proprietor of such stores dying and leaving millions to museums. It it any wonder that the people of the country are restless? The problem of the control of great wealth is the most important problem of the hour and the one that should receive our attention." An English writer in *Tit-bits* sees them in this light: "In America the builder, the engineer, the house-painter, the printer and compositor earn double the wages paid to such trades in this country. Also they work shorter hours and have better homes. No artizan walks the streets of an American city in his workman's clothes. He changes them for decent attire as soon as his job is finished. The American workman is both self-respecting and independent. His British brother is given to 'shirking' and beer-drinking."

Truth is Good Enough for Honest Folk

Boomers of Porcupine shares are resorting to full-page newspaper advertisements to galvanize into life a dead speculative market. Such methods are not warranted and are likely to prove futile. We have a high opinion of Porcupine and have no doubt whatever that much money will be made there, both in mining and in shares. But we must protest against such drivel as the following, printed in display type by the Chicago *Inter Ocean:*

"I have stood on the brink of the great Treadwell mine of Alaska and saw hundreds of men quarrying out the low-grade ore which keeps a thousand stamps in the never ending task of reduction. I have gone through the Homestake properties in Lead City and saw where millions were gained by quantity and scientific application for value recovery; I have held my candle to the face of quartz veins in California, Mexico, British Columbia, and Alaska which seemed 'splattered' with gold; I have peered into drifts which gave the appearance of treasure vaults; I have seen boxes cleaned in a placer camp and watched the men lug away the yellow dust; I have permitted my ecstasy to have full sway as I looked upon the gold beribboned face of the Truett-Mohawk lease in Goldfield; I have seen Cripple Creek rise from a desolated wilderness to a great active camp; I have peered in the face of every mining claim of renown and trod upon the surface of every camp of fame, and with the experience gained by years of travel, investigation, and investment feel that I am qualified to express an opinion. Let me set it forth here, for the benefit of friends and for those who do not know me, and all I will do is to repeat what has been said by every mining man whom I have met in this camp: 'The Porcupine is the greatest gold camp on earth'."

This is published as an introduction to a description of the district by Mr. N. H. Truett, whose competence to judge is sufficiently indicated by the extract. To those not familiar with Chicago newspapers it is worth noting that the *Inter Ocean*, once a great paper, is now the personal organ of Mr. William Lorimer. Having served in turn Mr. Yerkes while wrecking street railroads, and Mr. Walsh while wrecking banks, it is appropriately engaged in a search for widows' nickels on behalf of 'sure-thing' promoters.

Canadian Reciprocity

The bill providing for reciprocal exchange of goods between Canada and the United States has passed Congress, and, when signed by the President and sanctioned by the Dominion Parliament, will become the law. Journals which are in favor of free trade, the country over, will now proceed to demonstrate with learned arguments that trade between the adjoining countries will be enormously benefited, while those of the opposing faction will, with equal logic, point out that the commerce of the United States will be greatly injured by the new arrangement. To one who looks upon the political game with a mild interest, tinged with cynicism, the new law appears rather as a mighty effort of the administration to create a political issue for the approaching presidential campaign. The present administration went into office attended by a general public belief that a conservative and forward policy would be followed. It will retire attended by a sense of disappointment. In many respects the Taft administration has been unfortunate; its actions have been misunderstood and even misrepresented, but the general public belief that certain corporations have had too much influence in its acts and policies can neither be refuted nor denied. The tariff revision of 1909 was a breach of faith with the American people; it remains to be seen whether the attempt to divert their thoughts by the securing of free trade with Canada—in other words, giving the people complete reduction of duties where it can have little or no effect—will be successful. Public interest and attention in the United States belongs to the genus *Ephemeridae*, and it is not impossible that the attempt may succeed. On the other hand, the growth of ideas of social democracy and the strong public sense of the need for fundamental legislation to check the growth of monopoly, may easily combine to cause a Democratic victory at the next presidential election. Changes of political administration have usually coincided with periods where important issues were at stake, and have almost invariably been either preceded or followed by grave industrial disturbances. The industrial system is interconnected like a mighty power system. Mechanics may argue at length as to the relative merits of Corliss and other types of valve gearing, but while one type is being taken out and another substituted the machinery must stand idle and will not run smoothly until some time after it is restarted. At a political gathering it is customary to extol the great wisdom of the founders of the Republic. Adherence to sober fact recognizes in them men chiefly distinguished by patriotic zeal, who achieved astonishingly good results, when it is considered how little in consonance with their preconceived ideas our country has developed. It might have been expected that a method of government devised for the civilization of 1789 would be absolutely unfitted for the civilization of 1911, but it is only inadequate and unsatisfactory. From the editors' window there is visible a building that in 1906 was ruined by the earthquake and fire, though it remained standing. Workmen have since been busy, and girder by girder, brick by brick, one piece at a time, the building has been reconstructed until now it is a fair habitation. The government of the people, by the people, and for the people, which has proved in practice to be of the people, by the covert representatives of private interests, in the interest of corporations, needs similar treatment.

Fuel

The growing use of fuel oil in industrial work prompts us to make some observations upon fuel and its uses. Fuel is defined by the Standard Dictionary as "combustible matter used to kindle or sustain fire, or produce heat"; thus placing the cart before the horse, as the only rational purpose of kindling a fire is the production of heat. The idea of fire, or combustion, is essential, however, for heat may be obtained commercially without the use of fuel, as by exposure to the sun's rays, or by the use of the electric current. Since the idea of combustion is fundamental, and since we live in an atmosphere of dilute oxygen, it follows that fuels may be defined as substances capable of undergoing oxidation, with the concomitant production of heat. There are numerous substances possessing this qualification, but their characteristics, in many cases, unfit them for practical use. Pyrite, for example, can be readily oxidized, with the production of heat, but the products of combustion are an objectionable gas and a bulky residue of iron oxide. Carbonaceous substances, on the other hand, yield CO_2 and water vapor, the only residue consisting either of the impurities originally present or a small amount of unburned fuel. As a matter of practical convenience, based on this and other factors, fuels are carbonaceous substances either solid, liquid, or gaseous.

The commonest fuel is wood, which has been used for that purpose since primitive man first contrived to light a fire. Since this is bulky and contains much water, which puts a limit upon the intensity of the heat attainable, charcoal came to be used, giving a more intense heat and being more easily transported. Following up this advantage, coal and coke came into use. The use of the solid fuels is conditioned by six principal factors: the character of the gaseous products of combustion, the character of the solid residue, ease of transport, the amount of heat available per pound of fuel, the degree to which this heat can be utilized, and the ratio between the total heat per pound of fuel and that which can be utilized. To mention only a few examples, the pungent reek of peat and the heavy smoke of bituminous coal are disadvantageous, as are the large amounts of ash produced by the combustion of many anthracites. The greater number of heat units present in coal give it a great advantage over peat, while the friability of the latter, a character which it shares with many lignites, renders its transportation a difficult matter. The heat which can be utilized depends so largely upon the methods adopted, more particularly the type of boiler employed, that generalization is difficult. Anthracite has a higher fuel ratio than lignite, yet a boiler under which lignite can be satisfactorily burned would give unsatisfactory service with anthracite.

Liquid fuel, which for practical purposes, means the heavy petroleums which occur naturally in some districts, notably in southern California, meets admirably the factors given for solid fuel. It has a high fuel value, little residue, and the products of combustion are unobjectionable. The factors which militate against its use are commercial. Until recently no sufficient supply was available, so that it was not worth while to install types of boilers and burners adapted to its use. Even yet a supply is not universally obtainable, and as it can neither be so easily nor so cheaply transported as coal, its use is likely to remain localized. But where a cheap and abundant supply is available, liquid fuel is remarkably satisfactory in practice. Before a solid fuel can burn it must be converted into gas; strictly speaking, combustion is the burning of the gaseous products given off by a highly heated fuel. Since a liquid fuel is more easily converted into a gas, it is more easily burned. The burning of a gaseous fuel may be regarded, then, as merely the isolated second stage of ordinary combustion. This is well shown in the manufacture of producer gas in one apparatus, and its combustion in another. The burning of natural gas may be looked upon as a similar process, in which the time interval between production and combustion is very great. Natural gas unfortunately occurs in but few localities, and the means necessary for its transport closely circumscribe its use. A further disadvantage is the fact that it has been found that the duration of the flow of a gas well is so brief that industries founded upon the use of this cheap and satisfactory fuel have in some cases come to an untimely end. With the advance in mechanical methods, however, it has been found that the most economical method of utilizing solid fuel, in all cases where the size of the plant justifies the necessary expenditure of capital, is to generate gas from solid fuel; burning the gas, or using it in gas engines. German engineers have led in the experimental development of the latter, but the development of the gas-engine industry bids fair to repeat that of the automobile, where European manufacturers led in experimental development, only to be eclipsed by the standardized development in the United States.

Graphic Solution of Fault Problems

By C. F. Tolman, Jr.

(Continued from page 810, Vol. 102.)

Elementary problems in line and plane intersections to show the application of the two-level method of projection. (Fig. 1 to 4.)

Problem 1. Fig. 1.—**Given two parallel planes cut by a third plane. To find the shortest distance (both magnitude and bearing) between the two planes measured on the third plane.**

Analysis.—Revolve the traces of the intersections of the parallel planes with the third plane into the horizontal position. Draw a perpendicular between these traces and revolve back into the original position.

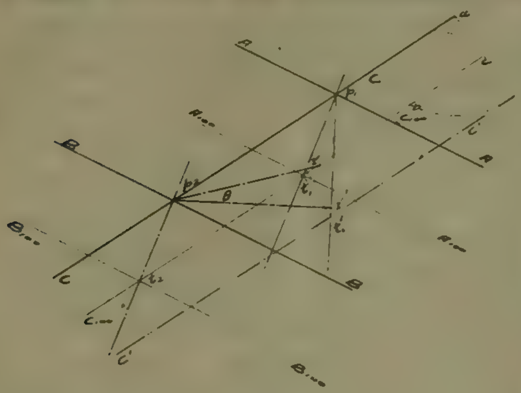


FIG. 1.

Construction.—AA and BB are the strike lines of the two parallel planes whose dips (45° in this case) are shown by the contours $A_{100}A_{100}$ and $B_{100}B_{100}$. CC and $C_{100}C_{100}$ represent the strike and dip of the third plane.

The strike lines AA and CC intersect at p_1 and the contours at t_1. p_1t_1 is the projection of the intersection of these planes, and p_2t_2 that of the second plane with plane CC. Construct the dip triangle *abc*. *ab* measures the distance $C_{100}C_{100}$ from CC when the plane is revolved about its trace into the surface. Such a revolution will cause p_1t_1 to take the position p_1t_1'. Draw p_2r' perpendicular to p_1t_1', and then revolve CC back into its original position, when r' falls on r.

p_2r' gives the length of the desired measurement.

p_2r is its projection and gives its bearing.

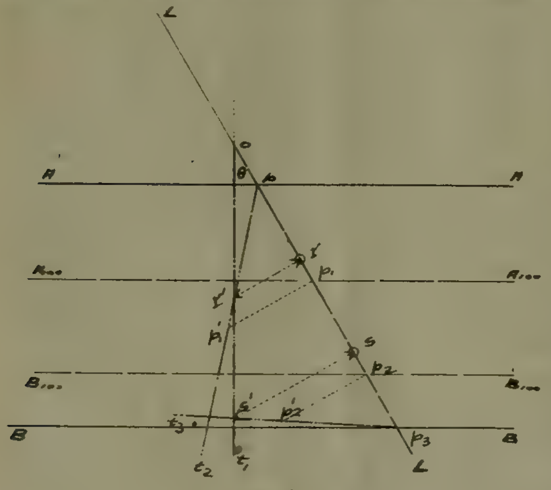


FIG. 2.

Problem 2. Fig. 2.—**Given two planes and an intersecting line. To find the points where the line pierces the planes.**

Analysis.—Take an auxiliary vertical plane containing the given line and revolve it into the horizontal position. The intersections of the traces of the given planes on the auxiliary plane, with the line, locate the desired points.

Construction.—*LoL* is the given line piercing the surface at *o* with a dip of Θ. AA and BB are the strike lines of the given planes with their dips shown by the contour lines. **Pass the auxiliary perpendicular plane through *LoL*** and revolve it into the horizontal position about *LL*. ot_1 is the revolved position of the line *LoL*. The traces of the given planes on this plane are found by dropping perpendiculars (scaling 100 ft. in length) from p_1 and p_2 (points situated at the intersection of the contours with the auxiliary plane). Therefore pt_2 and p_3t_2 are the desired traces, and r and s are the projected positions of the points where *LoL* pierces planes *AA* and *BB* at depths respectively of *rr' and ss'*.

Problem 3. Fig. 3.—**Given three points. To find the plane containing them.**

Analysis.—**Draw two perpendicular construction planes,** each containing a different pair of points, and rotate the planes to the surface. Draw a line passing through the pair of points in each construction plane. The points where these lines pierce the surface determine the strike-line of the plane, and its dip is shown by passing the contour parallel to the strike through the projection of a point 100 ft. below the surface on either one of the lines.

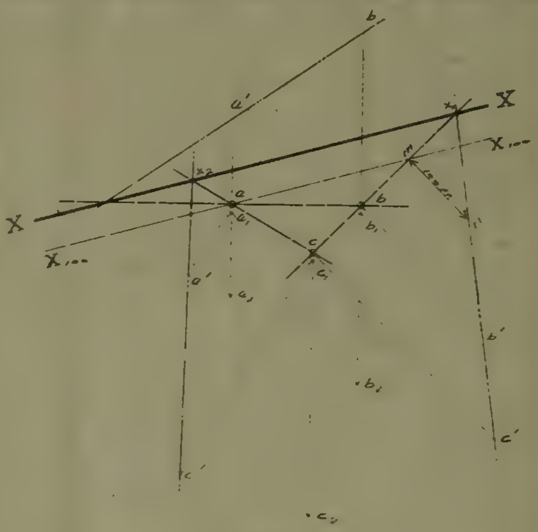


FIG. 3.

Construction.—a, b, and c are the given points whose distance below the surface are, respectively, a_1a_2, b_1b_2, and c_1c_2. Pass perpendicular planes through *ac* and *bc* and revolve them into the horizontal position. x_2c' and x_1c' are the revolved positions of the lines in each plane containing the respective pair of points ($aa' = a_1a_2$, $cc' = c_1c_2$, etc.). The surface trace of the desired plane passes through x_1 and x_2, and its contour is located by point m, which is the projection of a point on the line passing through b and c, 100 ft. below the surface.

Problem 4. Fig. 4.—**Given a line and a point. To find the plane containing them.**

Analysis.—The strike-line of the desired plane must pass through the point where the given line pierces the surface, and be parallel to a line drawn through the projection of the given point, and through the projection of a point of equal depth situated on the given line. The plane contour passes through the projection of a point on the line 100 ft. below the surface.

Construction.—*LoL* is the given line with a dip of Θ, and a the given point at a depth a_1a_2 below the surface. p is the projection of the point p' on the line *LoL* and taken at a depth of [illegible] as this happens to be just 100 ft., the contour of the desired plane passes through these two points and the strike-line is XX parallel to the contour and passing through [illegible]

FAULT PROBLEMS

Fault movement that of pure translation; fault plane vertical. (Problems 5, 6, and 7.)

Problem 5. Given a vertical fault plane and the strike, dip, and total heave of two faulted strata. To find amount and direction of total displacement.

Analysis. The fault movement separates the traces, on the fault plane, of the two strata on one side of the fault, from the traces of those on the other side; therefore a line connecting the intersections of the traces determines the amount and direction of the total displacement.

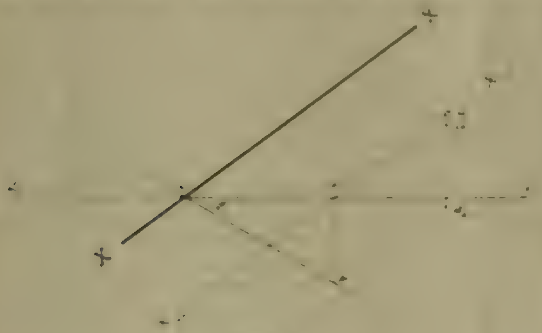


FIG. 4.

Construction.—The fault plane *FF* is vertical and *AA* and *A′A′* are the two portions of the faulted stratum whose total heave = *O*, and *BB* and *B′B′* of the second stratum whose total heave = *BB′*. Revolve the fault plane *FF* about its strike-line into the horizontal position. *ab* is drawn at a distance of 100 ft. from *FF*, and therefore is the revolved position of the 100-ft. contour of the vertical fault plane. *a*, *b′*, and *b* are at the intersections of *ab* with the contours of the faulted strata. *AA* and *BB* are the revolved positions of the traces of *AA* and *BB* on the fault plane and intersect at *C*. Likewise the revolved traces of *A′A′* and *B′B′* intersect at *C′*. Before faulting, *C* adjoined *C′*. Therefore the total displacement = *CC′* in amount and [illegible] = the angle it makes with the horizontal.

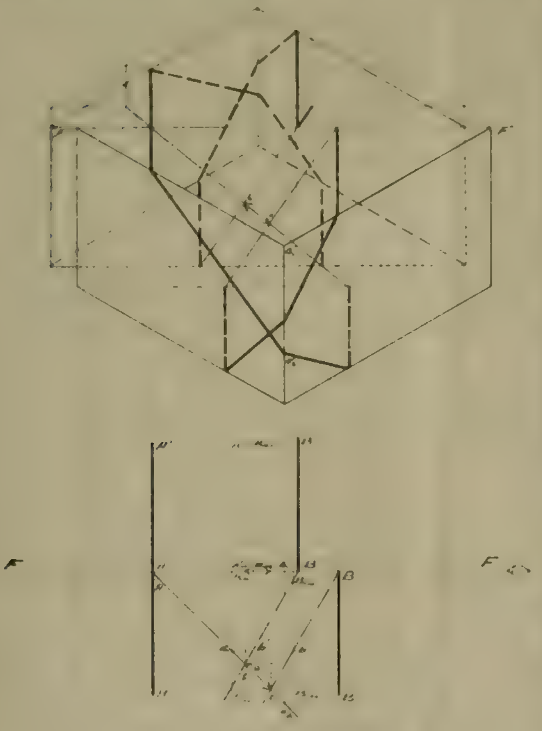


FIG. 5.

Stereogrammatic representation of this problem is shown above in Fig. 5. The graphic solution, beneath can be projected on the isometric block in the following simple manner. Make the 'long diameter' of the block *F′F′* parallel to *FF*. Then all points on *FF* (Fig. 5) can be projected directly on *F′F′*, for the long diameter is projected full length. To find, for instance, point *a′* on the stereogram in order to draw in the front trace of *AA*, measure its true distance a_1a_2 in the lower figure and diminish it according to the isometric ratio, giving the distance $a_1'a'$. In the upper figure the elevated block is supposed to be cut down to a level with the other block by erosion, but the removed upper portion with traces is shown in light lines.

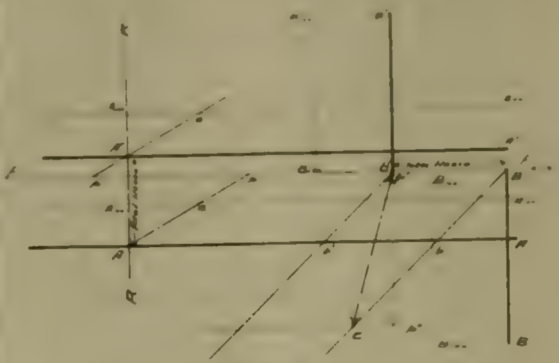


FIG. 6.

Problem 6. Fig. 6. Given a perpendicular fault plane, and the dip, strike, and total heave of two faulted strata, one whose strike is parallel and the other perpendicular to the fault. To find the total displacement.

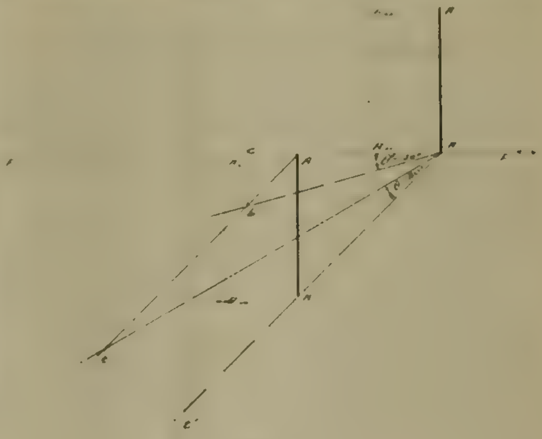


FIG. 7.

Analysis.—Fault *FF* is a strike fault when considered in reference to the parallel stratum, and a dip fault in reference to the stratum with perpendicular strike to the fault.

By passing a vertical plane normal to the fault plane, the vertical displacement of the fault is found, and from this, the total displacement which separated the traces of the second stratum on the fault plane, is found.

Construction. Pass a construction plane *RR* perpendicular to the fault strike *FF*. *Aa* and *A′a′* are the revolved traces of *AA* and *A′A′* on *RR*. Continue the traces until they intersect the fault trace on *RR* and at *p* and *p′*.

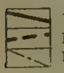
Then pp' is the vertical displacement. Revolve the fault plane on its strike-line FF into the horizontal position. The revolved traces of BB and $B'B'$ on the fault plane are Bb and $B'b'$. Lay off $p'' p'' = p'$ (vertical displacement). The total displacement is $p''c$.

Problem 7. Fig. 7.—Given a perpendicular fault plane, the dip and strike of both portions of a faulted stratum, the total heave, and the direction of fault movement *(a)* Θ is measured downward from the parallel displacement, *(b)* Θ is measured upward from the horizontal displacement. To find the total displacement.

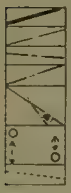
Analysis.—The distance between the traces of the two portions of the faulted stratum on the fault plane in the known direction (often told by fault striæ) of fault movement, is wanted.

Construction.—Locate At and $A't'$ the revolved position of the traces of AA and $A'A'$ on the fault plane. Lay off Θ (the angle between parallel and total displacement) $=$ 30° and find $A't$ as the total displacement, and tt' as the perpendicular displacement. Lay off Θ' (the angle between horizontal displacement and total displacement) $= 30°$ and find the total displacement $A'b$ and the normal displacement bc.

The scheme of lines chosen to represent planes, traces, lines, points, etc., used in this and succeeding discussion, is shown by the legend below.



Visible trace of plane with side of block.
Invisible trace of plane with side of block.
Intersection of plane within block.



Trace of plane with reference surface (strike line).
Trace of plane with surface 100 ft. below.
Projection of intersection of any planes.
Projection rotated back into reference surface.
Projection of a line—portion above reference surface is light solid line; that below is dot and dash. Dip of line theta is given by rotating same around its projection. (See Fig. 5).
A point is located by a small circle and the distance above or below reference plane by a dotted line.
Construction lines.

(To be Continued)

Condition of the Gas in Coal

In some cases the volume of gas liberated from broken coal is greater than the volume of the coal itself—that is, of the actual solid and the cellular space combined. Several theories have been proposed to account for this fact. If the inclosed gas is mechanically imprisoned in the microscopic pores of the coal, it must be under a pressure greater than that of the atmosphere; otherwise it would occupy after its escape a volume less than that of the coal. It is possible, furthermore, that there is a continual slow formation of methane by chemical decomposition of the coal, or it may be that the gas is held in a state of occlusion—that is, either dissolved molecularly or absorbed upon the inner surfaces of the cellular spaces. The gas which escapes from coal has been very often called 'occluded gas', but, as Chamberlin has made plain, the word 'occluded' has been loosely used in this connection, and the radical difference between mechanical imprisonment and true occlusion or condensation has been generally overlooked. The word 'occlusion' properly implies the condensation of a gas within a solid substance to a state approaching that of liquid or solid, either condensed upon the interior surfaces of the pores or dissolved molecularly in the solid. The Century Dictionary defines occlusion as the absorption of a gas by a metal, as of hydrogen by palladium, in which case the hydrogen is regarded as existing in a solid form as a quasi-metal. Mendeleeff states: "The capacity of certain dense metals for the absorption of hydrogen * * * is termed occlusion and presents a similar phenomenon to solution; it is based on the capacity of metals for forming unstable, easily dissociating compounds with hydrogen similar to those which salts form with water."—*Technical Paper 2, Bureau of Mines.*

Turquoise Mines of New Mexico

By John L. Cowan

Turquoise mining is one of the newest, as well as the oldest, of the mining industries carried on in North America. It was extensively practised so long ago that no legend or tradition of its beginning can be gleaned from the lore of the aboriginal tribes. Turquoise was mined in the Southwest ages before the first Americans had learned that gold, silver, iron, or copper were of possible use or value to mankind. Then the mines were closed, their location forgotten for a hundred years, and only within the last few decades were the old workings rediscovered and the mines reopened.

The major part of the civilized world now receives its supply of turquoise from the mines of New Mexico. They are said to be the richest turquoise mines in the world, and to produce some of the best stones obtainable. Yet it is little more than twenty years ago that they began to be worked on a scale of commercial importance. Prior to that time the owners of the mines of Persia, on the slopes of Mount Ali Mirza, enjoyed a practical monopoly of the trade in this beautiful semi-precious stone.

There are four important turquoise districts in New Mexico. One is the Burro mountains, southeast of Silver City; one near Los Cerillos, 16 miles from Santa Fé; one near Old Hachiti; and the fourth in the Jarilla mountains. In all these districts, turquoise was mined centuries ago by the aborigines, and in more recent times by the Spaniards. Their modern exploitation began a quarter of a century ago, when some of the old mines were rediscovered, and an impetus given to the search for new deposits; but it is only since 1890 that the production of turquoise in the United States began to assume important proportions, and that the American gem began to win a position placing it on a parity with that long held by the Oriental stone. The antiquity of turquoise mining in New Mexico is proved by the finding of many stones when excavations are made among the prehistoric cliff dwellings, as well as by the ramifications of the mines at Mount Chalchihuitl and in the Burro mountains. So extensive are these workings that it has been argued that their origin must be attributed to the Spaniards. This is claimed on the ground that the aborigines, ignorant as they undoubtedly were of the use of metals, could not possibly have performed work of such magnitude. However, in the old workings and dumps have been found great quantities of relics of the Stone Age that seem to establish the antiquity of the mines beyond the possibility of doubt. Among these relics are rude stone hammers and hundreds of fragments of pottery of the most ancient of known types.

It is now generally believed that the large quantities of turquoise found by the Spaniards in the possession of the inhabitants of Mexico at the time of the Conquest had been obtained from the mines of Mount Chalchihuitl and the Burro mountains. This stone was highly esteemed by the ancient Mexicans for use in mosaic and inlaid work. With it the famous gold throne of the Tezones was inlaid and ornamented. Like their modern descendants, the ancient Pueblo and other aboriginal tribes used the gems both for purposes of personal adornment and as a medium of exchange.

Some of the most valuable specimens of ancient Mexican (or Aztec) work in this material have found their way to famous European museums. Among these is a portion of a human skull bedecked with pieces of turquoise and other gems, the design imitating war-paint decorations upon a human face. A favorite embellishment of ancient Aztec idols was a somewhat similar design, in which the turquoise was prominently used. Probably the oldest mines are those of Mount Chalchihuitl (the Indian name for turquoise), near Los Cerillos, about fifteen or sixteen miles from Santa Fé. The 'mountain' is really no more than a moderate-sized hill, of a white and yellow rock that makes it a conspicuous feature of the landscape. These mines were also worked extensively by the Spaniards after their conquest of the territory. It is claimed that about the year 1679 or 1680 twenty Indians of those compelled to work in the mines were killed by a caving in of the workings, and that this was one of the principal causes of the general revolt of the Pueblo tribes that drove the Spaniards temporarily from New Mexico. This is the earliest recorded mine disaster within the present limits of the United States.

Considerable development work was done on Mount Chalchihuitl a few years ago, when the old workings were thoroughly explored and every endeavor made to discover a continuation of the gem-bearing deposits. The money and labor thus expended returned no adequate results, it appearing that the deposits of gem material had been exhausted. Three miles northeast is another mine that was also worked by the Spaniards, and was rediscovered in 1885. In the immediate neighborhood are the extensive mines controlled by Tiffany & Co. of New York; probably the greatest turquoise mines in the world. The production of the Tiffany mines is purposely kept at a low point in order to avoid depressing the price of the gems. For this purpose, the mines are now closed down indefinitely. Great trouble has been experienced at these properties by the refusal of the San Domingo Indians to respect the property rights of the New York company. The Indians argue that they and their ancestors owned and worked the mines long before a white man ever set foot in America; and they fail to see by what right the interloping Americans claim exclusive possession now. Large quantities of turquoise have been surreptitiously mined by the Indians every year, and at times the neighborhood has been made decidedly dangerous for the Tiffany manager. The Indians dispose of the gems thus obtained to tourists and to filigree jewelry makers in Albuquerque, Santa Fé, and other towns.

The turquoise mines of the Burro mountains were also worked by the aborigines, but not so extensively as those of Mount Chalchihuitl. Here stone hammers, fragments of pottery, and similar relics of prehistoric times have also been found in the workings and dumps. The modern discoverer of these mines was John E. Coleman, better known throughout the territory as 'Turquoise John', who located a number of claims in 1879. The next year M. W. Porterfield, Nicholas C. Rascom, and T. S. Parker located claims that have been extensively developed. In the quality of the gems produced, and in the quantity that could be mined if the demand justified, the Porterfield properties are believed by many to rank with those controlled by Tiffany & Co. Turquoise was discovered in the Jarilla mountains in 1898. The most important of the claims is known as the De Meules property, named after its discoverer, Amos De Meules, of El Paso. Since the death of De Meules, the mines have not been worked, although some magnificent gems have been discovered near the surface. In the Old Hachiti, or Eureka, district, turquoise of fine quality is mined in a desultory fashion, but systematic exploitation has not been attempted. In the neighborhood of both the De Meules and the Old Hachiti properties there is abundant evidence of extensive mining operations in prehistoric times.

The geological conditions under which turquoise is found vary so widely that no general statement is possible. In the Los Cerillos district it occurs in a red trachytic rock. In the Burro mountains it is found in a decomposed feldspathic granite. In Nevada it is found in a metamorphic sandstone. At the foot of Mount Sinai a worthless turquoise occurs in a red sandstone. Other localities in which it is found under still different conditions are on the slopes of the Mount of the Holy Cross in Colorado; in Fresno county, California; in Alabama, Arizona, and Chile. The modes of occurrence on Mount Ali Mirza and in the Burro mountains are very similar; and chemical analyses of the turquoise from these two widely separated regions are practically identical. This seems to indicate that the conditions there found are best adapted to the production of the perfect gem. The principal coloring constituent of turquoise is a compound of copper.

Many attempts have been made to explain how the aborigines were able to carry forward their extensive turquoise mining operations with the crude implements at their disposal. Perhaps the most plausible explanation is that given by M. W. Porterfield, of Silver City, New Mexico. He says: "The frequent occurrence of charcoal in the old workings leads to the belief that the mining was accomplished by first heating the rock and then pouring water upon the heated surface, causing it to crack. Then stone hammers were brought into requisition to separate the matrix from the true turquoise. This process must have been very slow, and the amount of work accomplished in the mines must have taken centuries of ceaseless, patient toil for its completion. Measured by our valuation of time and labor, the gems thus extracted would have been worth hundreds of dollars per carat. Even with all our modern conveniences and improvements for mining, it requires special skill and extreme care to take out turquoise without destroying more than is recovered. The quick action of giant powder is not considered as satisfactory as the slower effects of black powder; and even the 'water blast', as employed by the aborigines, would, in some cases, be more economical."

Although the Spaniards, after the conquest of New Mexico, worked some of the turquoise mines extensively, the general industrial eclipse that fell over the whole Southwest in the decadent later days of the Spanish occupation led to their abandonment. The exquisite polish of some of the gems dug from ancient burial places, and the extreme delicacy of the perforations made to permit them to be strung, have often excited the astonishment of modern lapidaries. The usual work of the aborigines is crude in comparison with that of workmen having all the tools and appliances of civilization, and that they performed such work with only the crude tools and appliances of the Stone Age is difficult to believe. Hence, it is sometimes suggested that the Southwest has its lost arts as well as the ancient civilizations of Africa and Asia.

Statistics of 1910 Copper Production

Hayden, Stone & Co. report that the thirty principal producers of copper in this country produced last year 937,948,000 lb. of copper, for which they received $118,417,000, or 12.6c. per pound. The cost of this production was $85,680,000, and the profit $32,737,000. In other words, these companies made a profit on their operation of a little less than 40%. Considering that this production represents the liquidation of so much wealth, this is very modest. It is interesting to observe that a lower price for the metal was met by generally decreased costs, the average cost of the whole production being just a shade over 9c. per pound, showing considerable improvement in this respect over the 1909 figures.

It is noteworthy, however, that four of the companies—Calumet & Hecla, Nevada Consolidated, Phelps-Dodge, and Utah Copper—with a combined production of 359,000,000 lb., or a little more than one-third of the total, earned $17,500,000, or considerably more than one-half of the total net earnings. Outside of these four companies the cost of the rest of the production, 578,000,000 lb., was just about 10c. per pound. Five companies, with a total output of 22,500,000 lb., produced their copper at a loss. Taking the year's record as a whole, it was one that reflects much credit on the managements, but from the investor's standpoint, it is unsatisfactory, as the net return was not sufficient to both reimburse the depreciation of principal and justify the risk.

Next to Pennsylvania, West Virginia possesses larger supplies of coking coal and other high-grade coals than any other State in the Union, but so long as both the coal and the coke continue to be shipped out of the State, West Virginia will not attain the position she should occupy as a manufacturing State, nor will the miners of coal and makers of coke receive a just return for these products.

The Rand Gold-Mining Industry and its Future

By F. H. Hatch

(Continued from page 98.)

In the past the use of machine-drills for stoping has not been looked upon with much favor. For this there are several reasons: first, the machine used was the heavy drill employed for development work, and with this type it was impossible to work in narrow stopes without breaking a large amount of waste; secondly, the bands of barren quartzite, with which the conglomerate is often interstratified, suffered such pulverization by reason of the large blasting charges used, that often it could not afterward be eliminated by sorting; and thirdly, the large blasting charges were found to weaken the roof, so that a greater number of pillars had to be left for its support than was the case with hand-drilling.

Only in wide stopes, on a large homogeneous reef with good walls, could these drills be used to economic advantage. The necessity for a good stoping drill for narrow reefs, however, has become more and more pressing with the extension of the mining industry, with which the supply of native labor for hand-drilling has not kept pace. In consequence the Chamber of Mines decided, in the beginning of 1908, to offer a prize of £2500 for the best small drilling-machine that could be produced for mine work on the Witwatersrand. The prize money was subsequently raised to £5000 by the offer of the Transvaal Government to subscribe an equal amount. A committee was appointed and a series of competitive trials took place during the year 1909, the report of the committee being published in 1910. The width of the stopes in which the competition was held varied from 24 to 45 in.,[1] and the results showed that it was possible to break ground as cheaply in narrow stopes with small machines, as by hand. The winning machines were of the reciprocating percussive type, thus reversing the result of a previous competition, held in January 1908, at the instance of the *South African Mines*, when the first place in the competition was won by a hammer-drill. The names of the four leading drills among the competitors are given in the following table, together with the footage drilled by each, the average drilling speed over the total time, and the cost of driling per foot.[2]

TABLE SHOWING THE RESULT OF THE STOPE-DRILL COMPETITION OF 1909

Machine.	Footage Drilled.	Average Drilling Speed (in. per min.).	Cost per Foot Drilled (pence).
Holman $2\frac{1}{8}$-in.	12,779	0.742	9.77
Siskol	14,083	0.818	9.90
Holman $2\frac{3}{4}$-in.	11,744	0.682	10.91
Chersen	11,781	0.684	11.94

These costs compare favorably with the cost of hand-drilling, which is rarely less than 13 pence per foot drilled. The tonnage broken is as 6 to 5 in favor of the machines, while the cost of explosive is as 6 to 5 in favor of native labor. Since the cost of native labor tends to increase, and this item amounts to 3d. per foot drilled in machine-drilling, as against 10d. per foot drilled in hand-drilling, this is also in favor of machine-drilling. It therefore may be taken as established by this competition that machine-drilling in moderately narrow stopes costs no more, and perhaps even less, than hand-drilling by natives. Hundreds of small drills (drilling a hole to take a $\frac{7}{8}$-in. explosive) are already employed for stoping on the Rand,[3] and their average duty is $\frac{3}{4}$ fathom per shift. To stope very narrow and low-grade reefs, hand labor is still necessary; but it is hoped that a drill capable of doing even this class of work will eventually be evolved.

The removal of the gold-bearing conglomerate bed which, except for its somewhat steeper dip, may be compared to a coal-seam, leaves an open space, which is not allowed to fall in, as in a coal mine worked on the long-wall retreating system, but is supported over enormous areas by pillars of unworked conglomerate in the stopes; by ribs left above and below drifts; and by pillars left to ensure the safety of the shafts, supplemented in some cases by filling with waste rock. These methods have sufficed in the past to keep open the stopes and drifts and to protect the shafts; but, owing to the robbing of the stope pillars in the outcrop mines, and more especially to the increased pressure of the superincumbent rock mass in the deep levels, serious movements of the hanging wall have lately been making themselves felt, crushing the pillars in the stopes, destroying the ribs above and below the drifts, and in some cases even affecting the shaft pillars.

HAND-DRILL WORK ON THE RAND.

To arrest this untoward movement, which at one time threatened the loss of the main thoroughfares of some of the mines,[4] a system of sand-filling has been adopted. By this system the abandoned stopes and other working places in the mines are filled with sand, taken from the residue dumps or run in direct from the mill. This method has been borrowed from the Silesian coalfield, where it has for many years been in successful operation, enabling a thick seam of coal to be safely mined under towns, villages, rivers, and main lines of railway.[5]

The method employed, in the case of the old residue-dumps, is to mix the sand with sufficient water to cause it to flow down pipes in the shafts and be discharged in the stopes prepared for its reception. Where tailing is used it is pumped as a pulp from the sand treatment vats, and is thickened in cone-classifiers, before delivery underground. The pulp is conducted in wooden underground launders to the stope to be filled. Barricades are used to keep the sand in place, but it drains well, and soon packs solid enough to bear the weight of a man. The effluent water is pumped back to the surface, and this charge is one of the chief items of expense. Another is the renewal of the pipes used to convey the sand down the shafts. The sand is extraordinarily abrasive, and the life of the pipes is very short. The cost of the process is, however, balanced to some extent by the increased ore reserve due to the advantage of not having to leave pillars in the stopes, coupled with the saving of the cost of cutting them.

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*Abstract of the James Forrest Lecture for 1911, delivered before the Institution of Civil Engineers.

[1] Forty-three per cent of the work was done in stopes of under 40 in.; but the size of the stopes depended, of course, on the local mining conditions, and not on the capabilities of the drill.

[2] The first and second prizes of £4000 and £1000, respectively, were divided between the Holman $2\frac{1}{8}$-in. and the Siskol.

[3] According to the Crown Mines report for the year 1910 (chairman's speech), $23\frac{1}{2}$% of the fathomage stoped in the early part of that year was broken with small machine-drills. Again, 20% of the total tonnage mined in the Robinson Deep is broken by small drills.—Superintending engineer's report of June 11, 1910.

[4] See chairman's speech at annual meeting of the Ferreira Deep Co., held December 14, 1910.

[5] It was first introduced at the Myslowitz colliery in Upper Silesia.

At first it was feared that the cyanide remaining in the sand would be dangerous to the miners; but a little research has eliminated this source of danger. The percentage of moisture in the pulp, as it comes from the thickening cones, is 12. It consists of water containing up to 0.02% of cyanide. By adding a 5% solution of permanganate of potash, or of chloride of lime, it is found that the percentage of cyanide in the moisture of the sand can be reduced to less than 0.0025. The effluent water from the sand-packs underground shows no trace of cyanide, and no hydrochloric acid has been found in the air of the stopes which are being filled.[6] The filling of the worked-out stopes will also assist ventilation, since it will prevent the dissipation of the fresh air current. The system is already in use at the Village Deep, Village Main Reef, Ferreira Deep, Robinson, and Simmer & Jack mines, and there is little doubt but that it will be universally adopted.

One of the most remarkable economic changes on the Rand is now being brought about by the concentration of the steam plant at two or three centres, from which power is distributed to the mines by electric transmission, or in the form of compressed air. This has largely been the work of the Victoria Falls & Transvaal Power Co., although one or two of the mining groups (notably the Farrar and the Robinson) have established their own power-stations. Electrically transmitted power is rapidly supplanting independent steam power for mills, hoisting, sinking engines, underground hoists, and pumps, owing to the low rate at which it can be purchased from the power company. The price has been fixed by agreement at 0.561 pence per unit until October 1912, and thereafter at 0.525 pence. The company has already in operation three central generating stations, namely, at Rosherville (50,000 kw.), at Simmer Pan (18,000 kw.), and at Brakpan (9000 kw.); and a fourth station is in course of erection at Vereeniging (20,000 kw.).[7] At all these stations the power is generated by steam turbines. Transmission is effected both by overhead lines (at 40,000 volts along the Rand, and at 80,000 volts from Vereeniging, a distance of 30 miles) and by underground cables (at 20,000 volts). The length of the overhead lines, including Vereeniging, is 150 miles; that of the underground cables, 35 miles. A part of the power, supplied by the company, is in the form of compressed air for rock-drills. For this, there is a supplementary station at Rosherville, generating 16,000 hp. by four compressors driven by steam turbines, and an electrically operated station at the Robinson Central Deep mine, delivering 24,000 hp. from six compressors. The compressed air is conveyed through 20 miles of air-mains, ranging in diameter from 26 to 9 in., the pressure of supply being 120 lb. per square inch.

A considerable economy will be effected by this centralization of power-generation, and the consequent reduction in the number of independent steam-plants. From the price per unit at which the Victoria Falls & Transvaal company is supplying power, the cost of a horse-power per annum, utilized continuously day and night, can be calculated: it works out at £14. It is not so easy to arrive at the average cost of a horse-power year on the mines prior to electrification, but it is stated to have been £28. In any case, the saving due to the substitution of electric motive power for steam power is undoubted, and there is, moreover, the indirect advantage of greater flexibility and more perfect control.

The introduction of electric hoists on the Rand has practically decided the long-debated question of hoisting from great depths, in favor of stage-hoisting, as against single lift. By the adoption of a large unit of load and a suitable arrangement of loading bins, the loss due to the repeated handling of the ore can be reduced to a minimum. In the new 7-compartment shaft of the Crown mines the ore is to be raised in 8-ton skips; and even greater units have been adopted at Kimberley (as, for instance, at the Wesselton, Bulfontein, and Dutoitspan mines), where 11-ton skips are in use. Underground electric hoists, to serve the inclines from the bottom of the vertical shafts, are being installed in several mines (as, for instance, at the Catlin and Howard shafts of the Jupiter mine). They will also be employed for hoisting in the deeper vertical shafts, when the depth reached is beyond the economic limit of a single lift.

Since the discovery of the Rand in 1886 to the end of 1910, 155 million tons of ore have been milled and gold produced to the value of £276,000,000, this being an average of 35.6s., or 8.4 dwt. of fine gold per ton milled. During the same period dividends amounting to £72,416,550 have been distributed, equivalent to 9.3s. per ton milled. During 1910 gold to the value of close on £31,000,000 was produced by crushing 21,500,000 tons of ore; this is equivalent to an average yield of 28s. 6d., or 6.7 dwt. of fine gold per ton milled. The working costs averaged (from the returns of 56 companies) 17s. 7d. per ton, giving an average profit of 10s. 9d. per ton milled.

As examples of large producers working at a low cost and making a good profit, I have selected the following companies, and have averaged their returns for the first three months of the present year.

Average Working Costs and Profits of some Witwatersrand Mines During the First Quarter of 1911.

Company.	Crushed Monthly (tons).	Yield (dwt. per ton).	Working Cost (shillings per ton).	Profit (shillings per ton).
Robinson	48,900	10.9	13.9	31.9
New Primrose	24,740	7.0	14.8	14.9
Simmer & Jack	68,530	6.3	12.1	14.4
East Rand Proprietary	182,170	5.9	15.2	9.6
Witwatersrand	34,860	5.0	12.6	8.4
Knight's Deep	57,820	4.7	11.7	8.4
Glencairn	18,520	3.7	13.7	1.8

These seven companies, crushing nearly one-quarter of the whole tonnage, are working at an average cost of 13.8s. This very remarkable result has been brought about by increasing, to their economic limit, the size of the units used in the various operations, such as cars, stamps, tube-mills, vats, pumps; by simplifying the methods of handling ore; and by replacing, so far as it is economy to do so, hand labor by mechanical appliances. Larger units of development[8] and the centralization of power-plant have also contributed to this result; while the amalgamation of the properties into larger units has helped to lower working costs, by permitting a reorganization of the transport and hoisting arrangements, and by reducing the standing charges.'

Working at a cost of 13.8s. per ton means that the cost of development, extraction, and reduction, including administration, is covered by a recovery of 3¼ dwt. of fine gold per ton. On 5-dwt. ore, therefore, this would allow a profit of nearly 7s. 6d. per ton. And it is only necessary to look at the value of the ore reserve of many of the big mines given in the latest published official reports to see that this is not far from the average grade of much of the ore which the controlling engineers propose to work in the near future. Thirty-six mines have blocked out ore reserves, amounting to over 69 million tons, and the value of these ranges from 11 to 4 dwt., the average over the whole tonnage being 6.8 dwt. In addition there are 12 million tons of low-grade ore developed, averaging 3.2 dwt. If this low-grade ore is included in the ore reserve, the total becomes 81 million tons, having an average value of 6.3 dwt. It is clear that over a considerable area of the Rand the average grade of the orebodies is not much above 5 dwt.[9] The inclusion of large tonnages of relatively poor reef, which formerly were considered outside the range of profitable mining, has been made possible by lower operating costs. The grade of the ore crushed has fallen in consequence. This does not necessarily imply that the increased depth of the mines has of itself caused a falling off in the actual value of the ore deposit considered as a whole. I have not been able, with the material at my disposal, to come to any definite conclusion on this point; but I am inclined to the view that a gradual impoverishment with depth does exist. It would be quite possible from existing records and assay plans to settle this really vital question; but hitherto no figures relating thereto have ever been published by any of the big houses.

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[6] E. Pam. 'Sand-filling on the Witwatersrand.' *Jour. Chem. Met. & Min. Soc., S. A.*, 1910, p. 76.

[7] Besides the above, stations have also been erected by the Farrar and Robinson groups at Kleinfontein (6000 kw.) East Rand Proprietary mines, and at Randfontein (20,000 kilowatts).

[8] According to the consulting engineer's report for the year 1910, the Modder B. mine is being opened out in blocks of 800 by 1000 feet.

The effect of this increased tonnage and diminished grade on the life of the Rand goldfield as a whole is an interesting subject for speculation. Some few years ago T. H. Leggett and myself set ourselves the task of estimating the production of gold to be expected from the Main Reef series, if worked down to a vertical depth of 6000 ft.[10] Up to that date (1902) the Rand had already produced gold to the value of £76,800,000, and we calculated that another £1,233,500,000 could be produced down to the depth stated. The average of the figures for gold recovery used in our estimate was 38s. per ton. The actual recovery at the time averaged 42s. It has since fallen to 28s. 6d. But, on the other hand, large bodies of ore are now being worked that were then passed over as unprofitable. No doubt, to a large extent, the one factor cancels the other; so that, for the purpose of a rough estimate, as this must of necessity be, we may still make use of the sum total then arrived at.

Between the years 1902 and 1911 the Rand has produced £187,000,000. Deducting this figure from the total, there remains £1,046,000,000, which, on the basis of an average output of £30,000,000 per annum, is equivalent to a life of 35 years, that is, down to a vertical depth of 6000 ft. But, if at still greater depths the banket should contain sufficient gold to yield a profit, after deducting the cost of working (which, under the best conditions existing at the present time, is 12s. 6d. or about 3 dwt. of fine gold per ton), we may rest assured that it will be worked. What then are the limiting factors? They are generally considered to be (1) the mechanical difficulty of raising the ore to the surface from such great depths, and (2) the effect of the temperature gradient. With regard to the mechanical question the electrical transmission of power applied to stage-hoisting has so modified the mining engineer's conception of the depth from which deep hoisting is practicable, that it is now generally assumed that there are no mechanical difficulties that cannot be overcome if it pays to do so. In respect to the temperature question, Mr. Marriott's careful experiments have shown that the rise is only 1° F. for every 208 ft. of depth, and that the average rock temperature at 1000 ft. is 68.7 F.[11] Figuring on these data, the rock temperature at 7000 ft. would be only 97.5° F., and with efficient ventilation the air temperature would of course be considerably lower. It follows, therefore, that for all practical purposes the whole question turns solely on the gold content; and what may be at a vertical depth of 7000 or 8000 ft. no one can tell. This much, however, may be said: the geologic structure clearly indicates the continuance of the conglomerate or banket beds to still greater depths than even 7000 or 8000 ft., before the bottom of the great synclinal basin of the Witwatersrand is reached; and, beyond that point, the beds must still continue until they rise to form the southern lip of the basin, known to exist beyond the Vaal river.

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[9] Compare H. H. Webb: Report to the Consolidated Gold Fields Co. for 1910: "I think this value of about 5 dwt. is a grade which will eventually represent an average over a large area of the Rand, especially in the deeper sections."

[10] Leggett and Hatch. An estimate of the gold production and life of the Main Reef Series, Witwatersrand down to 6000 ft. *Trans.* Inst. Min. & Met., Vol. XII, 1902-3, p. 39.

[11] Marriott. 'A Record of an Investigation of Earth Temperatures on the Witwatersrand Goldfields.' *Trans.* Inst. Min. & Met., Vol. XV, 1905-6, p. 405.

The Corrosion of Aluminum

The use of aluminum has been urged for many purposes, but the early belief that the metal was non-corrodible has proved in practice to have been mistaken. In view of the increasing use of this metal, tests recently made by E. Heyn and O. Bauer upon about 50 corroded aluminum vessels, most of which had been stored but not used, are of much interest. The vessels had been prepared from sheet aluminum in much the same way as in the manufacture of vessels from sheet iron, and all had been more or less cold rolled. After pickling, some were coated with lacquer and others sold without it. After an exhaustive study, the following conclusions were reached: (1) When aluminum is attacked by water and aqueous solutions there are two different ways in which the metal may corrode: (a) the whole surface is attacked and the aluminum is transformed into $Al(OH)_3$; (b) the corrosion is localized, accompanied by blistering and scaling, and considerable damage results, although but little aluminum may be changed to $Al(OH)_3$. (2) The nature of the attack depends upon: (A) the nature of the aluminum. The greater the cold rolling, the greater the tendency to be attacked according to type (b). If the effect of cold rolling is removed by heating at 450°, then there is no more tendency to corrode in this way, and the corrosion is according to type (a), which is not so serious. (B) The nature of the water or solution. Corrosion of type (b) never takes place with pure (distilled) water, but only with tap water which contains dissolved salts. (3) A solution which causes strong corrosion of type (a) does not necessarily cause any corrosion of type (b), and similarly, other solutions have little tendency to cause the (a) corrosion but give strong corrosion of the (b) type. (4) The vessels examined were all corroded according to the (b) type. (5) In many cases the blisters and scales occurred in lines coincident with the direction of rolling the sheets. (6) Chemical analysis showed the corroded metal to consist of $Al(OH)_3$, some CaO and some SiO_2 also being present. These last two constituents were always found in the efflorescence on metal which was artificially corroded by tap water or similar solutions. From these facts it is clear that the corrosion on the stored vessels was not due to deposition of moisture from the atmosphere, and experiments showed that atmospheric moisture attacked aluminum only according to type (a). Presumably, the vessels had been rinsed with tap water and not dried thoroughly before storage. (7) There was no difference in chemical composition between articles that corroded and those that did not. Corrosion could not, therefore, be traced to the presence of impurity in the metal. (8) Greasing with vaseline or similar substances tends to prevent corrosion of the (b) type. (9) Annealing the metal at 400 to 450°, after the cold rolling, may be advisable. This, however, makes the metal softer, so that it may be better to lessen the extent of cold rolling. (10) The utensils should be stored dry.

Electro-Plating Battery Plates

By J. D. Hubbard

Copper plates for battery aprons, when first put in place, are usually plated with from two to three ounces of silver per square foot of surface. They then readily take a coating of quicksilver and form the best medium for good amalgamation. But, whether silvered or not, mill plates do not remain indefinitely in good condition. The chemical composition of the battery water, quality of quicksilver used, size and condition of pulp passing over, and, most important of all, the particular 'dope' used by the amalgamator in dressing the plates, all have a tendency to shorten the life of an otherwise perfectly good plate. 'Brushing up' with a strong cyanide solution is the last word in poor amalgamation practice. Every time I come across an amalgamator using cyanide on his plates, or in his batteries, I ask him why he uses it, hoping some day to acquire the occult reason. But the invariable answer is, "Cyanide cuts grease."

Grease can be kept off apron plates by a little care and attention to the source of the trouble. And if any grease should unavoidably get on the plates it may readily be removed with a lye solution, or by scrubbing the spot with hot water and alkali soap. 'Scrubbing' is used in its most literal sense. Every particle of amalgam should be moved slightly every time the plates are brushed, and this cannot be done with a feather duster. A lack of energy will cause hard scales of amalgam to form, which spread and get worse with age, and are in many cases almost impossible to remove by subsequent annealing. When they commence to form and spread, the copper plate should be taken in hand at once.

Potassium cyanide is a penetrating alkali, and if used intermittently on amalgamated copper plates, will gradually form double cyanides of mercury and copper, causing the copper to 'rust', or form verdigris, which will in turn lift amalgam and even silver plating, and cause it to scale off the plate. All millmen know the bane of hard and oxidized copper plates. The hardening is due principally to absorption, and the oxidizing to deleterious chemical action. In time the plates get so bad that it is impossible to make amalgam hold to them. Mercuric chloride, or sodium or zinc amalgam offer but temporary relief. The copper plate simply gets worse. It is obvious that something must be done. A simple remedy at small and isolated mills, is to take off the copper plates, scrape them well, then heat them to dull redness over an open fire, and plunge in cold water to anneal them. The irregularities in the plate may be removed by placing them on a smooth, level surface, and hammering with wooden block and mallet. No furnace is necessary; just an open fire. Have only sufficient fire to heat the plate well. It is best to cover the plate with light dry wood, and when this has burned away the plate is ready to be plunged. This must be done as quickly and evenly as possible. Slow cooling is of no use in softening copper. There is no danger of melting or burning a copper plate of $^1/_{16}$-in. diameter or more, over an open fire. And after plunging the hot plate in cold water, it can be easily bent. After hammering out the bends and inequalities with a wooden block and scouring with fine sand, the plate is ready for use again, and should last a year or more, provided it is kept free of cyanide or acid solutions.

In many cases, where silver plating is desired, it is best to send the plates to a regular plating works, where facilities for doing a proper and thorough plating are at hand. But all large mining companies, more or less isolated, should have their own silver-plating plant. The first cost is insignificant, the space taken up is small, and the results are satisfactory. The main cost is the silver itself, practically all of which goes where it will do the most good: on the copper plates. The Oriental Consolidated Mining Co., operating at Unsan, Korea, installed a small silver-plating plant about three years ago. This company has a little over 2100 sq. ft. of copper-plate surface in use in the five mills. All the copper plates in poor condition were silver plated at this time, but without first annealing them. They gave good service for a time, but soon the plating commenced to scale off the hard plates. This finally got so bad that it was necessary to replate them. Recently the mill plates were properly annealed, rolled, scoured, and plated, and have been giving excellent satisfaction ever since.

The silver plating plant consists of two tanks and one vat (with apologies to 'KCN' *et al.*) made of wood. Metal tanks, unless heavily enameled, will not do, on account of their electric conductivity. One tank is used for stock solution, and one for rinsing the finished plate, while the middle vat holds the anodes and cathodes for the plating proper. The plating vat is made of 2-in. seasoned plank, well fitted, properly caulked, and painted with three coats of paraffine paint. The inside dimensions are: width 15 in., length 5 ft., and depth 6 ft. A hardwood cap, 4 by 4 in., is fitted across the middle lengthwise on the top of the plating vat, and $1\frac{1}{4}$-in. holes drilled every 6 in. for the wires to hold the anodes. Nine pure silver anodes 4 ft. long, 5 in. wide, and $^3/_8$ in. thick, weighing from 20 to 22 lb., are hung on these connections, and the whole connected with the main circuit. The two copper plates are lowered into the vat on either side of the anodes, and held in position against the wall of the plating vat by strips of wood. The copper plate or cathode connections are wired in a Y shape, each horn of the Y to connect each cathode or copper plate. The plating vat has a cover to lock on, to prevent an inopportune confiscation of the silver anode by the natives.

TARACOL HEAD-FRAME.

Care must be taken that there are no short circuits, and then the main circuit is closed with a switch conveniently placed near the plating dynamo. The original plates were 4 ft. 8 in. wide by 10 ft. long, in one piece. These plates cut into two sections were just the right size to go into the plating vat. The plates are first taken up and well scraped with chisels and scrapers to remove all the amalgam and scales. After cutting in two sections, holes are drilled for screws to fasten them back on the aprons, and two $^1/_2$-in. holes are made in opposite corners for the anode connections. These holes are covered with a wooden strip when put back on the aprons, and therefore do not interfere with the flow of pulp, or amalgam. After drilling, the plates are heated over an open wood fire to a dull redness and then plunged into a flat box of cold water.

At the Oriental Con. M. Co. shops there are no regular plate rolls, but a good set of bending rolls. These were adjusted to the right feed and a $^3/_4$-in. iron plate slipped between them. On this the annealed copper plate was laid and put through the rolls two or three times, taking out all the inequalities. The plates are well scoured with fine sand, and the back of each plate painted with paraffine paint to prevent plating on that side also. When the paint is dry each plate is weighed on a platform scale and the weight recorded. Two copper plates are lowered into the plating vat on either side of the anodes, and the current turned on. A dynamo made especially for the deposition of metals, manufactured by the Eddy Electrical Corporation, of Windsor, Conn., and of type I C, size I, speed 900, 5 volts, and 300 amperes, is used. The current was found to be too strong, but this was remedied by introducing more resistance in the circuit.

The copper plates are plated for 3½ hr., then turned end for end and plated for 3½ hr. more. As the plates were 5 ft. long and the anodes but 4 ft., it was necessary to turn the plates. The current, of high amperage, has a tendency toward excessive action near the surface of the plating solution, and deposits soft silver on the top part of the copper plate. If this soft or 'burned silver' is not removed with a brush, the final appearance of the plate is rough and dark where the excess silver was deposited. To overcome this, a whisk-broom was tied to a long handle of wood, and the plates brushed off every half hour, without removing the plates or turning off the current. After seven hours in the plating solution the plates are taken out, rinsed in clean distilled water, and then weighed again on the scales to see if the necessary amount of silver has been deposited, then removed to the mill. Under the conditions here, the seven hours' contact gave a deposition of 2½ oz. per square foot of surface.

The silver-plating stock solution of cyanide of silver is the most difficult part of the plating operation. It is very sensitive to all conditions of light, temperature, and chemical action, and to fluctuations of the current, which will cause both chemical and physical changes to take place in the solution. A weak solution of silver cyanide is a poor conductor, so it must be kept up to strength. From 1 to 2% is all right, but it must not be allowed to drop below 1%. Theoretically, the anode under current and with proper amount of free cyanogen in the stock solution, is supposed to add automatically sufficient silver to the stock solution to keep it up to full strength, but this is not always so in actual work. Strong cyanide of silver must be added to the stock solution now and then, depending upon the amount of work done, to keep it up to full strength.

A convenient way to test for silver in the cyanide solution is to evaporate carefully on a lead tray 10 c.c. of the stock solution, cupel the whole, and weigh the resulting silver button. As for testing the stock solution for free cyanogen, it may be done in the same way as for any working cyanide solution, by titrating with standard $AgNO_3$. The stock solution should show about 1% free cyanogen all the time. Another way to detect a lack or excess of free cyanogen, is to note the physical changes in the plating solution. If the silver deposited on the cathode has a hard and dark appearance, the anode plates assume a hard close-grained appearance, and are more or less coated with a slimy deposit of silver oxide, there is a lack of free cyanogen. On the other hand, an excess of free cyanogen is shown on the anodes by their very white frosted surfaces being pitted and their edges ragged, and on the cathodes by a soft, rough, and loosely deposited coat of silver which strips off under the brush or burnisher. Also a strong odor of cyanogen is noticed, mingled with an odor of ammonia in hot weather if much work is being done.

It must be understood that only pure silver is to be used for the plating solution. Standard silver is useless, as it contains copper, and copper quickly spoils the plating solution for effective work. Also, never leave the copper plates in the solution for any length of time when the current is turned off, as the free cyanogen will act upon them. If the silver stock solution becomes charged with copper it is necessary to make it up afresh. Use only distilled water, pure silver, and KCN of at least 90% strength. For the stock solution it is best and cheapest in the long run to buy good silver nitrate and dissolve it in pure water, precipitate as a chloride with NaCl, and then dissolve the silver chloride in KCN solution. Start off with a 2% silver solution, and afterward keep the strength up to at least 1% silver. Large wires must be used from the dynamo so as to offer small resistance to the current. In this case ½-in. insulated twisted cable was used. The time of contact may be determined by removing the copper plates from the plating vat and weighing them on the platform scales to determine the amount of silver deposited.

In conclusion the following points must be emphasized: (1) only pure silver anodes to be used; (2) large wires from plating dynamo to reduce resistance; (3) copper plates to be well annealed and burnished; (4) only pure water and high-grade potassium cyanide to be used in the plating vat; (5) free cyanogen to be 1% in excess in plating solution; (6) a stock silver solution of from 1 to 2 per cent.

A New Drill for Deep Holes

By George H. Gilman

*In many engineering undertakings, economical rock excavation requires the drilling of deep holes, of large diameter, to accommodate heavy charges of explosive. These holes, in current practice, range in depth from 15 to 50 ft., and from 3 to 5 in. in diameter at the bottom. They are usually drilled with ordinary rock-drills, from 3⅝ to 5½ in. cylinder diameter, with an additional derrick or tripod of wood or pipe to handle the heavy steel.

Three difficulties arise in using machines of this pattern. They are cumbersome and hard to move from one hole to another. Much time is lost in changing drill steel, since the range of feed does not exceed 2½ or 3 ft.; the deep holes are hard to keep free from mud and sludge, so that the force of the blow is partly lost by cushioning on mud instead of striking fresh rock at each stroke. The result of these handicaps is that a comparatively small proportion of the total working time is spent in actual drilling.

Two of these difficulties, those of transportation and of changing steel, have been solved by the use of churn-drills. The difficulty of cleaning the holes persists in this type, and is a considerable impediment to efficient work. With these considerations in mind, C. H. Locher, of the engineering firm of Grant, Smith & Co. & Locher, undertook about two years ago to devise a drill more rapid and efficient than any machine then available. This consists of a vertical standard or carriage, carrying a rock-drill cylinder attached to a heavy iron block, which is suspended in guides or ways over 20 ft. in length by a steel cable, which passes over a sheave and is alternately paid out or taken in, as needed, on a hoisting drum. The standard and hoist are mounted on a steel wagon-truck. A two-cylinder reversible engine provides power for the hoist and for moving the outfit from place to place, by means of a chain-drive to the axle of the rear wheels, above which the standard is mounted. The front wheels swivel to permit steering. The truck carries an air re-heater or a boiler as required, and jackscrews are provided at the rear end for taking up motion while drilling is in progress.

It will be seen that this outfit enables holes to be drilled to a depth of 20 ft. without change of steel. The work of cleaning the holes is accomplished by an entirely new device, which will be described before telling the nature of the performance done with this outfit or explaining its detail of construction.

When drilling in a 'blocky' formation the chief difficulty experienced with rock-drills was the extraction of cuttings from the hole as the depth increased. This was due not only to the broken condition of the ground, but seams were often intersected which led to an opening made by a previous blast, so that it was practically impossible to properly 'mud the hole'. After many devices and special kinds of steels had been tried without success, the idea of using the movement of the drill steel for direct pumping suggested itself, and upon trial gave good results. The

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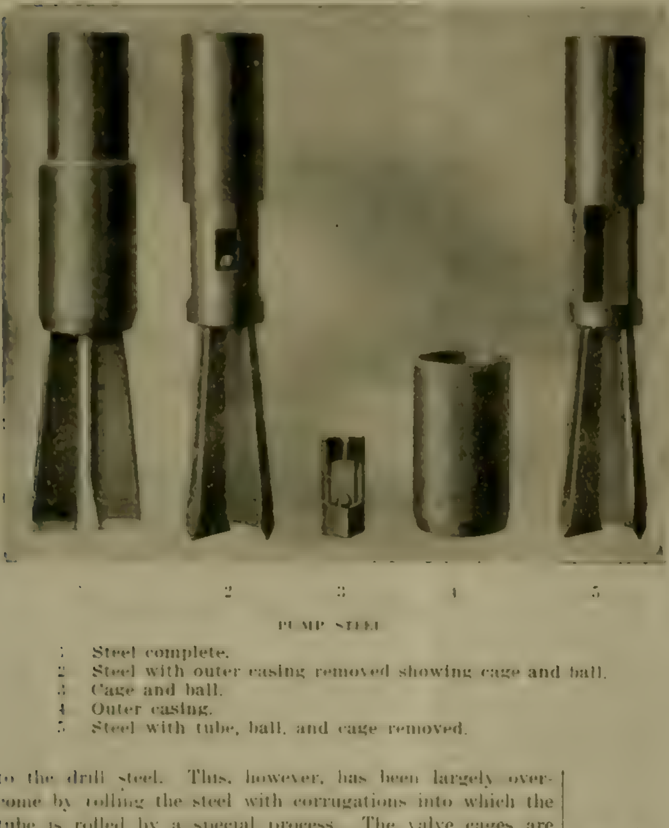
*Abstract from *Mine and Quarry*.

[illegible] employed for this purpose consists of [illegible] drill steel [illegible] a tube. The lower end of this tube is made in the form of a cage carrying [illegible] balls which act as valves. See the accompanying illustration. When the drill steel is thrown forward these balls are raised from their seats by the resistance of the [illegible] in the bottom of the hole, and a quantity of sludge is thus thrown above them. When the steel lifts, these balls are naturally dropped to their seats, thus preventing the entrapped sludge from escaping, and the rearward stroke of the drill is sufficient to throw the cuttings out of the top of the tube, where they are deflected downward by a saucer-shaped plate securely fastened to the shank of the steel.



PUMP STEEL

1. Steel complete.
2. Steel with outer casing removed showing cage and ball.
3. Cage and ball.
4. Outer casing.
5. Steel with tube, ball, and cage removed.

Difficulty was at first experienced in securing the tube to the drill steel. This, however, has been largely overcome by rolling the steel with corrugations into which the tube is rolled by a special process. The valve cages are then inserted in openings cut in the lower part of the tube directly opposite the grooves in the steel, and are held in position by an outer sleeve. With this device no difficulty was found in keeping the hole clear of cuttings, and even in broken ground little trouble was experienced in keeping the bit free.

When drilling with this arrangement, it is absolutely necessary to have a good stream of water running into the mouth of the hole. To prevent the cuttings from finding their way back into the hole, it is customary to use old sacks, held in place about the mouth of the hole by stones. To clean the hole after it has been drilled to the required depth, preparatory to loading for firing, or to regain the proper alignment in a deflected hole, it is merely necessary to throw the drill on a cushion provided for this purpose and described later. It will then reciprocate for nearly a full stroke without striking either head, and thus pump out any loose material which may remain in the hole. This system of drilling has been patented by Mr. Locher in both this and foreign countries.

The first rig was built of heavy timbers and carried a drill 5 in. in diameter, in guides providing a travel or depth of hole of 8 ft., without changing steel. This served its purpose admirably, for it demonstrated that an arrangement of this kind was practical. In drilling to the required depth, however, two changes of steel were needed for each hole, and the time required to make the changes was found to be a large percentage of the total required for each hole. It was furthermore found that by drilling larger holes a given amount of rock was broken to steam-shovel size with fewer lineal inches of drilling, and that there was a marked saving in the amount of powder used.

In spite of these handicaps, this first machine, crude as it was, worked steadily for several months, and made some interesting records. On one occasion, 29 ft. of 4-in. hole was drilled in 55 minutes, including four moves occupying about 45 seconds each. In an hour's run, with dull steel and low air pressure, 37 ft. 3 in. of hole was drilled, with five moves. In 32 minutes, three holes were drilled, 6 ft. 2 in., 7 ft. 2 in., and 7 ft. 2 in. deep, and the rig was moved three times. The first of these three holes was drilled in 5¼ minutes. Moving, from the time one hole was finished, until the next was started, occupied just two minutes.

This success led Mr. Locher to design and build another machine of more substantial construction, with a 14 ft. feed, on which was mounted a Sullivan 'UM' drill, with a 7-in. piston, capable of drilling holes to the required depth with a 5-in. bit. With this machine remarkable work was accomplished, and a drilling speed of 12 in. per minute with a bit of this size was by no means an uncommon occurrence.

In July 1910 this machine worked 28 eight-hour shifts and put in 3282 ft. of holes averaging 11 ft. in depth. This gives an average speed of 117.2 ft. per shift, of 5-in. holes, as compared with 39 ft. per shift for the 3¼-in. rock-drill drilling 3-in. holes.

The 28 shifts included 31 hours of lost time, moving away from shots, changing water lines, and other delays caused by limited space, low working-faces, etc. Seventy-five feet was drilled in 3 hours, 165 ft. in 7½ hours, and 145 ft. per day for five consecutive eight-hour shifts.

On October 26, 1910, two sets of records were taken. The first was made with a Sullivan 'UH2' 3⅝-in. drill, mounted on a gadder frame, with a small hoisting engine to raise and lower the steel, and pump steel. The leads permitted holes to be drilled 6 ft. deep without changing steel.

Hole No.	Depth (ft.).	Changing Steel (min.).	Drilling (min.).	Total (min.).
1	8	6	12	18
2	8	5	8½	13½
3	8	3½	9	12½
4	8	4	12	16
5	6	..	10	10
Total	38	18½	51½	70

Six holes were then put in by the same drill, using regular steel, and pumping the holes by hand. The regular feed-screw, 2 ft. long, was employed, so that the steel had to be changed once in 24 inches.

Hole No.	Depth (ft.).	Drilling (min.).	Total (min.).
1	8	14½	42
2	8	24	52
3	8	14	22½
4	8	18½	27½
5	8	13	32
6	6*	42	49
Total		126	225

*Bad hole.

The time for moving from hole to hole is not considered in either case. It will be noted that if the length of feed in the first record had been 8 ft. instead of 6 ft., 18½ min. would have been saved in drilling 38 ft. It will be seen from these two records that with the pump steel and long feed the rate of drilling was 1 ft. in 1.35 min.; with the regular steel and usual feed (ordinary method), 1 ft. in 4.89 min. That is, with the same labor and in the same time, the improved method accomplished 3.62 times as much work as the old or standard method.

In the summer of 1910 the work necessitated drilling holes to a depth of 20 ft. Mr. Locher decided to have a new machine built incorporating all the features which were found to be advantageous in the earlier machines. This outfit is capable of drilling holes to a depth of 50 ft. The mounting is arranged to move backward or forward at a speed of 20 ft. per minute. The hoisting speed for raising the drill and weight is 30 ft. per minute. The rig stands about 31 ft. high, is 21 ft. long, and 12 ft. wide, and weighs 33,000 pounds.

A brief description follows: The horizontal frame, built entirely from structural steel, is mounted upon four wide-tread steel wheels, those in front being swiveled for steering, while those at the rear are on a fixed axle. A drive shaft, geared direct to the engine through jaw clutches, carries two small sprockets on either side, which are connected by a sprocket chain to larger sprockets secured to the rear or driving wheels for moving the drill. Directly over the rear wheels is the vertical standard, made of channel iron, securely braced to the frame of the machine, and serving as a guide for the drill. Forward of this, mounted upon the frame, is the hoisting and propelling mechanism with its two-cylinder, reversible engine, while over the front wheels is mounted an air re-heater, through which the compressed air passes to supply both the engine and drill. It will thus be seen that the greatest weight is directly over the rear drive wheels. Jackscrews are provided at the rear of the frame, which may be set down upon the rock to give the entire machine stability in a lateral direction while drilling is in progress.

The feeding of the drill is accomplished entirely by a suspended weight, to which the drill cylinder is bolted and which provides stability. A slow retrograde movement of the hoisting drum for lowering is given by worm gearing, while the hoisting is accomplished by a train of spur gears which connect the main shaft of the engine, through a jaw clutch, with the hoisting drum. An automatic locking arrangement is provided between the hoisting drum and its gear, which prevents any possibility of the drum slipping. With the worm gear in mesh, both hoisting and lowering may be accomplished on the slow speed, while with the spur gears the drill may be hoisted only. No brakes of any description are employed, and the speed at which the various devices operate is controlled entirely by the engine throttle. The engine runs continuously while the drill is being fed at any desired speed. Every movement of the entire machine is controlled by a bank of levers so placed that each is accessible and convenient for the operator. One of these levers controls the power steering mechanism, by which the course of the rig is directed when in motion.

When starting a hole the drill steel is guided by a hinged clamp fastened to the lower end of the standard, and through which the drill-rod reciprocates. After the steel has cut to a depth slightly over the length of its stroke this clap is disengaged and swung out of the way, where it remains until the hole is finished.

A davit, with block and tackle, at the top of the standard, provides for handling the long lengths of drill steel, in connection with a winch on the main shaft of the hoisting engine.

The drill proper is an entirely new development in rock-drill practice. The cylinder is 7 in. in diameter, with a piston stroke of 8⅝ in. Important changes have been made in it to handle the heavy lengths of steel, and to secure at once speed, economy of power, and adaptability to the rock and other working conditions. It may be described as a combination of the standard drill and the chopping engine of the Sullivan direct-acting channeler, which has been in satisfactory use for many years.

The channeler valve and piston motion have been adopted to secure economy, by using the air or steam expansively. The main valve is air-thrown, but is controlled by a reverse valve mounted on the stem of a cut-off valve, which in turn is actuated by a lever in direct contact with the piston, so that the point of cut-off and the length of the stroke may be automatically regulated. Corliss valves in the exhaust ports provide a cushioning effect and prevent damage to the cylinder head in case the drill should run into a mud seam or pocket.

The usual method of rotation is employed, except that instead of boring out the piston to make provision for the rifle-bar, the rifle-bar is made a part of the piston proper by cutting the flutes upon a projection from the rear of the piston head. To eliminate cylinder wear, a guide bearing for the rod is provided by an extension from the cylinder proper, carrying a removable bronze bushing through which the piston rod reciprocates. This is one of the most valuable features about the machine, as it reduces cylinder wear to a minimum. This wear would otherwise be very pronounced when handling the long lengths of steel. The drill is lubricated by an automatic oiling device in the upper head, controlled by the pulsations of the air in the cylinder. The chamber holds about one quart of oil.

Some of the records of actual work were obtained at the crushed-stone quarry of the Church Quarry Co. at Sibley, Michigan, where it was installed temporarily, pending the resumption of the Government work at Grosse Ile this spring. At Sibley this machine has quickly drilled holes to a depth of 44 ft., and the pump-steel is entirely successful in handling sludge from holes of this depth. It is estimated that as a means for breaking ground, this outfit, run by two men, will do the work of five ordinary drills, requiring ten men for their operation, and that it will accomplish a considerable saving in powder, owing to the larger diameter of the holes drilled. The economy in motive power is also an important factor.

Australian Gold Production

The gold production of Western Australia during May was 111,028 fine ounces, valued at £471.619, as compared with 127,783 fine ounces, valued at £542.791, for the same month last year. The total for the first five months of this year has been 555,753 fine ounces, valued at £2,358,976, as compared with 608,891 fine ounces, valued at £2,586.402, for the corresponding period last year. In our issue of April 15, through an oversight, the production of the mines of Western Australia for January 1911 was given as the total for 1910. During 1910 eighteen mines in Western Australia paid dividends amounting to £1.028.393, instead of £95.700, as there stated.

The yield of the Queensland gold mines for May amounted to 37.188 fine ounces, valued at £157.964, as against 36.909 fine ounces, valued at £156.779, for the same month in 1910.

The return furnished by the Under-Secretary for Mines of New South Wales shows that the yield of that State for May was 24.389 oz. crude, equal to 21,319 oz. fine, valued at £90,558, as compared with 12,681 oz. crude, equal to 11,184 oz. fine, valued at £47.506, for the same month in 1910. The yield for the first five months of this year amounts to 89.571 oz. crude, equal to 75,310 oz. fine, valued at £319.898, as compared with 87.982 oz. crude, equal to 74.640 oz. fine, valued at £317.050, for the same period in 1910, thus showing an increase of 670 oz. fine, and £2848 in value.

The gold produced in New Zealand during May amounted to 60.371 oz. gross, or 56.557 oz. fine, valued at £240,281, as compared with 45.042 oz. gross, or 42,342 oz. fine, valued at £179.856, for the same month last year. Since January 1 the gold produced has amounted to 196.050 oz. gross, or 184.941½ oz. fine, valued at £785.581, as compared with 197.813 oz. gross, or 184.486½ oz. fine, valued at £783.648, for the corresponding five months in 1910.

Electric Furnaces

By Carl Hering

[*]The electric furnace is today no longer a laboratory device, it has taken a prominent place in the industries and has become a very important commercial apparatus, its usefulness growing steadily. Not including the very large number of small laboratory furnaces, there are today hundreds of large furnaces in use in the industries, producing thousands of tons of commercial products daily. In some cases the commodities are produced better or cheaper than before, while in others important products, which had never before been known or which could not have been made with other furnaces, are now manufactured in large quantities.

Among the present uses of the electric furnace may be mentioned the refining of steel, the reduction of iron ores by means of water power, the production of aluminum, silicon, graphite, carborundum, alundum, calcium carbide, other carbides, bisulphide of carbon, ferro-alloys, and others.

The electric furnace even promises to affect the wealth of nations. Sweden, one of whose national products for many generations was the famous Swedish iron, has for some time been losing ground in that important industry, owing to the greatly increased cost of charcoal. But owing to the enormous water-powers in that country, and the generous and wise aid of its parental government in developing them, Sweden will now be able to revive that important national industry by means of the electric furnace, which requires only a fraction of the charcoal that the blast-furnace does, and which enables the iron to be converted directly into refined steel, of considerably higher money value.

Norway's national industries will no doubt also be affected by the electric furnace. Its barren, rocky western coast, unfit for most other purposes, is admirably adapted to electric furnace industries, on account of its numerous easily available and nearly constant water-powers situated on the immediate coast where the products and raw materials can be cheaply shipped by water, which shipping will probably forever be open to normal competition and beyond the control of railroads, hence can always be relied upon to remain reasonable.

Canada and the States along the Pacific Coast, which abound in water-powers and mines, but have no cheap coal, will no doubt also be greatly benefited by the electric furnace for reducing and refining metals, provided nature's generous gift of water-power is not allowed to be monopolized by private interests, whose charges for power are governed only by the rule to charge "the highest price that the traffic will bear." The development of the electric furnace industry will depend greatly on whether or not the governments can keep control of the water-powers and regulate the charges. Existing power-plants would, no doubt, find it profitable to encourage the use of their power for furnaces, by offering reasonable and attractive rates, with an assurance of their permanency.

In its general principle, the electric furnace is an extremely simple device, as it merely converts the most available form of energy, namely, electric energy, into the lowest and most degenerate form, heat. Nature tends to do this for us if we give her an opportunity. Hence, so far as this conversion of electric energy into heat is concerned, electric furnaces require no skill to design; it is the reverse operation, namely, the conversion of heat into electrical energy, that is difficult and requires the highest skill of the engineer in the designing of boilers, engines, and dynamos, each of which itself is the result of a vast amount of study and skill.

The engineering skill required in the design and construction of electric furnaces therefore lies not in the fundamental conservation of energy, but in building them well and efficiently, the latter being of far greater importance than in combustion furnaces, in which the cost of a unit of heat is so much less that great economy is not of so much importance. Heat generated electrically costs more per unit, hence to successfully compete with the heat of combustion it must have other advantages; one of these is that such heat can be applied more directly to the materials, therefore with far less waste, and when in addition the furnace is built so as to retain the heat as much as possible, the difference in the amount of heat required may become very great, thereby compensating for the higher cost per unit.

One of the chief features in the work of the engineer, in the designing of electric furnaces, is the reduction of the loss of heat; that is, the increase of the heat efficiency of the furnace. Electric heat being much more expensive than heat from fuel, the only way it can be expected to compete successfully, as far as the cost of the heat is concerned, is by the best possible utilization of the energy; it is possible to control the losses to a far greater degree in electric than in combustion furnaces. The practice in the heat insulation of combustion furnaces would be quite inadequate for well built electric furnaces.

The reduction of the heat losses in electric furnaces, which have no chimney losses, involves the flow of heat through solids, a subject which until recently has not been given the attention which its importance demands. Heat insulation is rendered more difficult by the fact that nature has given us no virtually perfect heat insulators like those for electricity, and that even if they existed they could not be used for high temperature insulation on the outside of a furnace, as the whole furnace wall would then assume the full inside temperature, like in cases of over-insulation, which few known refractory materials would stand; and if used on the inside of a furnace it would have to withstand the chemical actions of the liquid materials and slags. Apparently the only way a high-temperature furnace can be insulated effectively with present materials is to provide for a certain allowable flow of heat through the walls, which shall be as small as possible, but not so small as to run the risk of over-insulation, which is more serious than insufficient insulation, as the walls and roof are then destroyed. It therefore requires careful designing, and there is great need of data which at present exist only in very crude form or not at all.

There are two kinds of losses of heat from the interior of an electric furnace, namely, through the walls and through the electrodes, which are subject to the control of the designer, assuming, of course, that the doors and openings of other kinds are made as few and small as possible. A few years ago I made some analytical studies of these two sources of losses, some of the conclusions of which were surprising, showing that former practice had been in some respects far from correct. The chief results are briefly as follows:

The usual formulas used for calculating the thermal resistance of such bodies as the walls of furnaces were found to be very greatly in error, as much as 100% and over, for thick walls. In general, for a flaring conductor, like one of the thick walls of a rectangular furnace, the proper mean cross-section is not the arithmetic mean between those at the two ends, but the geometric mean, that is, the square root of their product.

Using the correct formula, it was then found that the losses diminish very rapidly at first as the walls are increased in thickness, but that after the thickness has been increased to about one-half or three-fourths of the inside diameter, any further improvement in reducing the losses becomes small. The space in the inside of a furnace should be as small as possible to hold the charge, as the losses for the same charge increase rapidly with an increased inside surface. The losses in a large furnace can be made far smaller relatively to the charge than in smaller ones; hence it is considerably better to use one large furnace than two smaller ones of half the capacity.

Concerning the losses in and through the electrodes, the problem was far more involved, and former practice was in some respects found to have been radically wrong. An electrode naturally should be a good electrical conductor in order to reduce the resistance losses. But it then also is a good heat conductor and will tend to abstract considerable heat from the charge inside, thereby chilling it. Increasing its cross-section decreases one of these losses and increases the other, thereby complicating matters. The results of the analysis are briefly that, by so proportioning an electrode that the current in it will heat its inner end to the furnace temperature, the total combined losses will be the least possible, and the electrode will at the same time abstract no heat from the charge; it will then in effect act as a perfect heat insulator, better even than the walls, as far as chilling the product is concerned.

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[*] Abstract of a paper presented at a meeting of the Electrical Section of the Franklin Institute, April 20, 1911.

Another result was that the former practice of basing the size of electrodes on certain allowable current densities was found to be entirely wrong. Still another unexpected and surprising result was that graphite with its higher heat conductivity was more economical in size and losses than carbon, and that the metals were far better than either, the best electrode material being copper, quite the contrary to what would have been supposed.

In conclusion, the following statistical data concerning existing commercial furnaces may be of interest.

The carborundum furnaces are 30 ft. long and 12 ft. wide, require 1600 kw. at 20,000 amp., 80 volts and 25 cycles, have an estimated temperature of 2300° C., and yield 15,000 lb. of crystalline carborundum at each run.

The graphite furnaces are just like these and yield about 17 tons per day, the output last year being 12,000,000 lb., of a purity up to 99.9%; the temperature is estimated to be about 4000° Centigrade.

The silicon furnaces are double electrode arc furnaces 10 ft. wide and 16 ft. long, and require about 1000 kilowatts.

The bisulphide of carbon furnace is 41 ft. high, 16 ft. in diameter, requires about 400 hp., and yields about 6 tons per day; it is a 3-phase arc furnace with three electrodes; the temperature is said to be about 1000 to 1500° C. Although built in the last century (1898), when it was probably by far the largest electric furnace ever constructed, it is running today as it was then. It is probably the most efficient electric furnace in use, as far as the economy of heat is concerned. It revolutionized the manufacture of bisulphide of carbon. The materials charged are sulphur and charcoal, and the product is a vapor which is subsequently condensed.

For the melting and refining of steel there seem to be at present nearly 100 arc furnaces in use, mostly in France and Germany, although the few in this country include the largest ones. They are chiefly the Heroult and the Girod types. They are mostly of about 300 to 800 kw., and are for charges of 2 to 5 tons; the largest ones are in South Chicago and Worcester, having a capacity of 15 tons and requiring about 2000 kw. There are also several ore-reduction arc furnaces in use and under construction on the Pacific Coast, and in Domnarfvet, Sweden, the latter producing 2500 tons per year and requiring 400 kw., or about 6500 lb. of pig iron per horse-power per year. In Norway two furnaces are under construction, each for 7500 tons annually, requiring 1850 kilowatts.

The Government of Sweden is about to make available 600,000 hp., a large part of which will be used for reducing iron. Electric-furnace reduction of iron is said to save about two-thirds of the carbon, only one ton of charcoal being used instead of three, per ton of iron. The escaping gas is three times richer, as it contains no nitrogen, and is only one-eighth in amount, hence correspondingly less heat is carried off by it. Finely powdered ore can be used without briquetting; there is less labor cost, and less cost of erection. There are 30 to 40 induction furnaces in operation, mostly in Germany. They are 200 to 500 kw.; maximum, 750. The charges are from 1½ to 5 tons; maximum, 8½ tons. In some cases the material is charged hot and in others cold. Among the pioneers to whom the present commercial furnaces are due may be mentioned Acheson, Taylor, Hall, Tone, Colby, Heroult, Girod, Keller, Kjellin, and Stassano.

The Human Factor in Accidents

By David S. Beyer

[*]A large percentage of our industrial accidents can be attributed to carelessness, indifference, willingness to take chances—the same fundamental human failings and shortcomings that are found in the office and the home as well as in the mill. Rudyard Kipling has recognized the universal nature of our human characteristics and expresses it in the following lines:

"Who shall doubt the secret hid
Under Cheops' pyramid
Is that the contractor did
Cheops out of several millions;
Or that Joseph's sudden rise
To Controller of Supplies
Was a fraud of monstrous size
On King Pharaoh's swart civilians."

I venture the further surmise that if we could dig up the tablets on which the accidents of that day were recorded, we would find that men were suffocated in the wheat bins of Egypt, just as they are in Chicago's grain elevators; and I do not doubt that if the wearing of safety goggles had been made compulsory among the stonemasons who built the pyramids, these goggles would often have been found on the foreheads instead of over the eyes they were intended to protect—just as I have seen them in a modern steel foundry.

With the development of the complex and powerful machinery which is used in our modern industries, we have added an additional and magnified element of risk that is lacking in the more simple and fundamental occupations. The man who hurriedly jostles against his neighbor in the street may do so with impunity, but it is a different matter when a steam-engine or an electric crane is substituted for the passer-by. In the steady, rythmical motion of a large machine one readily forgets the 1000 hp. of energy back of it, in comparison with which the human body is as insignificant as a pebble to the steam roller.

It is not strange that a man who has worked day after day for several years in a blast-furnace plant, without any inconvenience, should forget that the colorless, odorless gas which is present in greater or less degree at all times can deprive him of his senses, or even of his life, without any perceptible warning, if he happens to breathe too much of it. It takes a tragedy to bring this home to his consciousness, and even then the effect soon wears off.

I have in mind a plant where several men have died as a result of being overcome by gas. The most recent accident involved a man who had had several years' experience about the plant and knew of the former accidents. He was on duty in a motor-house near the gas washer. There were no gas mains or direct connections to the little building in which he was located, and the work was so light that one man could easily have taken care of it. As a special precaution, however, an extra man was always employed at night so that a single person would not be left alone where he might be overcome by gas without anyone knowing about it. One night the motors were shut down for a few hours, and these two men had some idle time on their hands. They locked the doors of their house on the inside so that they would not be disturbed, and one of them made a bed of waste back of the switchboard, lay down and went to sleep. The other one sat in a chair, but he, too, must have become drowsy and did not notice that the water had escaped from a valve outside the building and that gas was leaking in through openings in the walls. When the doors were broken open a short time after-

You may say that this is an extreme case—and so it is—but examples of similar short-sightedness are constantly coming to our attention, and I could multiply them indefi-

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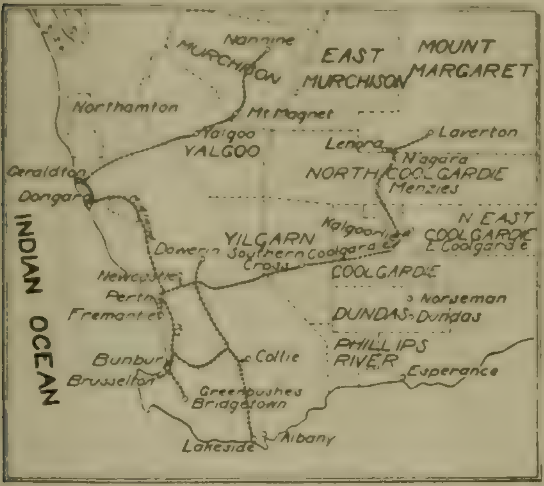
[*]A portion of a paper presented before the National Conference of Charities and Correction, Boston, June 13.

[illegible]. Frequently, as in this instance, it is the [illegible] who has to pay the penalty [illegible]. Fortunately the penalty is not often so severe as it was in the case I have described.

Scientific Prospecting

London Correspondence

An excellent example of scientific prospecting is to be found in the case of the Great Fingall gold mine, one of the Bewick Moreing group at Day Dawn, near Cue, Western Australia, not far from Mt Magnet (see map). For several years this mine gave wonderfully good results, but at a depth of 1200 ft the orebody became impoverished, though for three more levels the ore was good enough to mine. The engineers proceeded to do further prospecting at depth, and subsequently Malcolm Maclaren made a scientific examination. Prospecting was begun by sinking a winze from the thirteenth level in the foot-wall, the hanging wall being too crumbly. Just above the sixteenth level a wedge of white quartz began to appear, increasing in width until the winze was wholly within it. This white quartz was of no value. On opening out at the seventeenth level (at 2332 ft.) some dark quartz containing gold was cut on the hanging-wall side. It was 6 ft. wide, and rich. Then a drift was extended north and south, exposing similar dark quartz for a distance of 337 ft., with 14 dwt. ore in the north face. The winze is now being sunk below the eighteenth level (at 2492 ft.), where a drift has been started northward in ore.



SOUTHERN PART OF WESTERN AUSTRALIA.

This evidence does not indicate a new mine, as yet, but most assuredly it encourages further exploration and justifies the energetic policy of the management. According to Mr. Maclaren the Great Fingall vein is gold-bearing only where it crosses a dike of quartz-dolerite, which is 1200 ft. wide. This is a striking proof of the relation between ore deposition and petrography. Since the dike dips northwest, the ore-shoot pitches at an angle made by the crossing of the planes of the vein and the dike. This accords with observations in other regions. The Great Fingall vein carries two kinds of quartz, a dark variety, which owes its hue to "loss of light by total reflection from internal strain surfaces," and a white quartz of the ordinary type. The latter is younger than the former and was deposited during a renewal of the fracture marking the line of the present lode. More important is the fact that only the dark quartz is rich enough to constitute profitable ore; the white quartz is uniformly barren. The reappearance of the dark quartz is therefore significant. It reminds Mr. Maclaren of the conditions on the Champion Reef, in India, where the vein, after passing through a poor zone, became as rich at 4000 ft. as it was at the surface.

Copper for Casting

In copper for casting, certain properties are demanded, which a writer in the *Europäische Technische Korrespondenz* has given in detail. The metal is to be considered from the following standpoints: (1) Brand or source, (2) conductivity, (3) chemical composition, (4) form.

The brand has great weight in determining the value of the metal, as it gives the buyer a great deal of necessary information. In a good brand there is found, for example, a high degree of homogeneity. This is very important in a foundry where alloys are to be cast, as the 'mix' can be made according to the formula, without any anxiety as regards the result. A copper pig without any brand, or with one unknown in the foundry in question, might have the best qualities possible to obtain, and yet be less valuable than one of which definite knowledge was possessed. A good brand, however, will never risk the name of the refiner or the good qualities of the castings made from it.

The second quality, electric conductivity, might seem to one who was casting bearings or chandeliers, as of no importance; it is, however, because the greater the conductivity the purer the pig; and this is especially true in regard to arsenic. The following table shows very plainly the connection between conductivity and purity:

Percentage of arsenic.	Relative conductivity.
0.03	100
0.06	90
0.12	80
0.22	70
0.35	60
0.53	50
0.80	40

The impurities found in the pig are of two kinds—metallic and copper oxide. The latter may in one sense increase the conductivity, but at the expense of strength; the metallic impurities may increase the tensile strength in the hammered bar, but reduce the conductivity.

As regards the chemical analysis, the founder can be well satisfied if he gets 99.9% purity, even for the most particular alloys. The impurities are, for the most part, arsenic, antimony, iron, sulphur, bismuth, selenium, and tellurium.

Where the metal comes in pigs or bars partly joined to another, and which must be cut or broken apart, there is danger that the crucible will be damaged by the sharp or jagged ends resulting from the separation by cutting or breaking. Slabs and plates, on the other hand, must be cut into strips by shears, and this takes time and costs money; but the freight on slabs or plates is less than on the other forms. The founder 'pays his money and takes his choice.'

Reinforced Concrete Specifications

The investigation of the rusting of steel in concrete by the science committee of the Concrete Institute, has led to the following conclusions: The sand, stone, and cement must be thoroughly mixed and properly proportioned, and must be fairly wet and well hammered into place to minimize voids. The aggregate should pass a ¾-inch sieve and should be as non-porous as possible. The concrete covering should never be less than ¼ inch in thickness, and in the case of round bars, should be as thick as the diameter of the bar. In structures exposed to water or damp air, the thickness of the concrete should be increased at least 50%, and the size of the aggregate should be reduced to obtain a dense skin. The reinforcement must be completely surrounded by concrete, sufficient space being allowed between each piece and its neighbor for this purpose. All steel should be firmly supported during the ramming of the concrete to avoid displacement. Thick rust should be removed by scraping or by means of a steel wire brush, but the reinforcement must be neither oiled nor painted.

Discussion

Readers of the Mining and Scientific Press are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Threatened Rockslide in Crow's Nest District

The Editor:

Sir—The reference to the Crow's Nest Pass Coal Co., in connection with a threatened rockslide from Turtle mountain, as printed under the head of Special Correspondence, from Toronto, Canada, on page 87 of the *Mining and Scientific Press* of July 15, is incorrect and unfair to the company mentioned.

Turtle mountain is near Frank, Alberta, while the mines of the Crow's Nest Pass Coal Co. are all in British Columbia, at Michel, Coal creek, and Carbonado (Morrissey), respectively. The nearest of these places to Frank is Michel, about 27½ miles distant by rail. Even at half that distance in an air line, the nearest colliery of the Crow's Nest Pass Coal Co. is well without any danger line from threatened disaster across the Rocky Mountain divide between the provinces of British Columbia and Alberta.

E. Jacobs.

Victoria, B. C., July 19.

English as She is Writ—in Prospectuses

The Editor:

Sir—I am sending you a copy of a prospectus which I have just received, thinking it may be particularly interesting to you in connection with the discussion you have had in your paper, from time to time, regarding the relation of grammar and good English to technical writing.

R. S. Haseltine.

Oilfields, California, July 21.

[Some extracts from the prospectus follow.—Editor.]

"About one hundred and thirty feet above the Native Copper location is a strip of green grass over twenty feet wide that follows our ground the entire length. Below this contact is where all the float is found for a radius of a mile or two. Above the contact mentioned there is no float or stain. Now as there is plenty float in a small tunnel run in the hill in the slide, and away from the dreanery of the Native Copper claim but running in the direction of the contact mentioned besides finding shale and other indications at the said contact, it is our belief that there is a large contact at the above mentioned streak running through the mountain parallel with our ground, and farther, it may be and is probable that our main body of ore is at that contact. * * * If we can find what we have reasons to think we will find, there will be enough for all, and if we fail to find the ore as we think we will, it will not cripple anyone much. * * * In case we find that after we have prospected the ground to our satisfaction and find that in our opinion it is no good, we will protect our ground in all manner, and if there is any money left it is to be refunded to the stockholders per ratio as per their holdings of said stock. The elevation, about 3300 feet. Ore assays as per sack samples: Shipping ore 13.60 to 36.78 per cent copper. Gold, .82 per cent. Silver, one ounce and .20. Figuring copper at ten cents per pound which is less than market value, according to our assays our shipping ore is worth $24.60 to $70.20 per ton."

The Editor:

Sir—As many wonderful and great things come out of California, the following bit of light ought not to be hidden: "The 'country rock' so called, is not composed of a true granite but what is termed monzonyte. It consists of a mica-schist, spar quartzite and gneiss."

The 'report' went on to say that one vein carried from 9 to 58% tungstic oxide, another from 4 to 36% vanadium oxide; and "it has just been discovered that the ore carries thorium and selenium, and you, of course, know that these two minerals are in great demand." This gem was describing a silver mine, "some of the veins carry high values in silver, assaying 1000 oz. to the ton, * * * still others carry good values in lead, * * * and all carry a certain amount of gold" (a veritable embarrassment of riches). But as I have known of several 'mines' starting out, in their prospectuses, as silver-gold ones, and winding up as vanadium or tungsten properties, I was not convinced by this effusion (which calls to mind another—"a lacolithic dike of basic mud").

W. N. Cummings.

Tucson, Arizona, July 12.

Dredging Costs and Methods

The Editor:

Sir—I have been much interested in watching the dredging work in the Key Route basin in Oakland harbor, and thought that some of your readers might be familiar enough with the conditions of this or similar work in other places to give approximate working costs and details of operation. Is the method employed here one that has been proved satisfactory elsewhere, or are the contractors following new ideas? It seems to me that much of the mud lifted by the clam-shell buckets, to build the so-called retaining wall or dam must, as no bulkhead was first constructed, slide back into the excavation, also that considerable material must be lost from the sides and bottom of the buckets after they are lifted from the water and while the boom is being swung into proper dumping position.

Is the work paid for on the basis of cubic yards theoretically lifted by the buckets; estimating the yardage by the capacity of the buckets and keeping count of the buckets lifted, or are measurements made of the wall, and excavation? If the first method is employed, it would seem that a much greater quantity would be estimated as being in the dam than actually there. The rock brought in on barges and dumped on this mud wall to assist in strengthening the dam is, so far as I have seen, all small in size. For this purpose I would consider large pieces of rock and boulders far more efficacious; such as those used by the Southern Pacific when filling around their trestles and piers and by the Government when building the walls on either side of the estuary.

I understand that suction dredges will be used to fill in behind the dam, and would like to know the cost of such work; which varies, I suppose, according to distance the material is conveyed. Are dredges similar to those used in the Oroville and Folsom placer districts ever used in harbor work, and have suction dredges ever been successfully used in placer mining? Does the mud and sand in the Key Route basin carry an appreciable amount of gold? Some years ago it was claimed that the mud in parts of San Francisco bay carried as much as 25c. per cubic yard, but I believe investigation proved otherwise.

J. C.

San Francisco, July 21.

Most of the ground talc is used in the manufacture of paper of various kinds, especially building paper. It finds application also in the manufacture of molded rubber forms and as foundry facings and paints. It readily absorbs grease and is used to remove spots from silk and to bleach cotton goods. On account of its slipperiness, one of its most important properties, it is widely used to lessen friction, and for this purpose it is dusted into gloves and shoes and blown into conduits to ease the introduction of electric wires or other conductors. One of its widest applications is in toilet powders, most of which are made of high-grade talc imported from Europe. Laundry tubs, griddles, foot warmers, and many other similar utensils are manufactured from soapstone. The higher grades of massive talc, free from flaws, are sawed up to make pencils or crayons, french chalk, gas tips, and other special articles.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

TO COOL hot journals apply a dressing made of 11 lb. black lead, 23 lb. epsom salts, 9 lb. sulphur, 2 lb. lamp black, and 5 lb. oxalic acid, mixed and ground together.

A ROUND FILE that has become clogged with solder or white metal filings can be easily cleaned by saturating with ordinary machine oil and holding in a flame. The heat will melt the soft metal without injuring the temper of the file.

TIN can be recovered from scrap by any one of several processes, the sodium stannate process being the most successful. Clean tin scrap can be easily treated to recover its coating of the metal, but old rusty tin cans offer a good deal of difficulty. In this country the work is, in most cases, a minor industry of the large smelting companies.

A GLUE that resists the action of hot and cold water and the majority of the alkalis and acids is composed of three parts (by weight) of gum shellac and one part india rubber. Dissolve in separate vessels in ether (free from alcohol), applying a gentle heat. When both are entirely dissolved mix them and put them in a tightly corked bottle.

TUNGSTEN-ALLOYED iron or steel has great density of grain; only traces of oxygen and nitrogen have been discovered in its analysis. This accounts for its ductility and tensile strength. The addition of tungsten to iron and steel is the best preventive known for decomposition. Water-mains, gas-pipes, and steel structures containing as low as $\frac{1}{2}$% tungstic acid will resist electrical, chemical, and atmospheric influences.

PICTURES may be transferred for stereopticon use in lecturing by the following process. Dissolve 1 bar of common soap in 1 gal. of hot water, then add $\frac{1}{2}$ pt. turpentine. Let stand over night, stir well and bottle. Apply the solution to the picture with a small brush, lay the picture on the film or plate, then apply a clean cloth or paper to the back of the picture and rub with the bowl of a teaspoon, when the picture is instantly transferred.

CAST-IRON TANKS may be repaired by a cement composed of five parts of sulphur, two parts of black-lead, and two parts of sifted cast-iron filings, the whole melted at a slow heat, to prevent the sulphur catching fire. Before applying the cement, warm the metal by laying a red-hot iron over it. The metal must be perfectly dry, in order not to generate steam. Then stop up the damaged parts with cement, applied in a soft state by gently heating it in an iron ladle.

CHROMITE is a massive black mineral that resembles magnetite, but can be distinguished from it by the reactions which it gives for chromium before the blowpipe. An unscientific but useful means of recognition is that chromite commonly is associated with serpentine. This mineral is the source of the various chromium compounds used in calico printing, electric batteries, the chrome colors and pigments, and in the manufacture of chrome steel. In its raw state it is made into chromite fire-bricks, and finds a ready market.

TO QUICKLY cut threads on a long bar a tool made thus will prove useful. Swing a tap, with the desired number of threads per inch to be cut, between the lathe centres, and gear the latter to cut the same number of threads as on the tap. Start the lathe and feed the tool against the tap until the threads are cut to full depth in the tool. The tool should be wide enough to cover four or five threads, and after they are cut the leading threads should be filed off, leaving the last one a full thread. Harden and temper the tool as any other. In using the tool it should be held squarely against the shaft to be threaded. A full thread can be cut in two or three cuts, thus saving about three fourths of the time it usually requires to do the same work with an ordinary threading tool.

BARITE is a heavy white or light colored mineral having the composition $BaSO_4$. It may be distinguished from other light colored minerals by its high specific gravity, insolubility, and its green flame. It is frequently found in beds and veins with ores of antimony, copper, and lead, also as veins and masses in limestones. Most of the American production comes from North Carolina, Virginia, and Missouri. The white variety is ground and used as an adulterant for white lead and for weighting paper; the colored varieties are often cut into paper weights, vases, and other articles of use and adornment.

TOPOGRAPHIC MAPS of the United States are issued at frequent intervals by the United States Geological Survey. From 25,000 to 30,000 square miles in different parts of the United States are mapped each year by the Federal topographers, under R. B. Marshall, chief geographer. This mapping is done in the field, and the sheet shows every physical characteristic of the area surveyed, as well as all works of man. The contour lines which show the configuration of the country—the hills, slopes, valleys, and peaks—are printed in brown; the rivers, swamps, lakes, and other water features in blue; and the county lines and other political subdivisions, railroads, wagon-roads, houses, and other evidences of civilization are printed in black.

A BELT can be made endless when both pulleys over which it must pass are on shafting which is supported on pillow blocks, in the following manner. As it is necessary to join the ends of the belt in place, a belt clamp is generally used. Place each end of the belt in the clamps with a square, and screw down the nuts to prevent the clamps from slipping. In drawing the ends together stretch both sides equally so as to make a straight joint, and draw the belt taut. When partly tight, turn the pulleys to get the belt on the pulleys taut also. If the belt is too long, cut off the ends and prepare them as before. The best clamps for cementing are made of two pieces of 4 or 5-in. scantling, with a bolt through each end. Cement the width of the clamps. Slip the clamps over the part cemented and draw them down by the bolts in the ends, and let remain a few minutes. Cement as much more, moving the clamps over the new cement, as before. It is best to have the clamps crowned in the middle so as to make equal pressure across the joint. Apply the glue or cement hot, with a brush. If the proper cement is used, no rivets will be necessary.

ALL THE ammonium nitrate explosives are quite deliquescent, absorbing moisture from the atmosphere very readily, and great care should be exercised in storing them or using them in damp places. They are not suitable for use in wet mines. If an original package of an ammonium nitrate explosive is opened in such a mine and the cartridges are exposed for only a few hours to the damp atmosphere they will deteriorate; many of the failures to completely detonate can be attributed to this cause. The ammonium nitrate explosives when stored under favorable conditions for only a few months show signs of deterioration, and nearly all explosives of this class after six months storage at the Pittsburg testing station have failed to detonate, or detonated incompletely when re-tested. For this reason ammonium nitrate explosives should be obtained in as fresh condition as possible and should be used as soon as possible after their receipt. Ammonium nitrate explosives, when in a fresh condition, have the advantage of producing on detonation but small quantities of poisonous and inflammable gases and are especially recommended for mines that are not unusually wet and also in mines and working places that are not well ventilated.

Special Correspondence

LONDON

Wallis Properties in West Africa.—More Businesslike Methods.—Mining and Milling Methods at South Crofty, Cornwall.—New Methods of Work.

About a year ago I sent several paragraphs describing the activities of the Wallis Syndicate in West Africa. This syndicate owns the mineral rights of a large tract of country in West Africa near the source of the Pra river, and about 60 miles east of Obuasi and Kumassi. An extensive outcrop of auriferous conglomerate, containing large boulders, was discovered two years or more ago, and it was traced for many miles. The syndicate's shares were quoted at fabulous figures on the Stock Exchange, and financial assistance for development purposes was sought from various mining houses. The Consolidated Mines Selection Co., Ltd., after sending F. F. Sharpless to examine the property, bought a block of shares and guaranteed the issue of a further block. Work was subsequently commenced for the purpose of proving the deposits by means of seven shafts. The last report received was despatched on May 31, and it shows that the seven shafts have been sunk to depths of from 67 to 108 ft., and that 640 ft. of driving has been done. This work revealed a condition that was not suspected from surface indications: the lode was found to be much broken and faulted: so much so that no reliable estimate could be made of the amount or regularity of the gold content. As far as sampling could be done the lode was found to vary in width from 2½ to 11 ft., with assays from 3 to 30 dwt. Investigation has shown that the faulting is not great and the chances are that the disturbance is only local. Consequently it has been decided to sink two of the shafts farther in the hope of finding the vein intact. The work is now being done in a miner-like way, and the information given out is quite different from the secret and mysterious talk of untold riches that characterized the early operations.

Last week I referred to the reorganization of the board and management at the Carn Brea & Tincroft mine in Cornwall and expressed a belief that the new blood on the staff in the person of Edward S. King and H. Swan Edgar would work wonders. I have always written pessimistically about the condition into which Cornish mining has sunk, of the hand-to-mouth policy of the Cornish boards and engineers, and of the old-fashioned and out-of-date methods of finance and mining, but I have always noted the exceptions. This week the excellent progress at South Crofty must be recorded. This mine was worked for many years by Camborne people, until the financial partnership involved broke down and no more money could be provided by the owners. Five years ago the Allen-Meyerstein group in London took up the property and provided adequate working capital. Sixty modern stamps were built, modern concentrating tables were introduced, and magnetic separators provided for the separation of the tin and wolfram. The greatest credit must be given to Francis Allen, a London lawyer, who has been chairman of the company from the start. He has shown great enthusiasm and optimism, and though naturally not an expert in mining and metallurgy, he has the knack of finding out men who are, and of employing them on liberal terms. Other London people in a similar position to Mr. Allen have not displayed the same discretion, and have squandered money wholesale. The result is that South Crofty is now in a good position. During the last few months the high price of tin and wolfram has helped greatly, and at the same time the grade of the ore has improved. For the first six months of this year, 31,205 tons of ore yielded 341 tons of tin concentrate that sold for £38,882, 71 tons of wolfram concentrate that sold for £7513, and 410 tons of refined arsenic worth £3910. The value per long ton was therefore 32s. 2d. and the cost per ton, including expenditure on new plant and development and every other expense, was 21s. The board now makes it a practice to pay 1s. per £1 share every quarter and to put the rest to reserve. I wish to point out that the directors are pursuing a policy which is quite usual elsewhere, but is never adopted in Cornwall, even by the few sucessful and well managed mines. In Cornwall it seems to be the desire to rub along somehow, so low-grade ore is mined in times of high prices of metal, and high-grade ore (when obtainable) when the price falls, instead of mining good quality ore when the price is high and so providing the capital which is so much needed. The South Crofty directors are greatly to be commended in taking advantage of higher grade ore at times like the present, and so putting themselves in a position where they can afford to feel independent of the ups and downs of the metal market. Another excellent feature of the South Crofty management is that development is well ahead of the mill and that the engineer, Josiah Paull, can estimate his ore reserve as a three years supply. Such a thing as an estimate of the ore reserve is elsewhere practically unknown in Cornwall.

MEXICO

Santa Gertrudis Reduction Plant Operates.—Greene-Cananea Shows Increase.—Tigre Cyanide Plant Opened.—Taxco Railroad.—Many Labor Strikes.

The Santa Gertrudis company (Camp Bird) has marketed the first bullion from its new reduction plant in the Pachuca district, and soon the plant will be running at full capacity. Test runs have been in progress for a month. There are sixty 1550-lb. stamps, and it is expected that each stamp will average over 10 tons daily. The tube-mills number ten. The company has straightened and retimbered the old San Guillermo shaft of the Santa Gertrudis properties, equipping with a 300-hp. electric hoist, and all ore for the new mill is hoisted through this shaft, delivery being made by conveyor belt. With the new plant operating at capacity, Santa Gertrudis expects to earn about ₱250,000 monthly.

Greene-Cananea reports that the production cost of copper at Cananea now is slightly less than 9c. per pound. At the present price of copper, and the present production of Cananea, this cost means that Greene-Cananea is earning at the rate of 65c. per share. In June the company produced 3,462,000 lb. of copper, 102,606 oz. of silver, and 509 oz. of gold. The June production of the Moctezuma Copper Co. (Phelps-Dodge) was 2,071,060 lb. of copper. In the first six months of this year the Moctezuma produced 12,528,889 lb. of copper, as against 11,617,818 lb. in the corresponding period of 1910, and 11,914,690 in 1909.

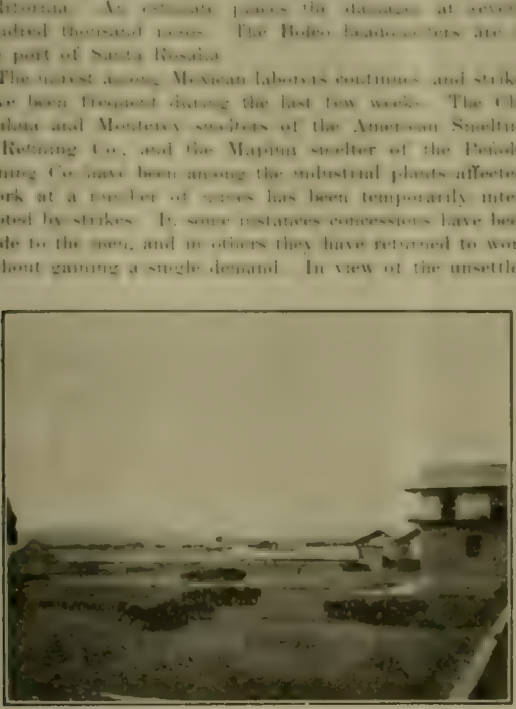
The transmission of power from the Copper Queen smelter at Douglas, Ariz., to the Tigre camp of the Lucky Tiger Gold Mining Co. in Sonora, a distance of 72 miles, has been commenced. The new 250-ton cyanide plant has been placed in commission, and the power is also operating the remodeled and enlarged crushing and concentrating plants. A big saving will result from the present power arrangement. Later, current will be furnished to other mining concerns in the Tigre camp.

The Chicago men who last year secured a concession to build a railroad connecting the Taxco district of Guerrero with the Balsas line of the National Railways have not abandoned the project, announcing that construction will be started shortly. F. E. Olendorf, a well-known mining man of the Taxco district, is representing them. The line will be 30 km. long, and will be of great benefit to the mining industry in that section of Guerrero. T. R. Marshall, general manager of the Taxco Mines of Mexico, Ltd., a British concern operating the old Rosario mines in the Taxco district, has left for London and Edinburgh, to complete arrangements for the erection of a large cyanide plant. The company has been carrying on extensive development work, and has had very satisfactory results.

In the State of Jalisco several companies that suspended operations last year are resuming. The Keystone Mining Co., of Shamokin, Pa., a reorganization of the Keystone Copper Smelter Co., organized by Philadelphia men several years ago to work copper-silver-gold [illegible] [illegible] [illegible] district, will [illegible] [illegible] [illegible] [illegible] [illegible] center. The new [illegible] will replace two old [illegible] now [illegible] the camp.

It is reported that the Boleo Copper Co., controlled by the Paris Rothschilds and one of the principal copper producers of Mexico, recently suffered heavy damages as a result of a hurricane that swept the east coast of Lower California. An estimate places the damage at several hundred thousand pesos. The Boleo headquarters are at the port of Santa Rosalia.

The unrest among Mexican laborers continues and strikes have been frequent during the last few weeks. The Chihuahua and Monterey smelters of the American Smelting & Refining Co., and the Mapimi smelter of the Peñoles Mining Co. have been among the industrial plants affected. Work at a number of mines has been temporarily interrupted by strikes. In some instances concessions have been made to the men, and in others they have returned to work without gaining a single demand. In view of the unsettled labor conditions, the Guggenheim interests have curtailed operations in several States, pending improvement. The earnings of the National Railways for the month of June show a decrease of ₱731,071, compared with June of last year. The earnings of the merger system for the fiscal year ended June 30, were ₱61,806,288, an increase of ₱323,141 compared with the preceding fiscal year. The big earnings of the first six months of the last fiscal year offset the big decreases of the last six months.



SANTA GERTRUDIS PATIO, PACHUCA.

According to New York reports, the sale of the Pearson oil interests to the Texas Oil Co., headed by John W. Gates, has been practically arranged. However, Lord Cowdray, head of the Pearson interests, who has been conferring with officials of the Texas company in New York, has issued a denial. It is rumored that the Maderos would oppose a transfer of the Pearson concessions as they stand, but there is no confirmation of this. The Magnolia Oil Co., of Texas, a new concern that combines the holdings of the Securities Oil Co. and the Gulf Refining Co. in that State, is reported to have entered into a contract with the Huasteca Petroleum Co., a Doheny concern, for the purchase of Mexican crude oil for refining in Texas.

GOLDFIELD, NEVADA

Development Work Active at Douglass.—Goldfield Con. M. Co.'s Post-Dividend Balance Largest in History.—High-Grade Ore Held in Reserve.

In Mineral county, 7 mi. west of Sodaville, Douglass is reviving in activity owing to discoveries made on the Tennessee group, purchased recently by G. C. Webb, a mining engineer and metallurgist from South Africa. At the upper end of the group a shaft had exposed ore that panned freely, but the new work farther down the hill, where a shaft has been started, has exposed 6 to 7 ft. of high-grade ore assaying from $75 to $2500 per ton with many assays from $[illegible] to $[illegible]. The ore is a light porphyritic substance, closely filled with seams of highly oxidized quartz, and, while little gold is visible, excellent pannings are obtained from samples taken across the vein and from the dump. At other points along the vein surface cuts have exposed rich ore. The veins are within dikes of blue andesite and andesitic breccia, cropping boldly, and the walls are as uniform as if built of masonry, indicating, throughout the district, but rare instances of fault displacement. The camp has a record of $600,000 production in the nineties, but was nearly depopulated and work almost entirely suspended by the rush of many inhabitants to the camps of Goldfield and Tonopah. It is reported that work will be resumed on the Douglass holdings. Mr. Webb has taken a lease on the Stewart 5-stamp mill at Sodaville. The Davenport, Oriole, Little Chief, and Wheeling Gold Range companies, the last named having copper instead of gold and being over the ridge to the south, are all developing. Excavations are completed and part of the equipment is on the ground for another 5-stamp mill to be in operation within 90 days, and the camp has an ample supply of good water. It was the only gold-producing camp at the time of the discovery of Goldfield and is apparently destined to become an important factor in the production of gold in this State.

In the final report of operations of the Consolidated Mines Co. in June the general superintendent, J. F. Thorn, shows that the month's total production was 28,540 tons, containing $923,472.87, or an average of $32.36 per ton, of which the whole was milled with an average extraction of $30.63 per ton, or 94.64%. The total net profit to the company was $646,830.48, or $22.67 per ton. Development work for the month amounted to 4376 ft. Operating costs were: Mining (development $1.04 and stoping $2.37) total, $3.41; transportation, $0.10; milling, $2.19; marketing, $1.15; general expense, $0.68; bullion tax, $0.38; construction, $0.15; total cost of operation, $8.06. Regarding conditions at the mines, the report says:

"Combination Mine.—The orebody just west of the 136-ft. stope was extended considerably and yielded a large tonnage of 2 to 3-oz. ore. We have also cut a very promising looking quartz mass nearly vertically under this orebody on the third level.

Mohawk Mine.—In this mine the 354-sill floor was considerably extended and produced 1068 tons of $19 ore.

Clermont.—The sill floor of the 413 intermediate, between the 600 and 750-ft. levels, was considerably extended, and produced 1413 tons of $60 ore. What is probably the downward extension of the 354-ft. orebody was cut from the 306 drift, about 500 ft. northwest of the Clermont shaft. Not enough work has been done, however, to prove the extent of this orebody.

Red Top.—The 403 sill was extended along the hanging wall and produced 250 tons of $40 ore. On the third level, 100 ft. north of the main cross-cut from the shaft, 260 tons of new ore worth $15 per ton was mined.

We are installing a 50-hp. electric hoist on the Jumbo shaft, which should be in operation within ten days. Recent sampling indicates a large tonnage of $20 to $30 ore remaining in this property."

The Jumbo workings will give the Consolidated seven producing shafts, the Combination, Mohawk, Clermont, Red Top, Grizzly Bear, Laguna, and Jumbo. Checks are being mailed for dividend No. 12, to reach all stockholders on July 31. This is the sixth consecutive quarterly dividend at the rate of 50c. per share, amounting to $1,779,574, and brings the dividend payments of the company to a total of $16,366,609. After the dividend is paid the company will have a cash balance of approximately $1,985,000, the largest post-dividend balance in its history. After the last dividend the balance was something over $1,640,000, and net earnings for the calendar quarter ended June 30 were about $2,120,000, or over $340,000 above dividend requirements. It is said upon good authority that there is a large tonnage of high-grade ore blocked in the mines and which is being held for the purpose of sweetening the leaner ore as it may be required.

BLACK HILLS, SOUTH DAKOTA

Tinton Properties Active.—Mogul Employees Plan Original Research.—New Mark in Gold Production.—Record Silver Shipment to Mint.

A small crew of men is employed at the Tinton property, in western Lawrence county, developing the orebody. The company hopes to start its tin mill at an early date. At the Ruby property, near Tinton, the shaft is being sunk to quartzite, which diamond-drilling has disclosed at a depth of 325 ft. D. N. Huff, of Spearfish, is manager. At the sale of the Hidden Fortune property, held by Kirk G. Phillips, receiver, the ground and personal property of the company, including a 40-stamp cyanide mill, was sold to the creditors for $46,000.

Employees of the Mogul Mining Co. have formed the Mogul Research Society, and will undertake cyanide tests along lines pertinent to Black Hills practice. A well equipped laboratory has been fitted up. Monthly meetings will be held. At the first meeting, held in July, the most important topic was a discussion of Mr. Chase's article on the Liberty Bell mill, which appeared in the *Mining and Scientific Press* of June 24. From the program tentatively adopted for the coming winter's work, some interesting papers and discussion will be had.

According to the figures given out by the United States assay office at Deadwood, the office during the quarter ended June 30 purchased gold bullion of a gross value of $1,889,000. This was the largest business ever transacted by the office, and indicates the general prosperity of the district. This production was made almost entirely by the Homestake, Lundberg, Dorr & Wilson, Golden Reward, Mogul, and Wasp No. 2. With a number of mills starting, it is expected that the production will be larger for the next quarter and that without a doubt the calendar year will show the largest output ever made by the district. An order to increase the 'assaying and stamping' charge which is imposed on bullion deposited at this office was postponed, to take effect from August 1 to January 1. The increase of this charge would have driven a large amount of the bullion produced in the district to be shipped direct to the Denver Mint. This would be cheaper for the producers, but their returns would be delayed. R. J. Gamble, Senator from South Dakota, was instrumental in securing the postponement of the date of effect of the charges, and hopes to have the order cancelled after the matter is thoroughly discussed. On July 1 the assay office sent off to the Denver Mint the largest shipment of bullion ever made from the district. It comprised over half a ton of bullion and had a value of close to half a million dollars.

The Columbia mine, at Keystone, has just completed a test run in the Tykoon 10-stamp mill. The plant is antiquated and not equipped for a close saving of the ore, but the results are satisfactory. The run was made at the instance of probable purchasers. An option on the Golden Slipper mine, at Hill City, has been obtained by prospective purchasers, who are making an examination. The last milling tests made showed that while a large portion of the ore contained in free gold, a considerable saving could be made by installation of concentration and cyanide equipment. The Forest City, adjoining the Golden Slipper, has been bonded by Salt Lake people, at a purchase price of $30,000, of which one-tenth is payable immediately. The shaft is 63 ft. deep, showing from 1 to 4 ft. of high-grade free-milling ore; it is described as one of the best-looking prospects in the district. The annual report of the Mogul Mining Co. for its fiscal year ended March 31 shows that the bullion returns from 114,873 tons of ore milled were $376,121.29. Milling was accomplished for $1.1026, according to John V. N. Dorr, consulting engineer, and a recovery of 76.5% of the gold and 35% of the silver made. However, the silver is of minor importance. With the tube-mill, which is now in operation, a higher saving is expected. W. L. McLaughlin, general manager, says: "We have opened up at the different mines probably more ore than we ever had, and at the present time the grade is better than it has been for a long time and promises to continue so. At the Farm the most promising development which we have is on the new Sunnysides, where we have a large body of ore which is of better grade than anything we have had for several years." The mine was shut down at the beginning of the fiscal year, owing to labor troubles, and did not get to running smoothly until July or August, and even then some trouble was experienced. Edward Manion, mine superintendent, in his report says, concerning the labor situation: "The class of employees which we have at the present time is better than it was when we were employing union labor, and everything is working smoothly and satisfactorily." The outlook for the present fiscal year is excellent.

PRINCE WILLIAM SOUND, ALASKA

New Copper Mines to Ship Soon.—Gold and Copper in Interior.—Two-Hundred-Stamp Mill at McKinley Lake.

Two new copper mines are to be opened this year on Prince William sound, already with its present two shippers the heaviest mineral producing district, by tonnage, in Alaska. It is believed by some that within a short time Prince William sound will ship regularly 60,000 tons of ore per year. Two steel freight steamships have been placed in service for Prince William sound. To the production of the mines mentioned will be added the output of the Bonanza mine, which is shipped from Cordova, the port of the sound. The Bonanza, at Kennicott, the Beatson Bonanza, on Latouche island, and the Ellamar M. Co. at Ellamar, the three large shippers, judging from the ore now blocked out, and the estimated amount for future working, probably will remain regular shippers for a long time.

The Bonanza ore is of extraordinarily high grade, previous shipments having assayed from 60 to 74% copper. A large amount of machinery is being installed, and by fall it is believed the Bonanza will have trebled its present output. Ellamar and Beatson ores are low grade, as are Sound ores generally. The two mines expected to become regular shippers during the summer are the Dickey, on Landlock bay, and the Fidalgo Bay Copper Co. The Latouche Ltd. M. Co., by J. A. Murphy, is developing a property on the east side of Latouche island, and Francis A. Hancock, in charge of the Reynolds mine, is developing property three miles north of the Beatson mine. F. Hodges, of W. A. Hodges & Sons, Salt Lake, and W. T. and F. H. Oster, have opened an assay office at Cordova. New rich gold and copper discoveries have been made by men sent into the interior from Cordova by the United States M. S. & R. Co., the London Exploration Co., and the Pierson Syndicate. Individual prospectors have bonded their properties without trouble.

The Mother Lode property, which joins the Bonanza on the other side of the mountain, is now being examined, and it is expected that this property will be worked, beginning this fall. Samples of ore have run as high as 70% and there seems to be an immense quantity above 50%. The Copper River & Northwestern railway has completed a survey from Mile Post 192 to the Mother Lode property, and four miles out on this new survey still another spur has been run to cross the range and enter the White River country, where good quartz outcrops are reported. In the event of these two districts, the White River country and the Mother Lode district, warranting action, the railroad will be built. Henry Bratnober, who represents the London Exploration Co., officially announces that if development on the McKinley Lake property justifies it, a 200-stamp mill will be erected. Kenneth Kerr, agent, the Alaska Steamship Co., recently returned to Seattle, taking with him 4000 lb. of samples of copper ore from the famous Bonanza mine. One of the samples weighs 1500 lb. and is a splendid specimen. These samples will be sent to the New York Land & Irrigation Exposition, to be held at Madison Square Garden in November, and will form part of a general exhibit which Alaska will make at this exposition. Agents are now going through Alaska gathering mining and general exhibits.

NEW YORK

British Interests in Porcupine.—Cobalt Mergers.—New Issue by the Camp Bird.—Ratification of Leroy Sale.—Increase in Calumet & Hecla Surplus.

Aside from the appalling loss of life, the recent fire in the Porcupine district is now looked upon as a real benefit. The destruction of the muskeg, the consequent exposure of the quartz outcrops, the doing away with the breeding places of the black flies, are real helps for the pioneers. Owners of undeveloped claims not within the fire zone are unanimous in regretting that the flames did not reach them, and so save them a large part of the future work of trenching and clearing. At the moment steamship lines are profiting very largely by the Porcupine situation. English capital has had a much more extended education in low-grade gold mining than has the investor on this side. As a result, many Americans are going abroad with investments at present, and it is said that many British engineers are going back and forth, and that the interest in London is increasing. The Kerr Lake interests have taken over some Porcupine properties and have organized the American Goldfields, Ltd. Edward Steindler, president of the Kerr Lake, is also president of the new company. An early merger of the Beaver Con. and the Temiskaming M. Co. of Cobalt is expected. Both properties now pay small dividends.

Cable advices state that the £500,000 of debentures, issued by the Camp Bird, Ltd., at the time of the purchase of the Santa Gertrudis, are to be retired by a new stock issue of 750,000 shares, £1 par, of 7% preferred stock. Of this 100,000 shares is to be retained in the treasury and 650,000 shares sold, the proceeds to be used in taking up the debentures outstanding. The Tomboy Mining Co. has just issued a statement regarding the negotiations now on foot with the Revenue Virginius for the acquisition of the latter property. The sale of the Leroy mine to the Consolidated Mining & Smelting Co. of Canada, made by the liquidators of the former company for the sum of $250,000, has been unanimously ratified by the shareholders. Ohio Copper seems left almost wholly friendless. A large block of the bonds sold recently at auction at $20, and 10,000 shares of stock were disposed of at auction one day this week for $1.75 per share. The stock was said to have been bought in by a Guggenheim representative, and there is some talk of a possible Guggenheim absorption of the property.

Notwithstanding that the past year has not been generally any too prosperous for copper producers, the Calumet & Hecla annual report shows an increased disbursement in dividends and an increase in the surplus carried forward. During the calendar year of 1910 dividends paid were $2,900,000, as compared with $2,700,000 paid during the previous twelve months. Profit and loss surplus was $8,576,856, as compared with $7,667,298 for 1909. The total dividend record of the Calumet & Hecla now totals $113,450,000.

In view of growing importance of the porphyries, the items of tonnage and copper costs in the Lake region are of greater interest than those of dollars and cents. On the Conglomerate lode, the scene of the most important operations, the company stoped 1,950,040 tons at a mine cost of $2.13 per ton. The tonnage handled is practically the same as that for the two years preceding. The copper produced was 58,739,509 lb., being in round numbers 8,000,000 lb. less than the year previous and 12,000,000 lb. less than 1908. Copper costs were 8.55c. per pound, against 7.77 in 1909, and 8.38 in 1908. On the Osceola lode there was produced 13,150,427 lb. of copper at a cost of 10.53c. per pound. On the Conglomerate the ore ran 30.12 lb. of copper per ton, the ore-value steadily declining. On the Osceola lode the ore showed 15.82 lb. per ton. The constant problem of the Calumet & Hecla is to win an undiminished return from rock which as constantly decreases in copper content. The very devices used and the progress made in handling large tonnages at a minimum of cost have in a great measure made available the low-grade milling coppers that for the time being are in command of the copper situation.

The British Columbia smelter is operating despite the coal miners' strike at Crows Nest Pass. Coke from the Pittsburg ovens is being shipped in to the Granby and the Consolidated Mining & Smelting Co, as well as the British Columbia. The latter is handling about 2000 tons per day, of which about one third is taken from the New Dominion.

TORONTO, CANADA

Substantial Reconstruction for Flame Swept Porcupine.—Losses Overestimated.—Value of Cobalt Ore Shipments Greater Than Last Year.—Large Dividends Paid.

The work of reconstruction after the Porcupine fire is being rapidly pushed, and the primitive structures swept away by the flames are being replaced largely by buildings of a more substantial character. As usual in such cases the first reports as to the loss of life and property by the catastrophe were greatly exaggerated. The actual number of known deaths to date is 67, and the extent of territory ravaged by the fire, according to official information, is about 10 miles square, comprising about two-thirds of the townships of Whitney and Tisdale, in which most of the larger mining properties are situated. The fire which destroyed Cochrane, 30 miles distant from Porcupine, had no connection with the greater disaster. The destruction of stakes on claims swept by the fire is likely to result in much trouble and confusion, as it will be difficult to identify many of the properties. On the other hand, a great stimulus will be given to prospecting by the removal of the vegetation and overburden and the exposure of the rock.

The West Dome will at once proceed with the erection of fireproof buildings of steel and concrete. John B. Cleveland, of Prescott, Arizona, has been appointed manager in place of Robert A. Weiss, who lost his life in the fire. The temporary working plant of the Vipond, which was destroyed, will be replaced as soon as possible by the permanent equipment for which estimates had been made before the fire. The Preston East Dome saved the greater part of its milling machinery, and its principal loss will be a month's delay in operations. The United Porcupine will rebuild at once and continue operations on a larger scale. At the Dome the fire which destroyed the buildings and plant, exposed bodies of quartz and schist which are regarded as adding materially to the available orebody. A new vein which has been found on low ground is regarded as equal to any on the property. The loss by the Dome Extension was small and work is being resumed. A new shaft is going down on an orebody about 100 ft. wide some 600 ft. from the main shaft. The Rea was not reached by the fire. The main shaft is down below the 118-ft. level and good ore is being taken out. At the Foley-O'Brien work was not interfered with. The big vein has widened to 55 ft. at the 160-ft. level. Ten more stamps have been ordered for the Hollinger, bringing the number up to 40. Four tube-mills will be installed, which it is calculated will increase the crushing capacity to 350 or 400 tons per day. The vein recently picked up in the northeast section of the main claim is being proved by a raise.

The half-yearly report of Arthur A. Cole, mining engineer for the Temiskaming & Northern Ontario Railway Commission, gives the shipments of ore from Cobalt for the six months ended in June as 11,978 tons, as compared with 14,868 tons for the corresponding six months of last year. The report states that the falling off in shipments must not be taken to indicate a decrease in production. The fact that higher-grade ore on the average has been shipped and that considerable bullion has been sent out, will bring the total valuation above that of last year.

A geological survey report just issued on the Big Horn coal basin, in Alberta, estimates that there are 6,600,000,000 long tons of coal, in an area of about 187 square miles, that are workable. The Big Horn basin is about 85 miles northwest of Banff, 140 miles southwest of Edmonton, and 70 miles south of the surveyed routes of the Grand Trunk Pacific and Canadian Northern Railway routes.

General Mining News

ALASKA

Of the $10,273,000 in gold received by the assay office at Seattle during the year ended June 20, $8,922,000 was sent from Alaska. This amount was in addition to shipments of gold sent by several of the largest corporations direct to San Francisco for smelting. The latter shipments in some instances were the total output of the mills.

Installation of power plants by two independent power companies, states S. R. Guggenheim, has afforded facilities for dredging earlier and later, lengthening the season a month. Last year the Guggenheim dredges were closed November 5, against October 1 in 1909. This year the first dredge commenced operation May 4, against May 22 the previous season.

The Copper River & Northwestern railroad is planning to equip its engines to burn oil, and a contract for a supply from California fields has been arranged. It also is probable that many of the mining properties will use oil for fuel. The Alaska Northern railroad, operating from Seward to interior points, has imported a gasoline motor car for passenger service and will use imported coal for only heavy freight.

The new placer discovery on Nansen creek is reported to be the best in Yukon for several years. The average yield is reported 2 cents per pan.

Juneau District

(Special Correspondence.)—In the contest between the Ebners and Alaska-Juneau companies over disputed ground, the court decided that neither had made a valid discovery and that therefore the ground was still in the public domain. The Alaska-Juneau, having made an appropriation of the water, was allowed to retain it, thereby winning a substantial victory.

Juneau, July 10.

Prince of Wales Island

(Special Correspondence.)—The sale of the Mt. Andrew mine on Prince of Wales island to the U. S. S. R. & M. Co. failed to go through, owing to differences as to price, though the examination showed the presence of a good body of valuable ore.

Cordova, July 11.

Valdez District

(Special Correspondence.)—James M. Hall has taken a bond on the Cogeshall group of claims at the head of Mineral creek. The purchase price is stated to have been $50,000, with the first payment of $2500 due January 1, 1912. A party of Chicago men, including George B. Harris, Samuel Scotten, J. G. Snydaker, G. W. Buckley, and Fred H. Weaver, have been visiting B. F. Millard and examining the properties in which they are interested with him.

Valdez, July 12.

ARIZONA

The value of the output of the mines of Arizona for 1910 was less than that for 1909 by $717,462.63, according to official reports recently filed with the territorial auditor.

Yavapai County

(Special Correspondence.)—Messrs. Griffin and Filmore, California oil experts, have gone to San Francisco for drills for claims in the Verde valley. Prescott residents have located claims all around the proposed drilling spots.

The A. T. & S. F. R. R. Co. is securing the rights of way for a standard-gauge road to supplant the United Verde narrow-gauge railroad. It will reach the United Verde property nearly 1000 ft. lower than the town of Jerome. The line later may be extended to Humboldt, by way of the Cherry Creek mining district. Much placer gold is being saved from small creeks started by recent heavy rains.

Prescott, July 22.

CALIFORNIA

The oil production of California during June, according to Bakersfield reports, was 6,526,661 bbl., with a daily average of 217,555 bbl. The San Joaquin valley yield was 4,949,805 bbl., against 5,083,116, although the daily average was slightly higher than for May. The southern fields produced 986,331 bbl. and the coast fields 590,525 barrels.

The Standard Oil Co. has bought in fee all of Sec. 3 and 4, 27-21, in the Lost Hills, according to report.

Butte County

(Special Correspondence.)—William C. Ralston, Assistant United States Treasurer, has been at Forbestown to let contracts on the Burlington mine for tunnel work in 100-ft. drifts. The mine is being blocked out by tunnel, drifts, and shaft to figure on an increase in the capacity of mill already planned. The company may erect a 100-ton stamp-mill this season if developments continue as encouraging as present assays show. Recent assays give the 3-ft. vein an average of $10 which will be the means of deciding for the company the erection of a 300-ton stamp-mill in the spring.

Forbestown, July 16.

Inyo County

The 12-stamp Merrall mill at the Tuba Canyon mine will be running in 30 days. The mill, capacity 50 tons per day, and cyanide plant, capacity 50 tons, are set up, and water is being piped. The vein averages 4 ft. wide. The ore averages $15 on the plates, according to report, and $6 cyanide. C. H. Brown is superintendent.

W. C. Price, an oil man of Los Angeles, is opening up the Wild Rose mine, formerly a Harrisburg property.

Mariposa County

(Special Correspondence.)—Another ore-shoot has been opened in the Bondurant mine in Coulterville on the 150 and 200-ft. levels. A dike which cut the vein at this working was driven through, and Mr. Gerkin, superintendent for the present company, was greeted with a glitter of specimen ore. The best ore is being sacked and the balance is put through the 10-stamp mill. Two 10-ton Pierce amalgamators have been installed after the plates. Two Union concentrators were placed early in the month. About 20 men are employed in the mine.

During the past week about 25 millwrights and carpenters have arrived, to work on the new mill at the Oro Rico mine. The frame timbers are on the ground, and the lighter parts of the mill have been hauled from Pleasant Valley. A pipe-line is being laid from Black creek.

Friction among the stockholders which was the cause of the temporary suspension of work at the Crown Lead Mines last winter, has been settled and work resumed on lines of development. Mr. Ireland is the new manager, with William Webb as foreman in charge of a force of ten men.

The machinery formerly in use at the Champion mine is being hauled to the Bluejay mine, and the outlook is very encouraging, according to statements made by Al. Sturzinger, superintendent in charge.

Coulterville, July 22.

Nevada County

(Special Correspondence.)—The 32-ft. rise from the 600-ft. adit at the Snowden Hill gravel mine has exposed the channel. Samples of ore show gold in commercial quantities. A drift is being driven at the rate of 12 ft. per week, shortage of water-power greatly handicapping the work. The property is controlled by Boston people. J. B. Martin is president. The Blue Lead, Bonanza, Eureka Lake, and Waukeesha gravel properties at Relief Hill, near North Bloomfield, have been merged under one management. A company is being formed to work the properties. W. F. Englebright and J. Oscar Jones, manager of the Blue Lead, are moving spirits in the new concern. The holdings comprise 1400 acres of land, with approximately two miles of gravel channels. The properties are located on the Big Blue Lead, the most famous gravel deposits in this section of California. It is reported that the deal involved $100,000. The ditches are being repaired and it is announced that development will be pushed. The gravel deposit of the Central Consolidated, on Banner hill, is reported to be showing good values. The mill is operating steadily on low-grade quartz. A 3-ft. vein has been found at the Sleeping Beauty, Moore's Flat district. The ore carries ribbon quartz and arsenical sulphide, but no assays have been made as yet. The property is controlled by San Francisco capitalists. Walter Muller is president. An improvement in the gravel channel is reported from the Posey Canyon, at Grass Valley. Gravel mining is attracting renewed attention throughout the county, several properties that have lain idle for years recently receiving attention.

Nevada City, July 22.

Plumas County

(Special Correspondence.)—Work at the Bushman placer mine is being rushed to open an old channel. H. C. Adams is in charge. The 10-stamp mill at Twain, operated by the same management, is milling some good ore taken from the Adams mine at that place. The quartz vein is about 3 ft. and is being blocked out with a view to enlarging the mill.

Twain, July 27.

Shasta County

(Special Correspondence.)—The Noble Electric Steel Co. is completing arrangements for the resumption of electric iron smelting at Heroult. Local and San Francisco foundrymen pronounce the Heroult product of exceedingly high quality. The Delta Consolidated Gold Mining Co. has completed a 550-ft. spur track from the shaft to the railroad and is about to commence shipping ore to the Mammoth smelter. The company has dispensed with ore-bunkers, loading the ore in cars direct from the shaft, and plans to ship custom ore from other small mines in the Dog Creek district. A 4-ft. vein assaying $15 per ton has been found in the Scottish Chief at a depth of 160 ft. The property is situated near Redding. Mat Vandiline is manager.

GENERAL VIEW OF BALAKLALA SMELTER.

The Balaklala Copper Co. has recently suspended all work at Coram. Fully 2500 people are more or less affected by the closing of the big plant. In their mad haste to prove their power over the smelter operators, the local farmers have killed a profitable market for their products.

Redding, July 24.

COLORADO

Denver County

Mining men here have suggested the use of the large testing plant under construction at the Colorado School of Mines, Golden, for experimental work by the U. S. Bureau of Mines. A $40,000 appropriation is available for investigations to reduce costs of metal production and make profit from deposits not now worked. Other suggested sites are Silverton, Denver, Pueblo, or some other mining school.

The Denver Chamber of Commerce is planning to organize a $2,000,000 company for the development of mining prospects in Colorado. The control of the company, which will be known as The Grubstake & Development Co., will remain with the Chamber of Commerce, which is to control 1,010,000 of the 2,000,000 shares. The other shares will be sold to the public at not less than par, as preferred. Ten per cent of the earnings will go to the common stock, with 90% available for dividends on the preferred. Recently a $10,000 fund for providing grubstakes was raised by popular subscription.

The North American company's Golden smelter is handling more ore than at any previous time under the present ownership. The ore is principally from Clear Creek, Gilpin, and Boulder counties. The policy of acquiring more property to insure a continuous supply of ore is followed.

Douglas County

The source of the gold in Cherry creek is believed to have been discovered, says a report from Newlins gulch, in an 8-ft. wide dike a short distance above the old diggings. No placer gold has been found above the dike.

San Juan County

Silverton is to have a reduction plant that will put profit into the zinc of the mixed sulphide ores. Arrangements for the construction of the mill have been completed. The Huff electrostatic separator will be used.

Lake County

Development at depth in the Sugar Loaf section of the Leadville district indicated the coming transformation of the region into a great copper camp. Placer mining for gold was the first activity in Leadville. Then followed the discovery of immense silver-bearing lead-carbonate deposits in blanket formations. Later some of the mines became producers of high-grade gold ore. Of recent years the production of zinc sulphide ores has been an important industry, and only last year large deposits of zinc carbonates that had previously escaped detection were found and have added largely to the yearly output of the district. Within the last few years also exploration has disclosed huge ore-shoots in fissure veins that extend through the overlying limestone and quartzite down into the granite. Two years ago, J. D. Irving, then with the U. S. Geological Survey, was quoted as saying: "The Sugar Loaf section will be a second Butte when you have attained the depth. The formation is exactly the same, and if you should put a Butte man into one of the Sugar Loaf properties without letting him know where he was, he would say he was in Butte." Ore running from 3 to 8% in copper is now taken from Sugar Loaf mines, and mining men here believe that in a few years Leadville will be a great copper camp, the first in Colorado.

Ouray County

A vein 4 ft. in width averaging $24 per ton in gold is reported in the tunnel driven by the Angel M. Co., which owns 3000 ft. on the Bimetallist vein and 4500 ft. on the Lloyd vein. The ore was found at the intersection of the two veins. This property, as well as the Virginius, the Camp Bird, and the Atlas, is in the Sneffels district of Ouray county. In the Red Mountain district on the Indiana group, owned by T. B. Crawford of Denver, a 5-ft. orebody 250 ft. in length has been opened, and a large production is assured. The Wanakah company, which has been making a regular production from the Bright Diamond and adjoining claims near Ouray, has bought the Orient group on Cascade mountain, and is planning systematic development.

Teller County

A regular quarterly dividend of 3c. per share has been declared on all outstanding stock of the Vindicator Con. Gold M. Co. of Independence.

IDAHO

Idaho County

Washing gold on the Hydraulic Placer Co.'s ground on Salmon river, 15 mi. below the junction with Snake river, will begin in August. There is an unlimited supply of water, and the giants will be under 65 lb. pressure.

Owyhee County

Ore assaying $59 per ton, asserts the *Owyhee Nugget*, was discovered on Cuddy mountain by Thomas Towell when he was digging an irrigating ditch. The vein has been traced over 1000 ft., and three men are at work.

Shoshone County

The lower adit on the Copper King M. Co. property at Mullan, now at 808 ft., will be completed. An ore-bearing stratum has been developed, but it is not considered a true fissure vein. An assessment of 1c. per share has been levied.

Directors of the Jack Waite mine in the Coeur d'Alene have decided to drive a new 2000-ft. tunnel to gain a depth of 1000 ft. Work has been started on a new compressor. Fritz Marchante, of Spokane, is president of the company, succeeding Patrick Burke.

The management of the Hypotheek mine near Wallace, reports that the building for the 20-ton mill will be completed the middle of August.

Active work will be started on the Coeur d'Alene-Mastodon mine as soon as supplies and equipment can be assembled there, according to J. H. Lever, manager of the property. A crew of five men and a pack-train of supplies have been sent forward.

MICHIGAN

Marquette County

The local committee on the Menominee range has selected Tuesday, Wednesday, and Thursday, August 22, 23, and 24, as the dates for holding the sixteenth annual meeting of the Lake Superior Mining Institute, and the council has voted in favor of this. Arrangements are now under way for the entertainment of members, and circulars will be issued containing the itinerary of the trip, together with a list of papers to be read, also any excursion features which may be decided upon.

MISSOURI

Jasper County

The American Zinc, Lead & Smelting Co. is reported to have leased 110 acres southeast of the Eastern Lead & Zinc Co.'s development work.

The Sitting Bull mine at Thoms station is reported to have turned out recently 142,800 lb. of zincblende in 9 hr., or two 70,000-lb. cars of concentrate.

A rich discovery of zinc and lead ore on the Alamo property is reported by T. C. Clary and Edward Sparrow, who hold a lease on a portion of it.

Phelps County

J. A. Holmes, recently here en route to Alaska, before the Missouri School of Mines advocated a combination of "persons or capital or holdings or mineral properties for operative purposes" in the coal business. The elimination of the middleman through the organization of a single syndicate he believes would result in a saving to the consumer. Coal production profits have been narrow for some years, says the Colorado State Board of Immigration, and mining men of that commonwealth also favor the plan.

MONTANA

Lincoln County

Work on the Snowshoe mine, one of the oldest in the Coeur d'Alene district, has been resumed. E. H. Wilson, manager of the mine and consulting engineer to the Pacific Coast Smelting, Refining & Mining Co., states that the 300-ton mill there is treating from 200 to 250 tons of ore daily, and that 1000 tons of concentrate is on hand. The latter averages between 50 and 60% lead, 14 and 20% iron, 25 oz. silver, and between $12 and $15 in gold per ton. The company has bonded the Silver Tip group of four claims making the southern extension of the Snowshoe property.

Silverbow County

The new compressed-air hoisting plant at the Mountain View shaft of the Anaconda property is reported to have proved very satisfactory. It was placed in commission last month. The Diamond shaft, and later the High Ore shaft, soon will be similarly equipped. The Anaconda is using electricity for power to a constantly growing degree. It is hoped that the present cost of producing copper will be decreased ½c. per pound.

NEVADA

Esmeralda County

(Special Correspondence.)—Conditions in the Rawhide district are improving, with 16 blocks of ground receiving attention. In several cases owning companies are conducting work, but mostly operations are in the hands of small lessees. Lack of capital continues to be keenly felt, also absence of adequate mining facilities.

Rawhide, July 23.

(Special Correspondence.)—At the 800-ft. level of the main Florence Goldfield shaft a station is being cut while the shaft is being sunk to the 1000-ft. level and new territory is being opened on the 500 and 650-ft. levels. Some ore of excellent quality is being taken from the new workings on the 500-ft. level as well as from the stopes on the 360-ft. level at the north of the Florence claim, in the Reilly vein. Laterals will be driven without delay on the 800-ft. level to open several of the orebodies from which a large production has been made on other levels nearer the surface. A change has been made in ore treatment. The Florence mill has installed an Akins classifier and a Dorr pulp thickener, eliminating the Deister concentrators and Frue vanners, and effecting the extraction almost entirely by amalgamation and cyanidation. The mill soon will be treating 170 tons per day with an increased recovery.

The Jumbo Extension Co. is making good progress in development at a depth of 1030 ft. on its Polverde claim, adjoining the Clermont and Jumbo claims of the Consolidated on the east. The interrupted work on the Annex lease on this claim is being resumed on a more liberal scale than in the past.

Goldfield, July 23.

Eureka County

Samples of copper ore from a 40-ft. shaft in the Copper Basin district, 12 mi. from Mineral hill, averaged 18.15% from top to bottom, with 8 oz. silver. A prospect hole 600 ft. north of the shaft, 4 ft. deep, showed 18.6% copper with 10 oz. silver.

Lincoln County

The final papers in the acquisition by the Nevada-Utah company of the Ohio-Kentucky and Con. Pioche properties have been transferred. E. R. Woolley, president of the Nevada-Utah, states that development on a huge scale will be furthered at once.

Nye County

The Tonopah M. Co. during June treated 14,113 dry tons at its mill, with an average value of $23.13 per ton of ore. The Tonopah Belmont company treated 6640 dry tons at its mill and shipped 2117 dry tons direct to the smelters. The ore averaged $31.30 per ton, about $1 higher than in May. The Tonopah M. Co.'s ore averages were $21.76 in May and $18.03 in April.

A discovery of $100 to $150 gold ore is reported on the Crescent claim. The vein is 18 in. wide and specimen ore shows some free gold.

M. J. Fink is planning extensive development of the barytes deposit on Lone mountain, 14 mi. northwest of Tonopah. Shipments will be considered as soon as a satisfactory rate to tidewater can be arranged.

The new shaft of the Halifax mine has been started. Driving will be started at the 1500-ft. point to strike the big Belmont vein. M. L. McDonald is resident agent.

Piute County

Rich discoveries are reported at Ten Mile camp, 12 mi. southwest of Marysvale. The district is virgin country. The lowest gold assay on the DeWitt claim is reported to be $44 per ton. The Cameron Pride, Sidney Black, manager, is operating near there. Other owners are James Long, C. Voigt, James Neilson, and the DeWitt interests.

WASHOE COUNTY

W. S. Foskey and associates have acquired from the Sierra Wood & Lumber Co. a 10-year lease of the old Hobart estate, and will prospect for the [illegible] bonanza.

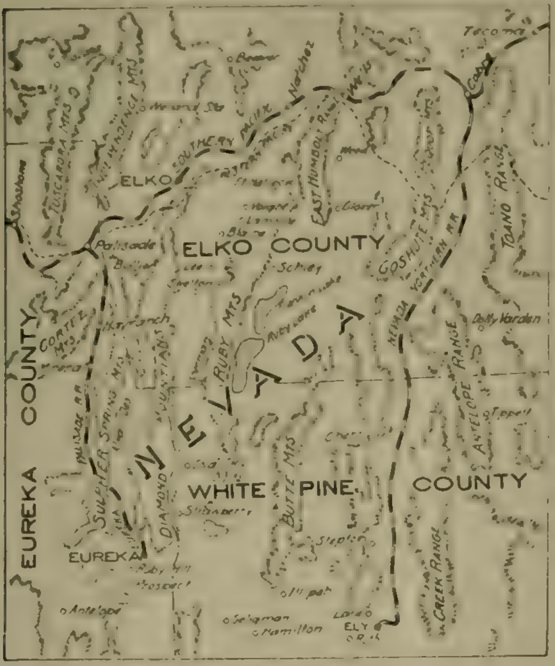
WHITE PINE COUNTY

(Special Correspondence.)—The Ohama company, at Sacramento pass, is doing considerable development, and has a milling plant of 30-ton capacity about ready to run.

The Centennial Developing Company is sinking a winze from its adit level which will be continued until the water level is reached, where it is expected that the secondary enrichment will be found.

The Greek-American Mining Co. last week purchased the Simon Davis group of claims in the Aurum district, 30 miles from Ely, upon which it has commenced development work. The mines show about 1000 tons of shipping ore in sight, which will be hauled to the railroad at Warm Springs and shipped to Salt Lake City smelters for treatment.

The Ely Revenue company, which has been idle for several years, has been reorganized, and resumed work this week. The company has about 200,000 tons of gold ore in sight, which will average better than $10 per ton. The company expects to erect a gold mill at the property next year. The Ely Consolidated company has reached its 600-ft. level and is now cross-cutting for orebodies on that level. This property joins the Nevada Consolidated on the south, and is showing much good ore on the 400 and 500-ft. levels.



MAP OF EASTERN NEVADA.

For some weeks past the Boston Ely has been developing orebodies on its 1245-ft. level, and is now placing an additional 80-hp. engine and another air-compressor. The ore development on this level is considered sufficient by the management to justify the company in installing a pumping plant and working the level. The company has been operating steadily for the past five years, and deserves much credit for its persistent efforts.

Ely, July 20.

NEW MEXICO

SOCORRO COUNTY

(Special Correspondence.)—The last bullion clean-up at the Deadwood mines amounted to 5200 oz. troy, gold and silver, with 25 sacks concentrate. The mill is handling 20% more ore than had been figured on. Last week 420 tons of ore was treated with 25 sacks concentrate.

The first 10-day clean-up for July at the Ernestine M. Co. showed 621 [illegible] oz. troy, gold and silver bullion, and 4½ tons concentrate. Seven hundred tons of ore was treated last week. It is reported important improvements will follow a visit by the vice-president next week.

The Oaks Company has finished a bridge across the arroya north of the adit portal and all grading has been completed.

A number of new contracts have been let in the lower levels of the Socorro mines. One thousand tons of ore per week is handled.

The Enterprise M. Co. plant soon will be ready for a test run.

Rain increased the water at the hydro-electric plant, and the Treasure M. & R. Co. mill is in full operation. More than 50 tons per day is hauled to the mill and treated.

Mogollon, July 22.

OREGON

BAKER COUNTY

The old Evening Star mine, Gimlet creek, has been abandoned temporarily owing to its cutting a watercourse.

W. I. Spencer, T. B. Neuhausen, of Portland, and Mohr have bought the Bi-Metallic mine near Greenhorn. A 500-ft. cross-cut is planned to tap the Bi-Metallic vein 300 ft. below the present deepest opening. Both gold and silver ore is produced there.

PENNSYLVANIA

ALLEGHENY COUNTY

The Pittsburg Coal Co.'s production for the six months ended June 30 was about 6,000,000 tons, a decrease of 550,000 tons, or 7½%, on account of low prices. July shipments compare better with those of July last year than the May and June shipments for the year's change.

UTAH

SALT LAKE COUNTY

The Inspiration Copper Co. soon will construct a 5000-ton mill. C. H. Repath will be in charge.

The Thompson-Quincy Con. Co. of Park City has acquired all outstanding stock of the old West Quincy company and is sole owner of 180 acres of patented land between the Daly West and the Daly-Judge mines. The drainage dispute has been settled.

UTAH COUNTY

Work on the Bonneville M. Co.'s adit near Provo will be resumed in the near future with three shifts of men operating Burley compressed-air drills. It is one of Jesse Knight's projects.

WASHINGTON

FERRY COUNTY

(Special Correspondence.)—The Butte & Boston, Chico, Jim Blaine Fraction, and Emma Fraction, contiguous claims in one group, have been leased and bonded to W. M. Crummer, formerly superintendent of the San Poil and Black Tail mines, in Republic camp, and A. W. Beckett of Republic.

Work has been resumed in the Trade Dollar mine, with the intention of raising from the No. 1 level to the adit which cuts the vein south of the shaft.

Republic, July 22.

J. L. Harper, general manager for the Republic M. Corporation, reports an important discovery on the 200-ft. level of the Surprise mine. The ore varies from $30 to $45 per ton. This, known as the 'Danny shoot', is believed to be a continuation of the Bonanza zone. The Republic M. Corporation shipped 1700 tons of ore in June.

The First Thought mine, in the Orient district, is reported sold to an English syndicate for $8,000,000, the deal involving a 10% first payment. The company is to be reorganized, some of the original owners retaining an interest in the company, and a large cyaniding plant is to be built. The deal has been pending a year. The mine has about 1,000,000 tons of ore running $8.50 per ton on the dump, and it has been estimated there is from 15,000,000 to 20,000,000 tons of gold-bearing ore in the property.

The Republic Mines Corporation shipped during the month of June 1700 tons of ore, all from the 200-ft. level of the Surprise mine. At the Quilp mine the principal work is confined to the vicinity of the winze below the 500-ft. level. Conditions in the Lone Pine mine are satisfactory; rapid progress is being made in driving on the 400-ft. level; ore is being blocked out in large quantities, ready for stoping.

Stevens County

(Special Correspondence.)—The Germania mine, on a suit for $1200 due for merchandise, has been placed in the hands of a receiver in bankruptcy, George H. Baker.

The Alice E. mine, owned by the Alice E. & Morning Star Mining Co., in Orient district, will resume operation with a force of 30 men under the management of George Robertson.

It is reported that the Standard Oil people will build a smelter, in opposition to the American Smelting & Refining Co. In connection therewith comes the statement that A. D. Goodell, formerly manager of the Northport smelter, at Northport, is taking up new contracts as fast as the old ones expire.

Orient, July 25.

CHILE

O'Higgins

Work on the new concentrator on the Braden property in O'Higgins province is being pushed and the first unit will be operated this month. The second unit will be operated in September, and the third in November, according to report. It is expected that No. 4 Fortuna adit will strike the main orebody in the near future. No. 4 is 750 ft. below No. 3½ adit, which is only half way through the orebody, where important developments are taking place. Reports state that 1,000,000 tons of 'probable' ore has been developed. The April estimate was 12,000,000 tons assaying 2.7% copper. Of the 5,000,000 tons added later, 1,000,000 tons was actual and 4,000,000 probable. An advance of 23 metres was made in Fortuna adit No. 3½, the ore averaging 2.85%. The first left cross-cut in Teniente adit No. 1 was advanced 23 metres in ore averaging 4.14%. Pope Yeatman is consulting engineer to the company.

CANADA

Alberta

The First Thought gold mine has been sold by Patrick Burns to an English syndicate for $8,000,000, according to report. It was among the first of the mines opened last year at Orient camp.

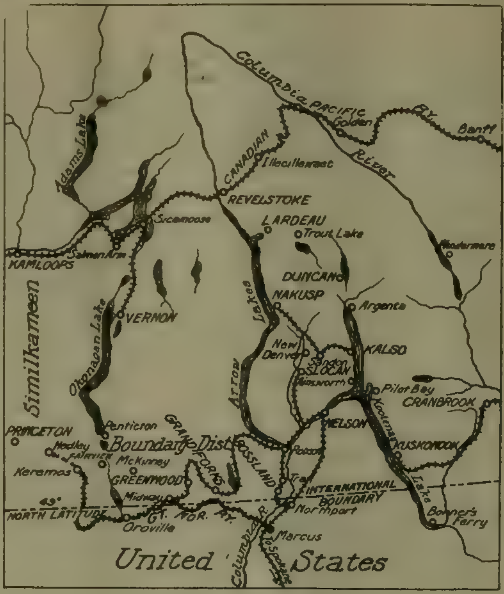
FIRST THOUGHT MINE.

British Columbia

It is said that the Con. M. & S. Co. is soon to work the Le Roi mine at Rossland. This company bought the property from the Northport Smelting & Refining Co. for the reported price of $250,000 a short time ago.

At Athin, B. C., the hydraulicking season has opened and J. M. Ruffner, of the North Columbia G. M. Co., has 15 giants at work.

Big Tunnel mine at Greenwood, B. C., probably the first mining enterprise in America subsidized by a municipality, reports a lateral depth of 2400 ft. and a vertical depth of 1200 ft., with rich ore showings. When the tunnel reaches a lateral depth of 5000 ft. a raise will be made for air. The tunnel company will then receive the first installment of the $50,000 which was voted by the citizens of Greenwood. The striking of the lead at 1800 ft. from the mouth of the tunnel proves there is plenty of high-grade ore at depth. The ore is the same as that found on the Providence mine, which shipped to the extent of $500,000 a few years ago.



BRITISH COLUMBIA.

MEXICO

Chihuahua

The Reform M. Co., organized to take over the Hinds Con. Mines Co., will not resume work until after the October elections, according to report. F. A. Matthew, it is said, will be in charge.

Durango

A bond and lease on the El Fuerte property, 39 acres; bond and lease on the Aguaje, 19 acres; full rights on the Little Anna, 17 acres; full rights on the Catalina, 10 acres; full rights on the Santa Isabel, 10 acres; and a Durango State mill concession for a cyanide mill have been secured by the newly organized Western Durango Mining & Development Co. John Allingham and J. H. Hedges will be in charge.

Guanajuato

The shaft of the Mineral Development Co. at Guanajuato is down over 2000 ft. and a cross-cut will be started for the Valenciana vein from the 1968-ft. level as soon as the 14-in. spiral ventilating pipe is installed. H. Vincent Wallace is manager.

Jalisco

The Consolidated Mining Co., owning the Casados mine in the Hostotipaquillo district, has during the past four months shipped ore of a value of $100,000, all of which was taken out in the course of development work, no stoping having been done. The shipments have been made to the smelters at Torreon and San Luis Potosi. A big tonnage of milling ore has also been developed in the Casados, and the present reserves are sufficient to keep a 250-ton mill busy for several years. Work is in progress on a 150-ton reduction plant, and it is expected to start milling before the end of this year. W. R. Ramsdell, one of the principal American operators of this section of Mexico, is at the head of the Consolidated Mining Company.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

Stephen Birch is at Cordova, Alaska.

G. M. Clark, of Placerville, has gone East.

F. F. Sharpless has been at Seward, Alaska.

D. J. Muir, Jr., has gone to Matanuska, Alaska.

James S. Wyatt has gone to the Altar district, Sonora.

J. B. Tyrrell has left Toronto for a short visit to England.

W. S. Noyes has gone to Colorado to be away four or five weeks.

Louis A. Wright left San Francisco on July 18, for a trip to Asia.

Rensselaer H. Toll is at Manhattan, Nevada, on professional work.

H. S. Chapman is in San Francisco on his way to Arizona on examination work.

William M. Brewer has gone to Alaska as manager for the Matanuska Gold M. Ltd.

P. G. Spilsbury is general manager for the Aguacate Gold M. Co. at San Mateo, Costa Rica.

J. S. Lockyer, director of the Solar Physics Observatory at London, was in Washington recently.

C. F. Dietz and D. V. Keedy, of Boston, have gone to Joplin in the interest of Boston people.

Frank H. Probert is at Ray, Arizona, and will proceed to Cananea before returning to Los Angeles.

H. Vincent Wallace is manager for the Mineral Development Co., Mina Nueva Luz, Guanajuato.

C. H. Repath has been put in charge of the offices of the Inspiration Copper Co., at Douglas, Arizona.

W. H. Weed was at Duluth recently, and has gone to Porcupine, returning to Butte toward the end of the month.

Arthur J. Hoskin is consulting engineer for the O'Reilly Gold Mines Co., on North Star mountain, Summit county, Colorado.

Gustave M. Gouyard has returned to New York from a two months' trip on professional business to Sonora and Chihuahua.

H. F. Lefevre has returned to New York from South America and sailed for Central America July 27, to be gone three months.

Boyd Dudley, Jr., instructor in metallurgy and ore-dressing at the Missouri School of Mines, has been granted leave of absence.

R. B. Lamb, of Toronto, has left for an extended trip to Cobalt, Porcupine, and Swastika, to inspect properties and make examinations.

G. W. Schneider, of Denver, has been elected professor of mining at the Colorado School of Mines, Golden, with Carl A. Allen as assistant.

L. C. Barlow, manager for the Metals Buying & Refining Co., at El Paso, Texas, is examining properties for Toledo, Ohio, people in the Porcupine district, Ontario.

The Mines Management Company has been retained to make an examination of the Carissa mine near Lander, Wyoming. H. P. Henderson has charge of the work.

Donald F. MacDonald, geologist for the Isthmian Canal Commission, has returned to his headquarters at Culebra, Canal Zone, from a profesional trip through Costa Rica.

J. D. Hubbard has resigned from the metallurgical department of the Oriental Consolidated Mines Co., to become superintendent of the Chosen Mining Co. in Yeng Byen province, Korea.

H. W. Edmondson has completed an examination of the Mejia mine in Planchas de Plata district, in Sonora, and is now reporting on the Volcancillo group near Autlan, Jalisco. He expects to return to Los Angeles next week.

Market Reports

LOCAL METAL PRICES

San Francisco, July 27.

Antimony	12–12½c	Quicksilver (flask)	$50
Electrolytic Copper	14–15½c	Tin	47–48½c
Pig Lead	4.75–5.75c	Spelter	7–7½c

Zinc dust, 100 lb. casks, per 100 lb., small lots $9.50–9.75, large $7.80–8.60

METAL PRICES

By wire from New York

Average daily prices in cents per pound.

Date	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
July 20	12.48	4.50	5.69	62⅝
" 21	12.46	4.50	5.71	62¾
" 22	12.45	4.50	5.71	62½
" 23	Sunday		No market.	
" 24	12.45	4.50	5.73	62⅝
" 25	12.45	4.50	5.73	62½
" 26	12.46	4.50	5.73	62½

ANGLO-AMERICAN SHARES.

Cabled from London.

	July 20. £ s. d.	July 27. £ s. d.
Camp Bird	1 9 3	1 9 6
El Oro	1 3 9	1 3 6
Esperanza	1 16 3	1 16 10½
Dolores	1 5 0	1 5 0
Oroville Dredging	0 6 0	0 5 9
Mexico Mines	7 12 6	7 3 9
Tomboy	0 19 9	0 19 10½

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing prices, July 27.		Closing prices, July 27.
Amalgamated Copper	$ 68⅛	La Rose	$ 4
A. S. & R. Co	79¼	Mason Valley	9⅛
Braden Copper	5¾	Miami Copper	21
B. C. Copper Co	4⅞	Mines Co. of America	5
Butte Coalition	18⅛	Nevada Con	19
Chino	22¾	Nevada Utah	¾
Davis Daly	⅞	Nipissing	8⅝
Doble	1⅝	Ohio Copper	1⅝
Dolores	5	Ray Central	1⅝
First National	1⅛	Ray Con	17⅝
Foley O'Brien	1¼	South Utah	¾
Giroux	6⅛	Superior & Pittsburg	16⅝
Goldfield Con	5⅞	Tenn. Copper	40⅞
Greene-Cananea	7	Trinity	4¼
Guanajuato Con	⅝	Tuolumne Copper	4⅝
Hollinger	12⅝	United Copper	2⅛
Inspiration	8½	Utah Copper	49¼
Kerr Lake	5	Yukon Gold	4

COPPER SHARES—BOSTON.

	Closing prices, July 27.		Closing prices, July 27
Adventure	$ 6½	Mohawk	$ 47
Allouez	30	North Butte	32
Calumet & Arizona	57	Old Dominion	48
Calumet & Hecla	445	Osceola	99
Centennial	12	Parrot	11⅛
Copper Range	60	Santa Fe	1¼
Daly West	5½	Shannon	10¼
Franklin	11¼	Tamarack	34
Granby	37	Trinity	4
Greene Cananea, ctf	6⅞	Utah Con	17
Isle Royale	17	Victoria	1⅛
La Salle	3½	Winona	8
Mass Copper	7¾	Wolverine	109

(By courtesy of J. C. Wilson, Mills Building.)

NEVADA STOCKS.

San Francisco, July 27.

Atlanta	$ .18	Mayflower	$ .05
Belcher	.41	Mexican	4.00
Belmont	6.32	Midway	.17
B. & B.	.24	Montana Tonopah	.70
Booth	.08	Nevada Hills	4.00
Chollar	.14	Ophir	1.85
Combination Fraction	.09	Pittsburg Silver Peak	.85
Con. Virginia	.91	Round Mountain	.62
Florence	1.55	Sandstorm Kendall	.06
Goldfield Con	5.72	Savage	.13
Gould & Curry	.12	Tonopah Extension	.86
Jim Butler	.28	Tonopah of Nevada	5.50
Jumbo Extension	.23	Union	1.37
MacNamara	.18	West End	.53

(By courtesy of San Francisco Stock Exchange.)

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS.

EVIDENCE—REPORT OF MINE SUPERINTENDENT

The statute of Illinois requires a mine superintendent to make a record of any accident occurring in the mine and to make a report of the same to the State Mine Inspector. Under this statute such a report and the record made by the mine superintendent to the Mine Inspector are admissible in evidence in the trial of a case for an injury to a miner to establish the facts required to be so reported and recorded; and the fact that such a report contained a statement that a piece of rock fell from the roof of the mine and struck a miner, and that the miner had a wife and child, would not operate to render such report and record inadmissible as evidence.

Aetitus *v.* Spring Valley Coal Co., (Illinois) 92 Northeastern, 579.

ESTATES IN MINERAL LANDS

A citizen may acquire any one of three possible estates in mineral lands upon the public domain. He may content himself with locating a claim in compliance with the statutes and rules and regulations, in which case he acquires a possessory title only, both the equitable and legal title remaining in the Government. In the second place, after making such location, he may comply with the further requirements of the law, and pay the required purchase price, thus acquiring the equitable title; the legal title still remains in the Government. Finally he may proceed one step farther and obtain a patent for the land, thereby devesting the Government of all interest both legal and equitable.

United States *v.* Rizzinelli. 182 Federal, 675. Aug. 1910.

COMBINATION TO PROCURE TITLE TO COAL LANDS

The fact that two persons engaged in an unlawful combination to procure title on behalf of a corporation to an area of coal lands in excess of the amount prescribed by law, and that lands in excess of the amount allowed by law were actually patented to them, would not make such patent valid, the unlawful combination making the proceeding illegal from the beginning. And a corporation formed to take over such patent lands is not a bona fide purchaser for value without notice to the extent that it precludes the Government from proceeding to cancel the patent, as the rule is that the person holding the voidable patent to lands can not protect himself against the process of the Government by forming a corporation in which he is the dominant factor and conveying to it the premises which he has acquired in violation of law.

United States *v.* Allen, 180 Federal, 855.

INSPECTION OF MINE—LIABILITY OF MINE-OWNER

The statute of Illinois requires a mine-owner to employ a legally qualified mine examiner to inspect the mine before miners are permitted to enter for work, and to see that all dangerous places are properly marked, as required by the statute. This statute is mandatory and not merely discretionary, involving only the exercise of good faith on the part of the mine-owner; and a mine-owner cannot excuse himself from liability for a failure to properly examine the mine and mark the dangerous places, even where the mine examiner and mine manager examined the place where the injury occurred, and in good faith believed it was not dangerous. And where the rock and other débris which fell and struck a miner, fell by reason of the condition of the roof of the mine before he commenced work, and whether the place should have been marked as dangerous, are questions of fact to be determined by a jury under the evidence.

Aetitus *v.* Spring Valley Coal Co., (Illinois) 92 Northeastern, 579.

Recent Publications

THE MAXVILLE LIMESTONE. By W. C. Morse. Geological Survey of Ohio. Pp. 128, ill., index. Columbus, 1910.

THE RATIONALE OF INVESTMENT IN ZINC MINING. By Otto Ruhl. Pp. 72, ill., index. Joplin, Missouri, 1910.

TWENTY-NINTH ANNUAL COAL REPORT OF THE ILLINOIS BUREAU OF LABOR STATISTICS, 1910. Pp. 537. Springfield, 1911.

PROPERTIES AND USES OF DOUGLAS FIR. By McGarvey Cline and J. B. Knapp. U. S. Forest Service, Bull. 88. Pp. 75, ill. Washington, 1911.

THE ROAD MATERIALS OF WASHINGTON. By Henry Landes. Washington Geological Survey, Bull. 2. Pp. 204, ill., maps, index. Olympia, 1911.

Commercial Paragraphs

THE MINES MANAGEMENT CO., New York, announces that Gordon S. Duncan, with offices at 28-29 St. Swithins Lane, will act as its agent in London.

Joseph F. Spellman, representing the CHROME STEEL WORKS, Chrome, New Jersey, announces the removal of his office to 414 First National Bank building, Denver, Colorado.

The SULLIVAN MACHINERY CO. announces that in future its business in France will be in charge of Hart O. Berg, at 30 Rue des Champs Elysees, Paris. All Sullivan machinery will be carried in stock as heretofore.

The MULCONROY CO., Philadelphia, has purchased the business, machinery, and patents of the Metallic Flexible Tubing Co. of Philadelphia, and will continue to manufacture the well known brands of the latter concern.

THOMAS N. MILLER has bought the business of Lawrence N. Wagner, chemist and assayer, 24 Broad street, Nevada City, California, and will operate a custom mill in connection with the assay office and chemical laboratory.

The WOOD DRILL WORKS, Paterson, New Jersey, has adopted the use of vanadium tungsten iron in making the cylinder, chest, and the air-head of Wood rock-drills. The makers claim that the wearing qualities of the new alloy are much superior to cast iron and that it allows a freer movement of the piston.

THE DEISTER CONCENTRATOR CO., of Fort Wayne, Indiana, reports the following recent sales of its tables: Gorman, Clancy & Grindley Co., Calgary, Alberta, Canada, tables No. 3 and 4; Nova Scotia Silver Cobalt M. Co., Cobalt, Ontario, Canada, No. 2 tables; Mt. Champion Mining Co., through Stearns-Roger Mfg. Co., Denver, No. 2 and 3 tables.

ALONZO F. BARDWELL, who has been manager of the assay office of Bettles, Mathez & Co., Salt Lake City, for the past three years, has purchased the interests of Mathez & Co., and in future the firm name will be Bettles & Bardwell. Mr. Bardwell will continue to devote his entire time to the business, having brought with him the experience of 23 years in the work at Aspen, Colorado.

The BRODERICK & BASCOM ROPE CO., of St. Louis, represented by The Hampson-Fielding Engineering Co., of Denver, has been awarded the contract for the Mount Champion Mining Co.'s aerial tramway, having a total length of 6250 ft., with a fall of 950 ft. The carriers are the G. & S. patent, with phosphor bronze bushings, and the improved hanger arms. The buckets are also G. & S. patent automatic self-dumping, self-righting, and self-locking, performing all these functions without the assistance of an attendant. The loading terminals are peculiar to this design. The load is evenly distributed in the bucket, as it enters the bucket from two sides instead of one, and the bucket is not stopped in transit, the loading being accomplished while the bucket is in operation at its normal speed.

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EDITORIAL

THIS is the first number to be issued from our new home at 420 Market street, San Francisco.

IT IS reported that the Postoffice Department is planning to establish an ocean mail service between the principal ports on the Atlantic and Pacific, by way of Panama and Colon.

THE UNITED STATES PATENT OFFICE has issued the astonishing total of one million patents, the millionth being for a new rubber tire. It would be interesting to learn how many have been issued for substitutes for rubber.

A FRENCH INVENTOR has patented a device to prevent an airship from turning over while descending. But it would seem that when the spot at which the airship strikes is of ordinary hardness, it would be almost immaterial which side up the aviator was at the moment.

CHARGES at the Government assay offices are to be doubled on January 1 next. Established when transportation was less abundant, these offices were of great service, but for many years past have been conducted at a loss. The office at Seattle assays much of the gold that comes from Alaska, and is likely to persist, but the increased charges are apt soon to remove from Deadwood, Carson, Salt Lake, Helena, and Boise these reminders of pioneer days.

A BILLION DOLLARS is a huge sum, yet the Bureau of Statistics of the Department of Commerce and Labor predicts that the exports of domestic manufactures of the United States for 1911 may exceed that amount. The increase in exports of manufactures for the year ended July 30 was 18½ per cent over the preceding year, nearly 100 per cent greater than in 1901, and 384 per cent greater than in 1891. Foodstuffs and crude materials show an equally remarkable growth. The imports of merchandise for the year show a decrease of 2 per cent in value, and even greater decrease in quantity, the excess of exports over imports being nearly half a billion dollars. But the amount of new securities issued yearly in the United States is so great that large amounts of foreign capital are necessary to keep up with our growing indebtedness.

The Cunningham Claims Decision

Few recent decisions of the Commissioner of the Land Office have attracted more attention than that which settled the so-called Cunningham claims. Interest in the matter is abundantly justified, not only by the merits of the particular case, but by the potentialities of the decision. There is a wide disposition to consider the opinion rendered as 'political,' flowing from a regard to the state of the public mind rather than a sound following of law and precedent. There is this much of justification for this point of view; the interpretation of the coal-land law laid down in this case is not one that has been commonly held in the coal-land States, and the new interpretation is, doubtless, largely the result of a new attitude of the public mind toward the public lands. This does not necessarily impugn the good faith or good judgment of those concerned. Whatever may be the opinion of anyone reading the documents in the case as to the propriety of selling large blocks of public coal lands to private individuals, there seems to us no room for difference as to the belief that the claimants were acting in strict accord with what they and their attorneys regarded as the law. Furthermore, anyone familiar with the operation of the coal-land laws in the West, will at once concede that thousands of acres of lands have passed into private ownership with much less right, and where the law was much less scrupulously observed. The Cunningham claimants proceeded under the law as they knew it, as it had been commonly interpreted, and in accord with the customs under which coal land had in the past been commonly entered and patented. The situation presents many analogies to that in which the oil-men in California found themselves when faced by the Yard decision. It should be clear that under such conditions a strong moral claim to protection may originate, even if the legal basis be inadequate. The Commissioner has placed upon the law what is substantially a new interpretation, though even for it some precedent was found. To the layman the interpretation seems essentially sound. In brief the statute requires the opening or improving of a 'mine' as precedent to patent, and no mine had been opened. In the very nature of things no mine could be opened until the patent had been granted, and on the basis of secure ownership, tipples, railways, terminals, and docks, all essential to the working of a mine, could be safely built. It must be obvious to anyone that in a wilderness, far from any local industry, no sane person will conduct a producing mine on public land prior to securing title to the property. It must be equally clear that under this strict interpretation there will be few additional mines opened anywhere except on private lands. It is one thing to buy land from the Government before opening a mine, and quite another to first erect expensive equipment, and begin shipping coal, and then take steps to secure title. The effect of the decision is that of ruling that there is no law under which coal land may be legally entered. The Land Office, finding itself beset with difficulties, has passed to Congress the long neglected task of revising the coal-land laws to meet the needs of modern industry. There is a wide gulf between a law which contemplates giving to an individual 160 acres for his exclusive use, provided he has previously opened on it a 'mine'—presumably a country bank to supply his kitchen stove with fuel—and the needed law under which contiguous tracts of coal land may be made available in area sufficient to warrant the investment demanded for a modern colliery, to say nothing of the transportation that must often be provided. Ostrich-like, Congress has kept its head in the sand and refused to see that conditions have changed. The lonely pioneer is no longer the only one for whom provision must be made. The individual 160-acre claim and the maximum 320-acre association claim are jokes and have been for years. By persistent refusal to provide relief, Congress has opened the way to frauds of many kinds, and, essentially, the Department of Interior has at last found public sentiment strong enough to cause it to refuse longer to go through the farce of administering inadequate laws.

The objection naturally arises that any law must be assumed to be capable of a reasonable and workable interpretation; that in enacting the coal-land laws Congress must be assumed to have had in mind the providing of some means for disposing of the coal lands. This is entirely correct, but following the ruling of the Commission to the effect that the act of 1904 was as titled, an amendment to the old and not an independent statute, it seems equally clear that Congress did not have in mind the granting of such areas of coal land as are necessary under modern conditions. It could not well have done so, since in 1873 the conditions themselves had not arisen. The individual and the small colliery were then the rule, and the laws followed the general model of those under which farms were given to citizens. The limitation as to size, the prohibition of the use of 'rights' more than once, the very wording of the law, indicate that only the old conditions were in mind. Successive Commissioners and Secretaries, helped by judges and attorneys, made the best of a bad situation, and actually a coal industry grew up in the West. Eventually the coal-land laws were extended to Alaska; with how little knowledge and thought is revealed by the fact that they were at first wholly inapplicable because the land was unsurveyed. This was remedied by another act permitting claimants to have surveys made at their own expense, and when in 1908 matters had come to a standstill another patch was placed on the crazy-quilt of legislation. It was characteristic, however, that the act of 1908 was only made to apply to those who had already acquired rights. There was not then, and there never has been on the part of Congress any broad statesmanlike consideration of the really vital questions at issue. Congress failed in its duty to provide any adequate law to meet the situation, with the result that a premium was placed on fraud, all claimants were branded alike as dishonest conspirators, and Government officials were held up to public disdain as complacent tools, or wooden-headed zealots. We believe the Commissioner and the Secretary were wise to refuse longer to accept the responsibility of winking at misinterpretation of the law, and of bringing its duty squarely before Congress, though we regret keenly the injustice to honest claimants that has ensued.

Alaska is suffering from having her resources locked up while the game of politics is being played at Washington. We are not the most enthusiastic as to the great market awaiting Alaskan coal, but it requires only the briefest personal contact with the land and the people to convince one that Alaskan coalfields should be opened at once. The opening of a colliery or two will not, we fear, bring true all the rosy dreams that have been born of the long nights and sunshiny summer days of Alaska; but it will relieve a situation of real distress and of rank injustice. We may well have differences as to a general land policy, but there should be no difference of opinion as to the advisability of opening one or two mines at once. It would even be better, we believe, to patent a few rankly fraudulent claims, if necessary, and then take such time as may be necessary for formulation of a really equitable plan for dealing with the coal lands. As for the Cunningham claimants, they have our sympathy. They have been caught by what is essentially a change in the 'rules of the game', after the play had started. Fairness dictates that some relief be granted them, as was done in the case of the oil-men in California. We understand that at one time the claimants were offered patent to the amount of land allowed under the act of 1908. If possible, the offer should be renewed, or some other adequate measure of relief afforded them. We believe in social progress, and we further believe that the Conservation program is essentially sound. Some injustice and hardship to individuals is inevitable in all change, but we also believe that the American people wish to be just and generous, and under the conditions, the Cunningham claimants are entitled to recompense for their time and money. The Government ought not to keep both the claims and the claimants' money. The responsibility for the whole matter is, however, now where it belongs—before Congress.

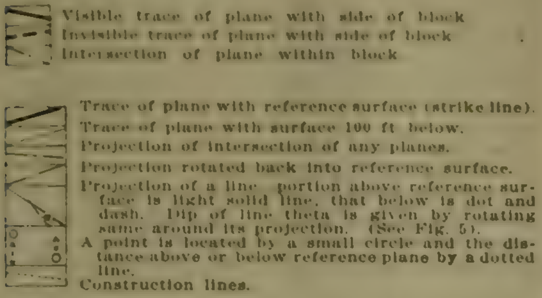
Graphic Solution of Fault Problems

By C. F. Tolman, Jr.

(Concluded from page 128.)

Where the fault movement is that of pure translation, and the fault plane is inclined. (Problems 8, 9, 10, 11, and 12.)

The scheme of lines chosen to represent planes, traces, lines, points, etc., used in this and preceding discussion, is shown by the legend below.



Visible trace of plane with side of block
Invisible trace of plane with side of block
Intersection of plane within block

Trace of plane with reference surface (strike line).
Trace of plane with surface 100 ft below.
Projection of intersection of any planes.
Projection rotated back into reference surface.
Projection of a line portion above reference surface is light solid line, that below is dot and dash. Dip of line theta is given by rotating same around its projection. (See Fig. 5).
A point is located by a small circle and the distance above or below reference plane by a dotted line.
Construction lines.

Problem 8. Fig. 8.—Given an inclined fault plane and the dip, strike, and total heave of both portions of two faulted strata (the total heave of one of the strata = *O*). To find the amount and direction of the total displacement. The analysis is the same as for problem 5.

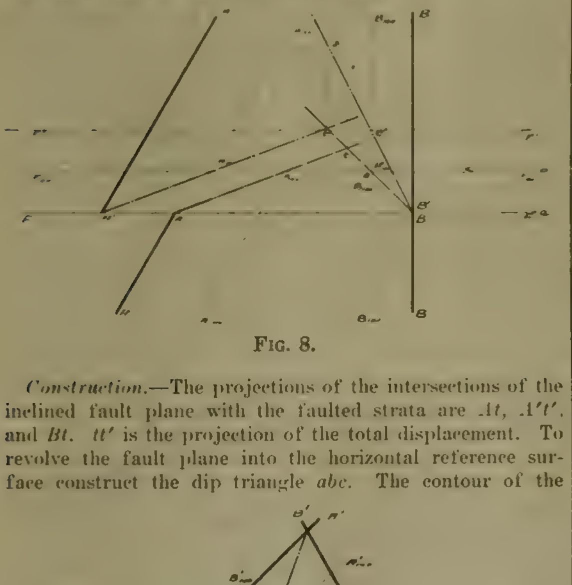


FIG. 8.

Construction.—The projections of the intersections of the inclined fault plane with the faulted strata are *At*, *A't'*, and *Bt*. *tt'* is the projection of the total displacement. To revolve the fault plane into the horizontal reference surface construct the dip triangle *abc*. The contour of the fault will move out until a distance from its surface trace = *ac*, assuming the position *F'F'*. *Be* moves out to *Be'*, and *tt'* to *xy*, which measures the magnitude of the total displacement.

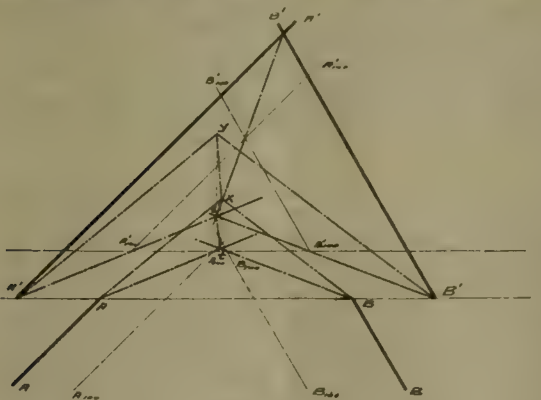


FIG. 9.

Problem 9. Fig. 9.—Given an inclined fault plane and the dip, strike, and total heave of both portions of two faulted strata. To find the amount and direction of the total displacement. The analysis is the same as for problem 5.

Construction.—Find the intersections of the projections of the fault plane traces of the strata on each side of the fault plane. These intersections are *t* and *t'*, and therefore *tt'* is the projection of the total displacement, the length of which may be found by rotating it into position *xy* which it assumes in the horizontal plane.

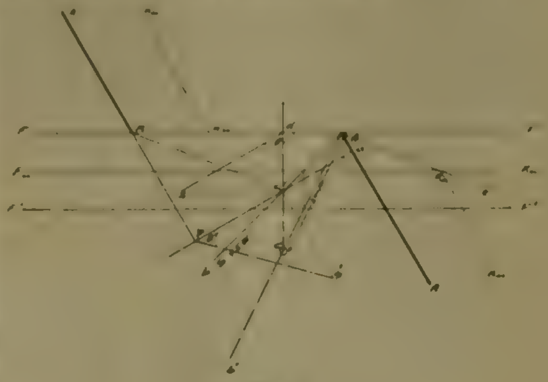


FIG. 10.

Problem 10. Fig. 10.—Given an inclined fault plane, and the dip and strike-line of one side of a faulted stratum, as well as the bearing and amount of the total displacement. To find the outcrop of the portion of the stratum on the other side of the fault plane.

Analysis.—After plotting the direction of total displacement, revolving its original (in the fault plane) into the horizontal position, the total displacement may be measured on this line from the intersection of the stratum and the fault plane, and the point thus found, when revolved back into the fault plane, will lie on the trace of the unknown portion of the stratum on the fault plane. Or, by determining the depth this point is below the surface, and projecting a line to the surface, in the direction of dip and at the angle of dip of the stratum, a point in the extended outcrop of the second portion of the stratum is determined.

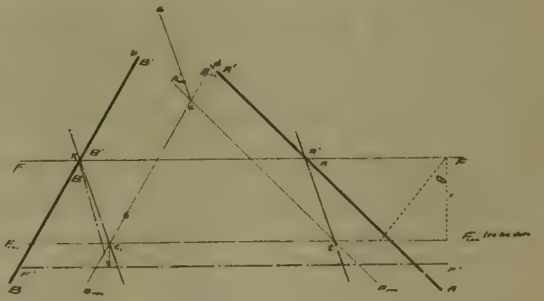


FIG. 11.

Construction.—*Ab* is drawn in the known direction of total displacement, and its original is revolved into the horizontal position *(Ab')* and the amount of the total displacement (200 ft.) measured on the same locates point *c*, which is revolved back to *c'*, and the trace *c'A'*, parallel to *At* is drawn, its intersection with *FF* locating *A'A'*. Or the distance *c'* lies below the surface *(c's and c's')* is used to construct the triangle *c's'p'*, drawn on *op*, which is perpendicular to *AA*, and Θ is the dip of *AA*. Point *p* lies on the produced strike of *A'A'*.

Problem 11. Fig. 11.—Given the surface trace of the fault plane, and the strike and dip of two faulted strata, neither of which are heaved. To find the dip of the fault plane.

Analysis.—Since neither stratum is heaved, (1) the traces (on the fault plane) of the two portions of either stratum coincide, and (2) they are parallel to the fault movement.

Construction.—Construct parallelogram *abcd*, *ac* is the one line common to both strata, and point *c* is 100 ft. below point *a*. Lay off xt_1 and parallel to *ac*. The contour of the fault plane passes through t_1 and its dip is Θ.

Problem 12. Fig. 12.—Given the strike of the fault plane, and the strike, dip, and total heave of three faulted strata. To find the dip of the fault plane.

Analysis.—The linear intersections of the strata on one side of the fault plane taken in pairs, will intersect in a point. A line drawn to the corresponding point on the other side of the fault plane will be parallel to and equal in length to the total displacement. The dip of the fault plane is determined by using the total displacement thus determined in combination with the dip, strike, and total heave of any faulted stratum.

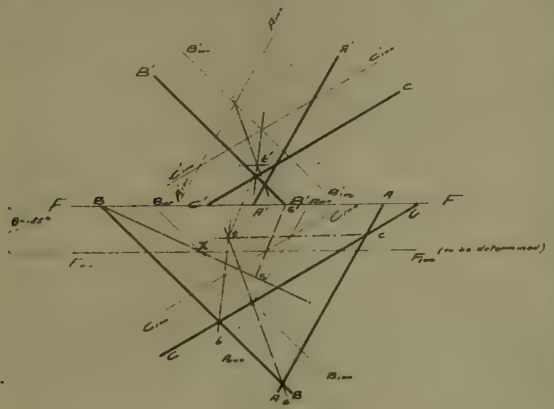


Fig. 12.

Construction.—Find any two of the three mutual intersections of the strata *AA, BB, CC (at, bt, ct)*. These intersect in a common point *(t)*, for each pair of lines lies in a common plane. *t′* is the corresponding point of *A′A′*, *B′B′*, *C′C′*. *tt′* is the projection of a line parallel and equal to the total displacement. Take *ss′* parallel and equal to *tt′*. *Bs* is the projection of the trace of *BB* on the fault plane, therefore its intersection with $B_{100}B_{100}$ at *x* locates $F_{100}F_{100}$, and the desired dip (Θ) is found by constructing the dip triangle.

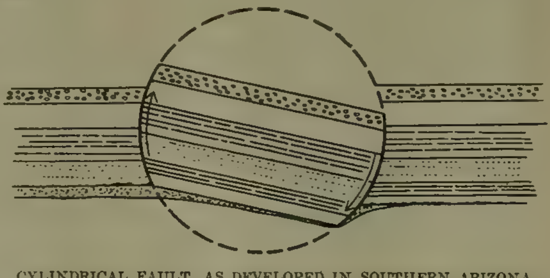
Discussion of the problems in which fault movement is that of pure translation. The above problems have been selected, not only to illustrate graphic methods, but to bring out certain features in faulting, which if borne in mind, may assist in approximate solutions, and emphasize those phenomena for which the investigator should be on the watch. It will be seen that there is no difference in attacking problems whether the fault plane is vertical or inclined, and that when the movement is of pure translation, the traces of each portion of a faulted stratum, in any plane, are parallel, and therefore a difference in strike on two sides of a fault indicates a pivotal component of fault movement.

Problems 5, 8, and 9 are examples of the solution of the important problem, which calls for the determination of total displacement when the fault plane is known, as well as the dip, strike, and total heave of two faulted bodies. The cases investigated where one of the strata is not heaved, are taken to emphasize that the offset at the surface is a function of the angle between the faulted displacement and the trace of the faulted stratum on the fault plane, and if the two are parallel, there will be no heave, regardless of the amount of fault movement. Problem 6 is an unimportant variation of problem 5, and problems 7 and 10 involve simple constructions often used in graphic solutions. Problems 11 and 12 involve the determination of the dip of the fault plane. In practice, when direct measurement of dip is not satisfactory, both dip and strike are generally determined by locating accurately three points on the outcrop of the fault plane, and determining their elevation and plotting these data according to methods of descriptive geometry. Problem 11 is theoretical, and is presented to show the possibility of the occurrence of an important fault movement, which nevertheless may not offset bodies with entirely different strikes (provided their intersections on the fault plane are parallel). Solution 12 may be occasionally of considerable importance.

Problems where a rotation about a pole is combined with translatory movement.

When combined rotary movement (about a pole perpendicular to the fault plane) with that of pure translation occurs, the angle between the fault plane traces of each portion of the faulted stratum measures the angular displacement regardless of the position of the pole. Almost every careful underground fault measurement will disclose such a variation of the traces from the parallel position, but generally so slight as to cause uncertainty as to whether this difference should be ascribed to rotation, or to minor irregularities of movement, or to faulty measurements. As already stated, cases have been reported of important pivotal motion, and as accurate, detailed observations increase, rotation will probably be found to be of more importance than suspected heretofore.

Solutions of problems in combined rotation and translation are greatly simplified by the following facts regarding faults. (1) Movements are so universally confined to definite planes that an ideal geometrical plane can generally be selected to represent the fault plane. (2) Fault fissures are universally closed. Any given earth movement will find complete relief (*a*) by a moderate amount of form distortion before the break takes place, (*b*) a movement between the two sides adjoining the fault fissure, and (*c*) a rock flowage by which that portion of the stress is relieved, that could not be satisfied by the fault displacement. This rock flowage caused by (*a*) and (*c*) must be considered in an investigation of the total deformation of an area, but in the practical investigation of the effect of an individual fault plane in displacing a lode, the consideration of rotary and translatory movements is made regardless of rock flowage. From this it follows that the pole about which rotation takes place is perpendicular to the fault plane. Otherwise one side of the fault plane must grind and the other gap. The initial position of the pole, which it would assume to give complete relief to the stresses, is probably not often perpendicular to the line of weakness that determines the fault plane, but molecular adjustment, which prevents the fissure from opening, etc., has the effect of raising the pole to the perpendicular position. The effect of simultaneous or subsequent warping of the fault plane, can generally be discarded in the simpler problems of individual displacements.



CYLINDRICAL FAULT, AS DEVELOPED IN SOUTHERN ARIZONA.

Certain 'strip faults',* by means of which an entire desert mountain range is given monoclinal dip, approach the form of a right cylinder. Such a form, if perfectly developed, could relieve both a rotation perpendicular to the end faces, and a movement parallel to the curved face, without an accompanying rock flowage. (See accompanying figure.) In the occurrences in mind, the cylindrical surface is represented by one or more great parallel faults, occurring as the main structural features of the region. The cross faults, on which the rotary movement should be expressed, are seldom developed, the rotation being satisfied by flowage, instead of fracture, and even when fracture occurs the cross-

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*Tolman, C. F. *Jour. of Geol.*, Vol. 17, No. 2, p. 139.

faults are much more difficult of recognition than the parallel faults. Fault block systems are more common than single large strip faults, the blocks presenting a large variety of form, and here evidently only a portion of the movement block can find relief along the fault or planes, the rest going to adjust the form of the block to its new position.

Problems 12 and 13.—Given a fault plane, a pole, and angular displacement of *p* about the pole, and the dip and strike of two strata on one side of the fault plane. To find the outcrop and strike of the same on the other side of the fault plane, after both sides have been planed down to a common horizontal surface.

Analysis.—An auxiliary plane parallel to the fault plane should be constructed. The points where the pole pierces both planes can then be located, and these used as centres about which the fault plane and auxiliary plane traces of the given strata can be rotated. The points where these rotated traces of each stratum intersect the common level to which both sides are reduced, locate the strike line of the rotated portion of that stratum, the dip being determined from the rotated trace on the fault plane.

Case I.—The fault plane is perpendicular. Fig. 13.

Construction.—*FF* is the strike line of the perpendicular fault plane and *ff* of the auxiliary plane F_nF_n and f_nf_n being respectively the revolved position of their 100 ft. contours. Pass a perpendicular plane *RR* through the pole, and revolve it about its strike-line. R_nR_n is the revolved position of its 100-ft. contour, and the arrow shows the known revolved position of the pole, intersecting the fault plane and the auxiliary plane respectively at *p′ and* p_1'. The fault plane and the auxiliary plane, however, are revolved about their strike lines into the horizontal position, such a rotation bringing *p′* into the position *p″* and p_1' into the position p_1''. The traces *at* and *bt* are now rotated about *p″* through angle *p* into the positions *a′t′* and *b′t′*, and likewise in the auxiliary plane. a_1t_1 and b_1t_1 are rotated about p_1'' into the positions $a_1't_1'$ *and* $b_1't_1'$. Let erosion bring down the rotated block to the level represented by lines *FF* and *ff*. The intersection therefore of *a′t′* on *FF* and $a_1't_1'$ on *ff* locates the new strike-line *A′A′*, and *B′B′* passes through the intersection of *b′t′* with *FF* and $b_1't_1'$ with *ff*. Their dips are determined from their traces *A′t′* and *B′t′*.

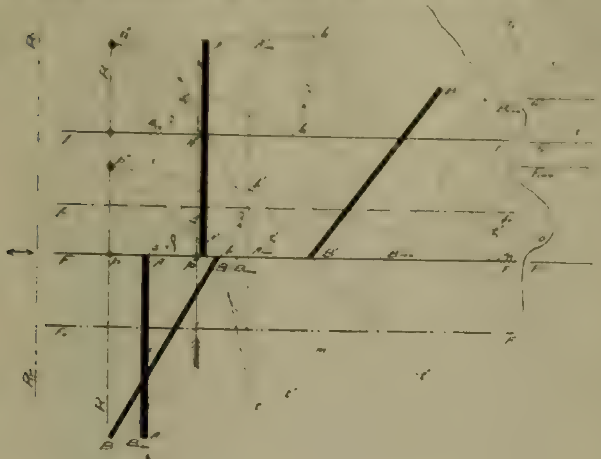


FIG. 13.

Case II.—The fault plane is inclined. Fig. 14.

Construction.—Inasmuch as the fault plane is now inclined, the pole shown in the revolved position of the auxiliary plane *RR*, has the inclined position $p'p_1'$, instead of a horizontal position as in the preceding case. It will be easily seen that when the fault plane and auxiliary plane are revolved on their strike-lines into the horizontal positions, the centres of rotation in these planes will be respectively *p″ and* p_1''. The rotation of the revolved traces *at* and *bt* about these centres and the determination of the strike and dip of the rotated portion of each is carried on as described for case I.

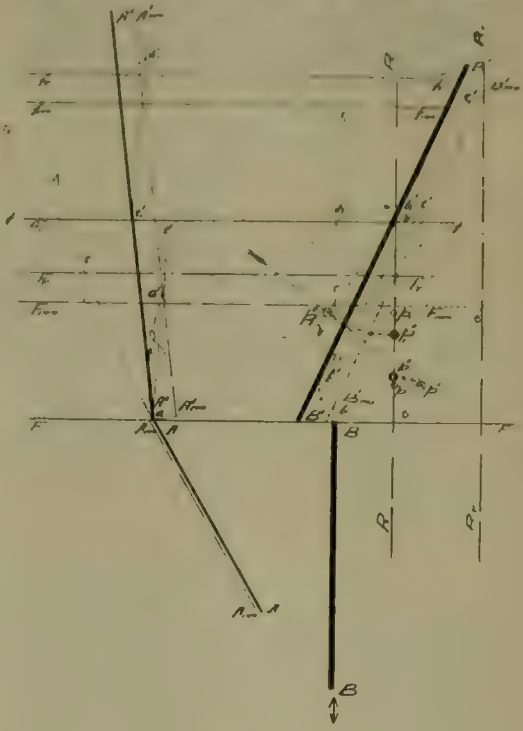


FIG. 14.

Discussion.—These two simple problems emphasize the following facts of practical bearing, which may assist in the detection of the existence of rotary movement, and explain some of the phenomena of faulting that otherwise would be difficult to understand. Assuming that fault movement is by angular displacement: (1) With a vertical fault plane, strata striking at right angles to the same suffer change in dip and not in strike. Others develop changes in both dip and strike after rotation. (2) Only those lines parallel to the pole will remain parallel to their original position after rotation. A strike line can be parallel to the pole only when the fault plane is vertical. Therefore when a stratum suffers a change in dip without a noticeable change in strike, the fault plane should be approximately vertical. (3) Very considerable heaves may be developed by a relatively small rotation, if the trace of the stratum is thereby caused to approach a horizontal position. For instance, in Fig. 13 if the stratum *BB* intersected the fault plane in the trace *bm* instead of *bt*, the faulted portion would have had outcrop *no* instead of *BB′*. Are not some of the thrusts described by geologists better explained by moderate rotations than by great translatory displacements?

Problem 14.—Given an inclined fault plane and two faulted strata, dislocated by a combined rotary and translatory movement. To find the equivalent pole about which it has taken place. Fig. 15.

Analysis.—The angular rotation *p* is the angle between the fault plane traces of the two portions of any faulted stratum. Find a line on the fault plane that is the locus of all poles that will rotate the trace of one portion of each faulted stratum through angle *p*, so that it falls on the trace of the other portion of the stratum. The intersection of these lines therefore gives the desired position of the pole.

Construction.—Both portions of a faulted stratum are completely known, when we can determine the fault plane traces of both portions, the strike and dip of one portion of the faulted stratum, and the total heave. The strike-line of the second portion (*A′A′*, for example) is determined from the above data as follows: traces *At* and *A′t′*

(these have been rotated into the horizontal position) intersect at a, and a pole therefore at that point will rotate At so that it falls on $A't'$ extended, the amount of rotation being equal to p. A second point k is found that will also rotate At into the position $A't'$, and these two points locate the line containing every point about which At can be rotated through angle p, so that it will fall on $A't'$ extended. (The easiest construction for obtaining this line is to draw arc rs with a as a centre. It is easy to show that the line through rs is parallel to the line of poles through a.) Every pole will pierce both the fault plane and auxiliary plane at a definite interval when the latter planes are rotated into the horizontal position. For example, the distance between points e and f becomes interval fh after both planes are rotated into the horizontal position. Making $p'p_1 = fh$, the line of the intersection of the A poles on the auxiliary plane becomes ll. MM and mm and NN and nn are the corresponding lines of poles for BB and CC. Projecting AA until it cuts ff at i, and drawing a_1t_1 parallel to at, and from a_1 drawing a_1t_1' parallel to at', the point j where this latter line intersects ff is a second point on the strike-line of $A'A'$ locating the same.

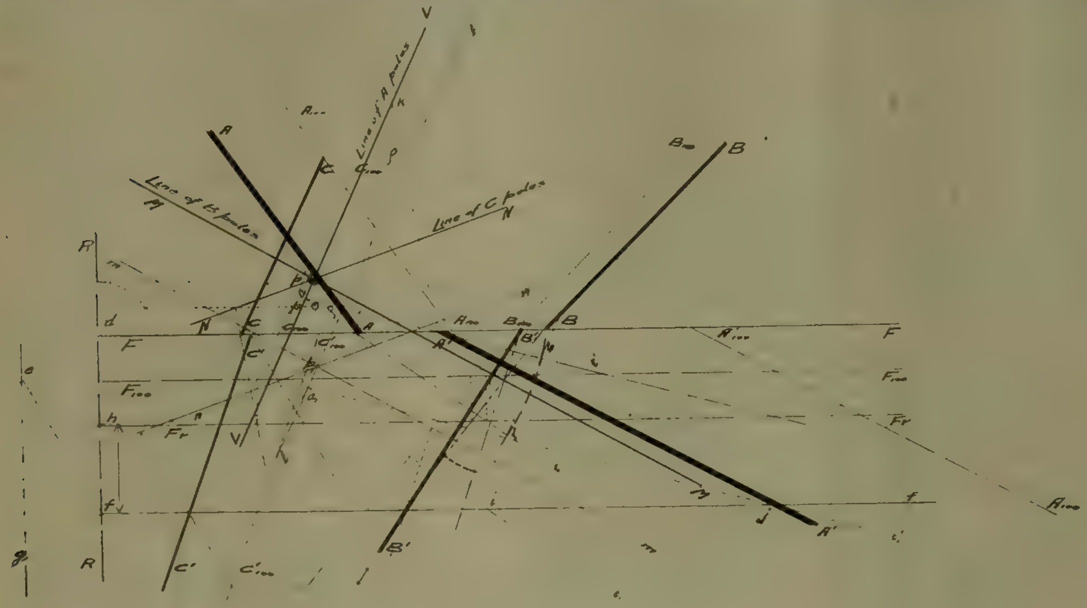


Fig. 15.

The intersection of the lines of poles at p' locates the point at which the desired poles of rotation pierce the parallel plane when the latter is in the horizontal position, and p is the projection of this point when the fault plane has been revolved back into its original position.

Discussion.—It can be shown that if a number of strata have been affected by the same set of combined translatory and rotary fault movements, their lines of poles, determined under the assumption that the movement is of pure rotation, should intersect in a point. As already suggested, this point locates what may be termed the 'equivalent pole' about which an angular displacement, as shown by the rotated fault-plane traces, will produce the same result as the actual successive movements have done. This concept of an equivalent pole may be used in investigating the question whether a portion of the fault movement antedates the formation of the younger stratum. Further application, however, can hardly be covered by simple type solutions. For instance, if it is found that angle p, determined by the intersection of the fault plane traces of the two portions of each stratum, is not constant, it may be necessary to use the data collected during a geological investigation of the area to determine whether the observed structure was the result of rock flowage taking up a different portion of the movement for each stratum, or whether a portion of the rotation took place before the formation of the younger stratum. Or if the angle is approximately constant, but the line of poles does not intersect, this may be due to a translatory movement antedating the younger stratum, or to varying rock flowage. Of course the smaller the area involved in the study, the less the effect of changing rock flowage, and the less complicated the problem.

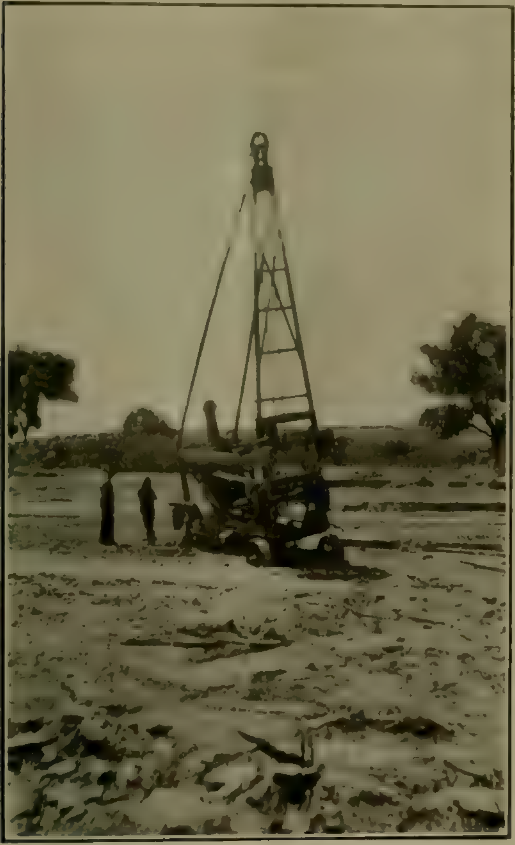
IN driving an intake tunnel, in 1906 and 1907, from the power plant of the Central Pennsylvania Traction Co., at Harrisburg, Pa., to the Susquehanna river, a distance of 1100 ft., it passed through limestone and was from 5 to 20 ft. below the river level. In sinking the midway shaft and driving the headings for 200 or 300 ft. each way from the shaft, H_2S gas was encountered in such quantities as to cause serious inconvenience to the men, and for a time artificial ventilation was necessary. The gas affected the eyes, and the men required frequent medical attention; occasionally their eyelids were swollen so much that their eyes were entirely closed for a day or two. The tunnel passed directly under the yard of the Central Iron & Steel Co., and near two blast-furnaces, and the gas was attributed to the furnace-slag filling which was used extensively around the yard of the steel works. At Cripple Creek large quantities of nitrogen gas exist in the stoping ground and when the barometric pressure is low finds its way into the working places, often causing work to stop temporarily.

THE process of making sand-lime brick was invented in Germany, where it probably has had its greatest development. Observations made there seem to prove that sand-lime brick is a building material which will resist soot. Three years ago an inn was built in Greifenhagen, in which sand-lime brick was used for everything but the lining of the chimney flues, which were built of common brick because at that time the question whether sand-lime brick was equally resistant to fire had not been settled. In spite of the fact that lignite briquettes were burned, soot was found in the flues in a short time, and the flue bricks were permeated as high as the rafters of the ground floor. When the flues were pulled down it was found, however, that the sand-lime brick were entirely unharmed and white in color, in spite of the fact that the brick walls were only about 4½ in. thick. If this experience is repeated elsewhere, it is stated, the fact will be established that sand-lime brick is the best building material to withstand soot.

Prospecting for Gold on the San Juan River

By Robert Livermore

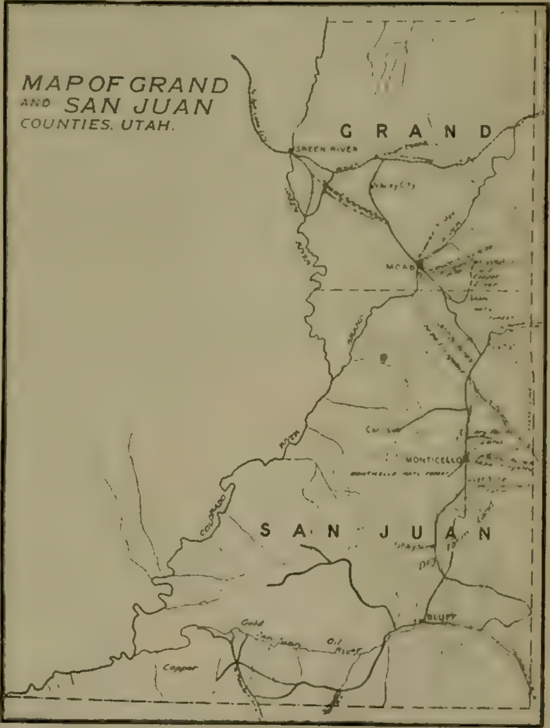
In the summer of 1900 I was engaged to take charge of an outfit to prospect the sands of the San Juan river, in southern Utah, in the hope of finding gold deposits of sufficient value to justify the installation of a dredge. The outfit, consisting of a No. 3 Keystone drill, with the necessary pipe and equipment, was unloaded from the cars at Mancos, Colorado, and after being set up was started out under steam. Bluff City, Utah, a Mormon settlement on the river some 90 miles away, was to be our destination and future headquarters. A fair road for the first 20 miles to Cortez, Colorado, and for 20 more down McElmo creek, by pleasant fruit and alfalfa ranches, made fairly easy going, but from there on the vicissitudes of traction progress were such, from bad roads, alkaline water, and almost impassable sandy 'washes', that at the Yellow Jacket wells, where it was necessary to leave the settled country and make a forced march across 20 miles of waterless desert, a council of war resulted in abandoning the aid of steam and falling back on that of fourteen good horses, recruited from our supply wagon and from ranches along the route.


BAD GOING.

We progressed 10 miles into the desert the first day, and there I sent the horses back to water and camped with the drill, undisturbed except by a wandering Navajo and his squaw, who stopped to ask in Spanish a few wondering questions, and to beg a little food, and then vanished in the dusk, doubtless much perplexed at the strange ways of the white man. A steady pull the next day brought us to the broad valley of the San Juan, and camp was made upon its banks, where ample water and green grass refreshed our weary stock, and a cool swim in the river and a plentiful camp supper helped us to forget the discomforts of desert travel. Ten miles of sand along the river, through green cottonwood groves, and under towering sandstone bluffs, brought us near Bluff, where another camp was made, and early the next morning we pulled through town, escorted by fully half the population, and by noon were drilling our first hole on the broad flats below the settlement.

AT WORK DRILLING.

Bluff City and its surroundings merit a short description. Here, remote from the conveniences of civilization and from markets, the Mormons, who, whatever their faults may be, are certainly good colonists, established a settlement some thirty years ago, and by their industry built up a most thriving little community. The first settlement was made some eight miles above the present site, but a great flood swept away their houses and covered their fields with sand. Nothing daunted, however, they built anew the present site, and now have a thriving town of stone houses, pleasant shade trees, and beautiful orchards. Beyond the town lie the fields of alfalfa and corn, watered by a good ditch kept in order by their common labor. Above them tower the steep bluffs which give the town its name, and across the river lies the Navajo reservation, with whose inhabitants they have friendly trade.



The cliffs along the river abound with most interesting remains of the old cliff dwellers who once inhabited the valley and pastured their flocks along the river banks. There are no large ruins, such as the famous cliff palace at Mesa Verde, but there are many well preserved single houses and small villages, perched in nearly inaccessible caves in the cliff faces, with rude steps cut in the sandstone, by which the dwellers reached their homes, still visible. On the smooth rock faces are numerous examples of picture writing, remarkably clear, and drawn with a good deal of skill; one large rock in particular, some four miles below Bluff, is fairly covered with well executed drawings of men, goats, snakes, and various mystic signs. Among the most curious carvings is that of a man shooting, with bow and arrow, a running deer, in which the arrow's course is shown as a straight line, running from the bowman's hand to the deer's heart. Another very curious and often pictured figure is that of a man with goat's horns playing a pipe, or else a goat, upon his hind legs, with the same musical instrument. It seems a curious suggestion of the old Greek Pan.

What manner of people the cliff dwellers were, how they lived, and how they died, is a most fascinating subject, and one which was of great interest to me in the intervals of work; but it is hardly of professional interest. I cannot leave the subject, however, without a mention of one ancient settlement which a companion and I happened upon by chance in the trip across the desert. We were riding some miles ahead of the main outfit, and had exhausted the water in our canteens. My companion had heard of a good spring of water said to exist in a cave in one of the gulches, a mile or two from the road. Upon recognizing the gorge from descriptions received, we rode up the dry and rocky stream bed to its head, and there were well rewarded for our pains. A great cave encircled the head of the gulch, and in the smaller crevices were built the houses of the ancient denizens. Perched on a great rock overlooking the surrounding mesa was a round fort or watch-tower, strongly and carefully built of rock. This tower was very well preserved, even the ends of the cedar joists used for floor beams still showing in the walls. Far back in the largest chamber of the caves was a beautiful clear spring, the seepage water of which had caused a luxuriant growth in the soil of the gulch below.

As we sat in the shady cave, enjoying the cool water and looking out over the green little amphitheatre, we pictured to ourselves the busy life that had existed here so many years ago. Above in the watch-tower had been the sentinel looking out over the mesa with its pastured flocks, alert for alarms; below, the village about its daily tasks; goatherds passing out with their flocks; laborers to the fields; water carriers with gaily colored jars, whose fragments now lay here scattered, waiting their turn at the spring, and all the other life of a prosperous tribe, now gone forever.

The company for which I was prospecting had options on several miles of territory above and below Bluff, and wished that summer to definitely ascertain whether the preliminary work would justify further systematic exploration and the eventual construction of a dredge. I therefore planned to drill as many holes as possible in the short time available, to get a general idea of the conditions, and later, if warranted, to block out the ground systematically. During this examination only the preliminary holes, some twenty in number, extending for about five miles along the river, were drilled.

Near Bluff the valley is a mile or more wide, and in times of flood the water covers more than half of its width. The banks, on which are the houses and fields of the settlers and the 'hogans' of the Indians, are of loam underlain with sand, and, were they of sufficient value, would be ideal for dredging ground. Bluff was the scene of a gold excitement in the eighties, when many a weary prospector footed it back to the railways after it had been found that the profitable placers were decidedly limited in number and extent. At various points along the river I believe that attempts were made to extract the gold by mechanical means—with what success I could not at that time learn—but I believe that my outfit was the first to explore by modern methods the river flats for dredging ground.

Drilling in a country as far remote as this is somewhat more complicated, and necessarily more expensive, than in a settled country, such as California, where good roads abound, machine-shops are handy in case of a breakdown, and labor is plentiful. I found it necessary to establish a camp near which several holes could be drilled; then to move, usually some two miles, to the next place. The expense and labor of moving was greatly increased by the fact that the main drive pinion was so badly worn by sand on the trip in that, upon our first attempt to move under steam, the teeth were ripped off, and not having foreseen such a contingency, we were forced to depend upon horses for the rest of the summer. The horses available were good, bad, and indifferent, mostly the last, and as the sand was unusually deep, a good many of them were required.

In places we found quicksand, so that much time was lost in corduroying roads in advance of the machine; and in spite of all precautions we were more than once badly bogged and had to extricate the drill by a process of plank laying, jacking up, and repeating, till at last a firm bottom was found. In one move across a branch of the river, we made a very firm road by the simple process of riding to and fro until what had been a very dangerous quicksand became firm enough by the continual pounding to afford a splendid crossing. The illustrations show some of the difficulties.

Our crew was as follows: One engineer, one fireman, myself as panner and weigher, a man and team to haul water and fuel, and a camp cook. I kept from two to four Navajo Indians busy chopping wood for fuel for two weeks. These made very good workmen, and did more work at a dollar a day than many self-styled workmen I have met since did at three. The moving, about once every two days, required a varying number of horses, sometimes as low as four, and as high as fourteen. The actual drilling, as figured out from my notes, cost $1.70 per foot, including all wages, food, chopping, fuel, and water hauling. The cost of moving came to about 50 cents per foot, making $2.20 in all, or about $900 for the 20 holes drilled. The cost of the expedition, allowing for depreciation on the drill (about one-half), freight, moving the 90 miles to and from the railroad, preliminary work, and traveling expenses was, of course, much greater than this. In fact, by far the largest expense of prospecting such a district occurs outside of the actual drilling.

Work was started as early as possible in the morning, and continued, if necessary, to dark. Amusements being few, and unions non-existent, we did not feel it incumbent to quit at the stroke of time. Harmony and willingness to work was the rule. The process of drilling did not differ from that usually followed in prospecting dredging ground, and few difficulties were encountered in the actual driving of the hole to bedrock.

The procedure was as follows: The first length of casing was set up in a hole previously dug, and pounded down through the top loam as far as possible by the lugs on the drill stem; then the soil was drilled and pumped to the bottom of the casing. When gravel was reached, the pipe was driven ahead a foot or two at a time, and the drillings pumped out and poured into a wooden sluice box. It was necessary to drive the pipe farther than usual when quicksand was met in order to prevent the sand from running in, but usually the sand and gravel were found to hold quite firmly. Bedrock of soft sandstone was found at an average, and almost uniform distance for all holes, of 17 ft. The character of the drillings showed invariably small gravel and sand with no boulders, and little clay. The drillings from the sluice-box for every two feet were rocked down in a 6-ft. smooth-bottom rocker, the concentrated sand panned, and the gold taken up with quicksilver, parted with nitric acid, and weighed. In calculating results per cubic yard, I used the factor 0.27 for a 6½-inch (outside) casing.

My notes show that the gold was very fine, in fact, much of it 'float' gold. It was about evenly distributed through the sand and gravel to bedrock, with no perceptible in-

[illegible] on the dredge. A sample page from the log reads as follows:

Hole 16.

Began Aug. 25, 1:45 p.m.
Finished Aug. 26, 8:45 a.m.
Drilling 6 hours.
Repairing 1 hour.
Moving 2¼ hours.

Situation: About ¼ mile E. of No. 15 on river bank in cottonwoods. Big drill house on Navajo side bears S. 42° E. ¼ M. Paint Bluff bears N. 42° W. ¾ mile.

Surface—10½ ft. mud, sand, and gravel, no colors.
10½ to 13 ft., gravel, 1 color, 2 specks.
13 to 14½ ft., gravel, 4 colors.
14½ to 16 ft., sand, 2 colors, and float gold.
16 to 18 ft., sand, 10 small colors, and float gold.
18 ft., bedrock, soft red sandstone.

Notes—Gold very light, with tendency to float. Surface water 4½ ft. Bent derrick brace, 1 hr. repairing. Moved to No. 17 with 10 horses. Stuck once in quick; had to jack up. No wood, no water, till late. Built road and did not drill rest of day.

ANCIENT CAVE DWELLINGS.

It is reasonable to suppose that the San Juan river flowing, as it does, through the richly mineralized mountains of the same name, might well contain in its sands sufficient gold to warrant the construction of a dredge. Whatever may be the value of other parts of the river, the results obtained over the ground I drilled did not encourage my employers to proceed further, and I was instructed to pull out. On the return trip the movable parts of the machine were knocked down and loaded in wagons. The whole undertaking was contracted to the Bluff people, and the rig arrived in Mancos in due time at moderate expense. There, the drill was set up again and housed for the winter, and the crew disbanded. I have examined some fields since then, both with the aid of a drill and without; but count this as one of the most interesting in incident, if not in financial results.

Filling in Maps

By [illegible] A. Sperry

Though the method of filling in topographic maps by the use of photographs is known by many engineers, it is surprising that its details are so little understood and that use so seldom is made of it. It must be admitted that it can not be employed in all cases, but, on the other hand, there are many in which it is of great value and assistance, especially to individual engineers or small parties working on a short time allowance in the field.

As in all topographic work, the first step is the establishing of a system of triangulation, the extent of which depends entirely on the needs of the case, and must be left to the judgment of the engineers. As the results of the work from the negative depend strictly on the focal length of the lens employed, it is quite essential that having once determined this value, it be accurately maintained, so that there will be strict uniformity in the negatives. It is therefore advisable to use a camera having a fixed focus, the length of which has been accurately determined by the use of the transit. It is of course possible to use an ordinary camera for the purpose, but great care must be exercised in setting up that the same focus, once established, is used throughout the work. The importance of this will be apparent in the following description and explanation.

An accurate spirit level must be attached, in order to maintain a true horizontal position of the camera. There are two position lines which must be indicated on the negative; one being the true horizon line, the other the vertical centre line of the field. These two lines should intersect at the centre of the negative, obviously at right angles. In case it is found necessary to raise or lower the field of view this must be done by raising or lowering the lens vertically without affecting the level position of the camera. Should this be done, however, a note should be made of the exact distance that the lens is moved from its central position, so that it may be allowed for when the negative is being used. The position of these two lines on the negative may be shown by attaching pointed metallic strips to the inside of the camera, a short distance in front of the sensitive plate, so constructed as to extend into the light rays before reaching the plate and thus causing sharp clear images at the margins of the negative, showing the points between which these line extend. (See Fig. 1.)

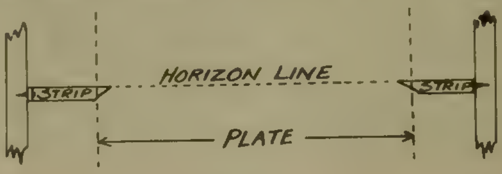


FIG. 1.

This applies to the establishment of the centre line of field also. There are three adjustments which should be determined and corrected. These are: first, the setting of the lens so that its axis or the centre point of field shall be coincident with the centre of the negative; second, the location of the horizon line; and third, the determination of the focal length of the lens. These are given in the order in which they should be made. In the first, it is presupposed that the axis line of the lens is at perfect right angles with the surface of the plate; or, in other words, the front board is parallel to the plate. Sights may be placed with reasonable accuracy on top of the camera on the centre line, for convenience in operation. A sharp, distinct, vertical line should be drawn on the ground glass, through the centre.

Set the camera up and carefully level it. Turn it on some object such as a building, pole, or plumb-line which has been determined to be perfectly vertical. Turn the camera so that this vertical line is in line with the sights along its centre line, always maintaining its position at right angles to the plate. This adjustment will also check the level used on the camera. Having thus fixed the centre line of field, the horizon line should be determined by the use of the transit or level. Set the leveling instrument up at the same height as the centre of the lens of the camera and note several distant objects which are on the same level. Mark the position of these on the ground glass. By drawing a line connecting these the horizon will be determined. Should this line intersect the centre line of field at or very close to the centre of the plate the lens is in proper position. In case there is considerable difference it would be well to raise or lower the lens to bring it to this position, approximately at least.

On these two lines, in the ground glass, construct a rectangular figure as shown in Fig. 2, and the focal length can then be determined. In this figure it is assumed that 5 by 7-in. plates are used, as that size seems to be most convenient for general purposes. The vertical lines at the ends of the ground glass should be carefully drawn at equal distance from the centre line of field; for convenience in operating this distance should be such as to represent an even angle, for reasons given later.

The focal length should be determined by means of a transit, and can be done as follows: Set up the camera over a fixed point, and turn it so as to bring some especially distinct object on the centre line of view. Select some other object on either side and next carefully measure the distance in inches between as shown on this ground glass. Make a number of these measurements, so as to check thoroughly. Take down the camera, and set the transit on this same point. By using the object noted as being on the centre line of view, as 0° the angles of the various objects noted and measured can be determined.

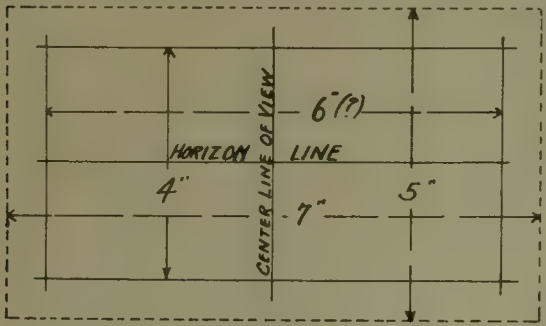


FIG. 2.

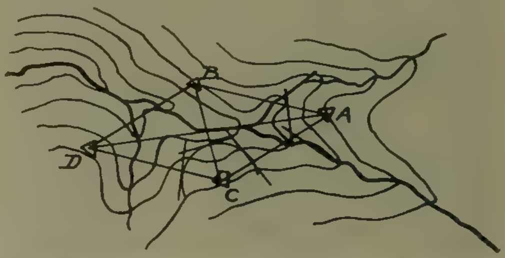
By the method of similar right angle triangles the distance from the focal centre to the plate can be readily determined. For example; the distance from the centre line of view to an object is 2.65 in., and the angle subtended is 16°25′, we have the equation tan. 19°25′ : 2.65 = rad. : 7.25, which is the focal length as employed. To fix the vertical lines at the ends of the ground glass at a point representing an even angle, as mentioned above, we would have tan. 19°25′ : 2.65 = tan. 20° : 3.04.

The camera is now ready for work in the field. After having established the triangulation system, as indicated, with the location of the viewpoints as advantageous as possible, the various sets of views can be taken. Some judgment should be exercised in the orientation of the views. In each set some one of the views should be so directed as to show one of the other viewpoints on the centre line of field, as this will add materially to the convenience in platting. The following sketch will serve to illustrate. At point *A*, the middle view of the set of three plates will have point *D* on the centre line, and so on. The special reason for this is that in determining angles with the centre line as the 0° point, the line *A D* of known bearing will be the basis, thus simplifying the operation.

The adjoining views should lap at least one-half inch, as at that point the objects will be clear and distinct, and also this will allow a margin in case of injury to the emulsion in development or manipulation. After taking the first view, some prominent object should be noted on the vertical line at the end of the ground glass, toward which the camera is to be swung. Swing the camera so that this object shall coincide with the line at the other end and thus make a swing equal to the angle subtended by these two lines. As indicated above it would make for convenience to have these lines include some even angle. By repeating this operation the full set can be taken with a systematic relation between the negatives.

By calculating on the negatives the angles between points, of which the angular difference has been previously determined by the transit, the work of the camera can be carefully checked. Should there be a persistent difference between them there is reason to conclude that the focal length of the line has not been correctly computed, and correction should be made. Negatives made for this purpose should be developed denser than usual, in order to bring out all details sharply and clearly, for on this depends the value of the work, namely the amount and clearness of detail to transfer.

In order to readily work from the negative it should be held at an angle of from 30 to 50° from horizontal according to personal preference, so that a clear white diffused light may be transmitted. This is accomplished by the use of a stand similar to the retouching stands used commonly by photographers. The negative should lie, emulsion side down, on a ground glass on which two lines are drawn at right angles to each other. The negative is so placed that one of these lines is coincident with its horizontal line, and the other with its centre line of field.



SKETCH SHOWING ARRANGEMENT OF VIEWPOINTS.

It might be well to state at this point that neither films nor prints should be used for this purpose, as both are liable to distortion. Glass plates should be employed, as they preserve the proper proportion and relation perfectly.

After having located the triangulation points on the paper on which the map is to be made, a circle with a radius equal to the focal length of the lens should be accurately described around each point of view. This circle represents the section of a sphere with which the plane of view (the negative) comes in contact tangentially at the point of intersection of the centre line of field and the horizon line. It is, of course, perfectly vertical. If, as suggested, one negative of the set has been taken with some other triangulation or view point on the centre line of field, and consequently having a given bearing, the position of this negative can be readily fixed by drawing a line at right angles to the given line, and tangential to the circle. If this has not been observed it will be necessary to determine the angle between the centre line of field and the given line, and by laying off another radius on this angle the 'negative plane' may be located by drawing a line tangential to the circle at the point cut by the new radius.

By using a properly constructed lens all vertical lines are parallel at all points of the negative. As a consequence all horizontal angles are determined by measuring the distance from the centre line of field, and using this distance as the tangent of the angle with radius equal to the focal length of the lens. Were the sphere alone considered there would be a convergence of these meridians, or lines of equal azimuth, to the pole of the sphere, but inasmuch as these lines are projected through the surface of the sphere to the 'negative plane' this convergence is overcome, and they become parallel. This is desirable to [illegible] demonstration of which will not be entered into in this paper. To illustrate, in moving from the centre line of field to a line that an object is 2.25 in. distant. Assuming the focal length of the lens to be 7.52, we have the following equation: 7.52 and 2.25 = tan. 20°39′.

With the vertical angles the case is different. While the horizon line is perfectly straight and continuous in all the negatives the imaginary lines at given elevation angles are not parallel to it in the negative. As before, only in reverse, if the sphere were considered only, these lines of latitude, as it were, would be parallel, but as they are projected to the 'negative plane' there is obviously a divergence. To illustrate: in the view shown, the horizontal lines are all normal to the vertical lines. On the centre line of field all angles of elevation or depression will be calculated in the same manner as angles of deflection. This is because the initial point of the angle is located at the point of contact between the sphere and the 'negative plane.' Thus the roof line at its intersection with the centre line of field will be computed by measurement of the distance from the centre line of field, this distance being used as the tangent reduced to the simple radius of the sphere.

In computing the angle of elevation of the point in the roof line at the end of the building, however, a new set of factors enter. While the point on the roof line at its intersection with the centre line of field is directly above the point of contact between the sphere and the negative plane, or the centre point of field, the point at the end of the roof line is directly above the outer end of the secant of the horizontal angle between the centre line of field and this point.

As the actual distance between the horizon line and the roof line is constant at all points, and as the secant of the horizontal angle must be used as the radius of the new angle, it is clearly evident that the elevation angle of any point outside the centre line of field will be in inverse proportion to the secant of the horizontal angle between it and the centre line of view. Thus the rule for determining the vertical angle of any object may be stated as follows: The tangent of the angle of elevation (or depression) of any object in the negative equals the vertical distance from the horizon line divided by the focal length into the secant of the horizontal angle between the centre line of field and the object. To illustrate: supposing the focal length to be 7.52 in. as above, the object 2.25 in. from the centre line of field and 3.15 in. above the horizon line. The horizontal angle has been determined at 20°39′ by the equation $\frac{2.25}{7.52}$ = tan. 20°39′. The natural secant of 20°39′ = 1.064. The radius or focal length = 7.52. 1.064 × 7.52 = 8.00 or the actual secant. This being used as radius the angle and the vertical distance as the tangent of the vertical angle we have the following equation:

$$\text{tan. X} = \frac{\text{vertical distance}}{\text{focal length} \times \text{nat. secant of hor. angle}}$$

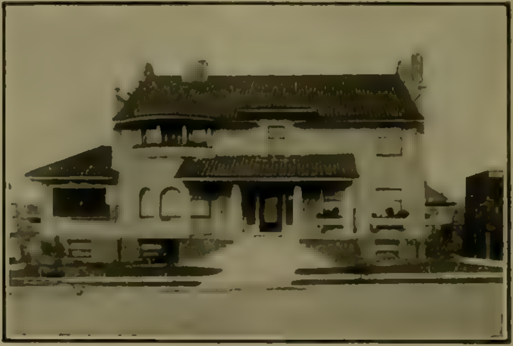
or $\frac{3.15}{1.064 \times 7.52}$ = 0.39375 or tan. 21°29′, the angle sought.

Only the horizontal angles are transferred directly to the plat, the vertical angles being used only for the computation of elevations of objects after their location. After having calculated a few important angles so as to thoroughly locate the positions of the various negatives the mass of the information can be transferred by simple measurement. The position of each negative of each set should be shown by a line drawn tangential to the circle at its proper point. Each negative should have a number corresponding with that of the line.

By placing a scale graduated to $\frac{1}{100}$ of an inch so that the 0 corresponds with the centre line of field a common triangle may be run along the ledge on which the negative rests, and the distance of any object from the centre line of field read off at once in inches and hundredths. As the line representing this negative is in exact correspondence on the plat, it is clear that the direction line passes through the negative line at the same distance from the radius to which it is tangential in the plat. Note the distance on the negative line and draw a line through it from the centre of the circle or the point of view. The line of direction of this same object from some other point of view is likewise determined, and by protracting them to intersection the position is shown. A third line, from still another point of view, will check it. This process can be carried on indefinitely.

In determining elevations by the vertical distance, the tangent of the angle of elevation or depression into the distance of the object, as indicated on the plat of course, gives the relative elevation above or below the centre of the camera. After calculating the elevation of a number of prominent objects for checking purposes, the mass of detail may be more roughly determined, if it is so desired, by the use of a diagram made on a thin sheet of transparent celluloid, the lines on which show the curves of equal angular elevation. This diagram should be made for the focal length of the lens employed in each case. By using the formula, vertical distance for a given angle of elevation = tan. A × (focal length × secant B) in which A = the vertical angle assumed, and B = the horizontal angle from the centre line of field at which this vertical angle is taken, these curve lines may be constructed at as frequent intervals as may be desired.

By laying this diagram under the negative with the centre lines of field and the horizon lines coincident, the angles of elevation or depression of the various objects and points may be very closely read by interpolation, and from these the elevations readily calculated. In the selection of a lens for this purpose it is not advisable to choose one of a much wider angle than 60° on a 5 by 7-in. plate. This gives good general details and illumination, and is less liable to distortion than those of wider angle. In any case the lens must be perfectly isometric and rectilinear as well as perfectly free from astigmatism. It is hoped that this brief explanation of the use of photography in filling in maps may be of service to engineers in the field.



VIEW SHOWING HORIZONTAL AND VERTICAL LINES.

FOR PRIMARY LEVEL LINES standard Y levels are used by the U. S. Geological Survey; lines are run in circuits or are closed on precise lines, with an allowable closing error. The standard bench marks, which are established by the Survey at different points, are of two forms. One form is a circular bronze or aluminum tablet 3½ inches in diameter and ¼ in. thick, having a 3-in. stem, which is cemented in a drill-hole in solid rock in the wall of some public building, a bridge abutment, or other substantial masonry structure. The other form, used where masonry or rock is not available, consists of a hollow wrought-iron post 3½ in. outer diameter and 4 ft. in length. The bottom is split and spread to a width of 10 in., to give stability, when planted. A bronze or aluminum-bronze cap is riveted over the top of the post. A third style of bench mark with abbreviated lettering is used for unimportant points. The tablets, as well as the caps on the iron posts, are appropriately lettered and stamped with numbers representing the altitude of the bench mark.

Cave-Ins in Oil Wells

By Dorsey Hager

An oil well is producing oil at a steady rate, one it has maintained for several months with but slight variations in flow. Suddenly the well ceases, or almost ceases, to flow. Some trouble has befallen the well, but what this trouble is generally puzzles the oil operator, especially when the rods, tubing, and well pump are all found intact and in good working condition. A bailer or sand bucket is let down in the well by means of a cable. The bailer fails to reach the bottom of the hole. Apparently it has reached a collapsed place in the casing and cannot sink any farther.

The bailer is withdrawn and its contents dumped into a box made for this purpose. Oil and a fine sandy shale constitute the mixture that rushes into this dump-box. Interspersed through this oil and fine shale hard lumps appear, which upon examination prove to be lumps of compact shale. This shale gives the clue to the trouble.

Overlying most of the oil sands of the California fields is a layer of soft, friable, fine-grained shale. This shale roof confines the oil to the coarser grained sand beneath. When this roof caves in it becomes a source of much expense and trouble to the operator. It is generally understood that when a well is first 'brought in,' or first begins to produce oil, it should make large quantities of sand. So general is this belief that a well which produces little sand at first immediately becomes the object of suspicion. The withdrawal of this sand—often 50,000 to 100,000 cu. ft.—supposedly causes the formation of a large cavity in the oil stratum wherein the oil may gather to form a pool. Such a condition is certainly very desirable under some circumstances, as activity of this kind would give a much larger collecting area for the oil than a cavity with but the diameter of the casing. But the oil operators do not consider that the loose sands of this region will allow such a favorable condition to exist for any length of time except under unusual circumstances.

An examination of the oil sands of California proves them generally to be clean, unconsolidated quartz sands. These sands do not form a sandstone, nor will they stand up rigidly like sandstone. Their tendency is rather to flow, especially when saturated with oil. Further, a study of the angle of repose of these sands (the angle or slope at which the sand will lie, due to the friction between its grains), shows that the average value for this angle is a trifle over 11°, or approximately 20 ft. in 100, a grade of 20 per cent.

Consider a typical case. The illustration shows two oil sands, A and B, separated by a stratum of shale. Above A is another stratum of shale, intercalated or interlain with several sandstone beds, each several feet in thickness. Above the top shale is a water sand, W. The oil sands have an average dip of 17 ft. in 100, or nearly 10°. (The thicknesses given in the figure are typical.) Suppose that oil and sand are pumped from the well in large quantities. The remaining saturated sand seeks its angle of repose, the angle of 20 ft. in 100. This angle is greater than the angle of dip of the oil stratum.

Consequently a cavity will occur at the top of the oil sand and around the casing (where the angle of dip is equal to, or greater than, the angle of repose no cavity would exist). The roof overlying this cavity is left unsupported. As this is formed of a soft shale it soon begins to crumble, especially as it is washed by the oil in the pool below it, and affected by the suction of the escaping gas and oil which are drawn upward from the well. The bottom layer of shale, an inch or two in thickness, is considerably harder than the shale above it, and when this layer gives way crumbling proceeds very rapidly. Now any unusual disturbance will precipitate a cave-in or fall of the shale roof. Excessive suction due to swabbing, to a long pump stroke, or to very high pumping speed will create sufficient disturbance to cause a fall.

The cave-in may result in collapsing the casing, in sweeping it entirely to one side of the former hole, or may not affect the casing at all. However, the shale now rests upon the oil sand and totally fills the former cavity below it. As this shale forms an almost impervious cover for the oil sands, no oil will rise into the open casing above the oil sands. In many instances some oil does rise above the shale blanket, though not a very large quantity.

If the casing has not been too greatly damaged it may be brought back to its normal cylindrical shape by means of a swedge, a round-nosed tool, tapering from a small diameter at the nose to a larger diameter slightly less than that of the casing. The nose first enters the injured casing, and as it is gradually driven downward enlarges the opening until the casing regains its proper shape. Now the bailer is introduced into the hole and the shale bailed out, if possible. Generally it is necessary to resort to drilling tools to penetrate the compact shale. The drill-bit loosens the shale, which is then bailed out until oil begins to freely enter the casing. Then the well is put to pumping again. This cleaning-out process may call for a week's time, or for months, depending upon the quantity of fallen shale.

In the figure is shown a sandstone layer, 5 ft. thick, overlying the shale above A. The caving will extend to this sandstone bed, and must then stop, as the hard sandstone will not cave in readily. As this is the case, the shale that has fallen will be like a blanket upon the oil sand beneath. When this blanket-like layer of shale has been drilled through the sand below the shale will furnish oil freely. However, no cavity favorable for the accumulation of oil will exist immedately above the oil sand. Where the fall of shale has not been too great it is possible to clean all the shale from around the casing, but generally this is not the case, as the cave-in extends clear to the sandstone bed near the centre of the shale stratum. Some of the fallen shale may be bailed out of the hole, but the shale, on the whole, forms a compact layer that remains packed around the casing. Danger from cave-ins is now past, but the presence of finely disseminated shale in the oil causes much trouble in operating the well.

The example given above is a general case. There are other speial conditions and cases where cave-ins do more than merely cause a temporary stoppage of production, and require a week or two for treatment. In some instances the casing may be so greatly damaged that it must be replaced with new material. This calls for a period of time generally exceeding a month, and not uncommonly several months. Sometimes the well must be re-drilled. Where a water stratum overlies the shale and no sandstone partings are present to prevent caving, water is admitted to the oil-zone. This may cause the abandonment of the well and endanger the life of a whole field unless some way is found to shut off the water, which is not a simple matter under such circumstances.

We have so far considered conditions favorable for cave-ins. There are, however, several conditions that are unfavorable. Briefly these are three in number. (1) Where the oil stratum consists of a coarse gravel formation; (2) where there is a thickness of several feet of sandstone immediately overlying the oil sands; (3) where the angle of dip is equal to or greater than the angle of repose of the oil sand. The first condition is found best illustrated at McKittrick. In this field some of the oil formations consist of pebbles which are larger than the perforations in the casing. As the pebbles cannot enter the casing, only the fine can do so; the consequence is an oil stratum without a cavity above it. The pebbles act as natural strainers, the large interstices offering free channels for the inflow of the oil.

It is obvious that where a hard sandstone roof overlies the oil sands the cavities below the roof are not likely to cause cave-ins, especially if the sandstone, or 'shell,' is sufficiently thick to withstand the pressure above. Such a condition quite often occurs in the oilfields. A thickness of 5 ft. should insure safety, especially when other sandstone layers occur in the formations above the shale.

The third condition requires that the dip of the oil stratum be equal to or greater than the angle of repose. If the dip is greater than the angle of repose the sand of the stratum will replace the sand that is withdrawn from the well. As a consequence, the cavities will occur around the casing, but will extend at some places upward to the cap and at a considerable distance from the well. The column of oil standing in a well will modify the tendency of the sand to cave in. A column 1000 ft in height would exert a pressure of 100 lb per square inch where the oil possesses a gravity of 22° Baumé.

The present method of perforating casings appears to invite cave-ins. The perforations are generally oblong in shape and vary in size from 1/8 by 3/4 to 1/2 by 1 1/2 in. The large perforations admit sand freely, as this seems to be desired, the perforations serve their purpose. The withdrawal of the sand, however, results in cavities, and, later on, cave-ins, with the attendant expense, trouble, and sometimes permanent injury to the well or oilfield. That these cave-ins can be avoided is unquestionable. The use of strainers or screens, which allow only the finest sand to enter the well, would do away with the trouble so prevalent in the California fields. The strainers consist of lengths of casing with horizontal slots cut in them, the slots having a width slightly less than the diameter of the average sand grain of the particular oil sand.

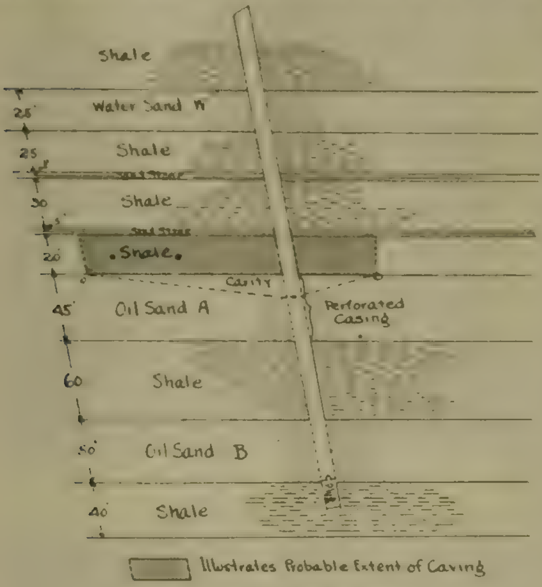


DIAGRAM SHOWING CAVING.

Screens consist of lengths of perforated casing wrapped with wire which is wound spirally around the casing. The width between the wires is slightly less than the diameter of the average sand grains for which the screen is to be used. These strainers and screens can be placed as liners inside the casing, which is perforated according to present methods. However, it is the opinion of many oil-men that strainers cannot be used successfully with the heavy gravity oil of California. There seems no valid reason for this. Strainers are successfully used in both Louisiana and Texas, with sands as fine if not finer than those of this State. Besides some success has been attained with strainers in the Sunset-Midway field. Not only this, but the pores or interstices between the sand grains of the oil sand are not as large as the slots in a strainer, or the spaces left between the wires of a screen. The question, however, is one of economy.

Is it cheaper to have cave-ins with the resulting trouble and expense, and with perhaps a large initial production, than to use strainers or screens and avoid cave-ins? The use of strainers or screens might reduce the initial production of a well, but would guarantee long life and little trouble.

The problems presented by cave-ins are by no means simple. They call for the exercise of thought and effort in overcoming their effects. The prevalence of these evils is so general, the expense of treating them so great, and the results so pernicious that it seems to me that more interest and more careful study should be given the subject than is the case at present. The effects are treated; what should be done is to reach the cause. Practise rather the old adage, "An ounce of prevention is worth a pound of cure," and cave-ins will cease to be a source of trouble.

Hints on Travel in Mexico

By G. L. Sheldon

I have had thousands of miles in the saddle, on the West Coast, and presume that similar conditions exist elsewhere in the Republic. An engineer making his first trip to Mexico is very likely to meet with some discomfort and disadvantages, which can be easily overcome by proper foresight. On leaving the coast—and there are few mines in the agricultural section—there are no roads, only trails, and it is necessary to take to the saddle.

If possible get a letter of introduction to some prominent person or firm at the point where saddle and pack mules must be obtained; tell him what you want, and leave it to him. It is best to see personally that the saddles and *aparajos* (pack saddles) are in good condition, strong, and durable. I once rolled three mules and packs down the mountain several hundred feet, because the leather string which tied the breeching to the *aparajo* was not strong. It broke going down the mountain, frightened the mule, which ran in behind the others on the narrow trail, and threw them all down the mountain. Have this man secure you a good mozo; a foot-man will do, if it is not too long a trip; but if out for any length of time, it is impossible to keep a good man and make him go afoot, as his feet invariably get knocked out. Never take a mozo who is not recommended by some well known man. The mozo is generally under obligations to his patron, and he will do what is right; otherwise he knows he will be held accountable. It is not safe or advisable to make a practice of traveling without a mozo, even if only for a day's trip. Americans who have been killed on the trail in Mexico have generally been alone or have abused their mozo. Some mozos are quite handy at cooking. The usual charge for mozos and for mules is ₱1 per day and expenses. If you are going into the mountains, never take a horse; feed is often poor and scarce, and a mule will do well where a horse will starve; mules accustomed to mountain trails are preferable. When you strike bad, rough, dangerous trails, a mule is far safer, as he is sure footed and careful; you can not force one over a precipice, even in the darkest night. A horse has too many feet; he does not know what to do with them all when he gets into a bad place; and with a spur he can be driven over a cliff at any time. Always wear spurs when riding mules; they have much respect for a spur, even when they care nothing for a whip or quirt. I much prefer the macho or male mule, as he is more quiet and gentle; the mare mules are of a more nervous and treacherous nature.

You will find that you must always pack your own bedding in Mexico. While in the United States buy a large quilt, army folding cot, and have a canvas bag of 8-oz. duck made, 18 in. diam., 4 ft. long, with eyelets for small rope to tie with. Buy your blankets in Mexico; good blankets are cheaper there than in the United States. Fold your quilt double for a mattress, and you have always a good bed, above the ground, away from venomous reptiles and insects. While there are not many of these, one sleeps better and does not get nervous and restless thinking of them. If you are in Mexico during the winter months you will need plenty of bedding, even in the lower country where there is no frost, otherwise you will get chilled through toward morning. There is room enough in your sack to roll up with your cot and bedding an extra suit of clothes, and the whole pack will not exceed 25 pounds.

When going several days' trip, I much prefer to pack provisions and camp out. Feed and water are abundant in the mountains; you will live better and make more miles than if you stop at ranches, as you can get started earlier in the morning. There are many trails in the mountains where one is obliged to camp out, which is possible with comfort and pleasure for nine months in the year on the west coast. Buy coffee, tea, sugar, flour, baking-powder, soda, salt, potatoes, rice, sago, oatmeal, a piece of bacon for the lard, and any canned goods or dried fruit that you wish and can get. It is hard to get fresh meat, except in the larger towns, but you can always get dried meat. Take this and have some woman toast it, and mash it on a *metate* stone, so it will all pick up fine; keep in a clean sack. When on the trail, take a couple of handfuls of it in the morning, put it in the frying pan with enough water to more than cover it, let this boil 6 to 8 minutes. If you have any cold boiled potatoes left over from night before, slice them fine and put in the pan also. Take two teaspoonfuls of flour in a cup of water, stir till thoroughly mixed, put it in the frying pan while boiling, continue to stir, to keep it from burning, for a minute or more, till it thickens. You will relish this greatly, as one always has a good appetite when in saddle and camping out.

Eggs can nearly always be bought cheaply in Mexico. To carry them, buy a couple of morrals made of the maguey fibre by the Indians; they are about 8 by 12 in., with slings of same material to hang over pommel of saddle. Take along some old newspapers, and when you buy eggs at the ranches wrap them well in pieces of paper, put them in the morrall and tie it on the right-hand side behind the saddle. You generally carry your coat tied there; run one end of it through the string of the morral to steady it and keep from pounding; tie up short, and you will have no trouble. I have packed them 150 miles in hot weather and they were all right. With eggs and baking powder fine pancakes can be made; use a piece of bacon or suet to grease the frying pan. You can nearly always get limes, as they grow wild. The juice of a couple, with soda, eggs, and two or three lumps of sugar, make an even better pancake. If you prefer bread baked in the frying pan, use a little grease from the fried bacon, with baking-powder.

You will find the ordinary sample sacks which one buys for 50c. per dozen in the United States, just the thing for many of the provisions; a separate sack for each is best, then put all in a strong large sack for the pack. Don't pack heavy boxes for grub; it is not necessary, and as they begin to get empty the things will pound to pieces. For your kitchen, take a couple of 6-qt. pans, one for a wash dish and the other for bread-pan; place your frying pans in these, your plates in the frying pans, on top of the plates a large kettle, with two or three small ones nested in it, and cups in the smaller. All these dishes should be of granite ironware, which can be bought nearly everywhere in Mexico. Put a coffee pot on top, and wrap up your kettles and frying pans with newspapers or old cloth, as they get black in the fire. In this way things will be kept clean and from rattling on the trail; if you have trouble from this tuck in some palm leaves. Knives, forks, and spoons should be wrapped in paper or cloth and put in a common jute ore-sack; tie down tight, then put this sack into a heavier and longer strong sack. When you have your pack all cinched on, except the last or left-hand hitch, place your kitchen on top in the middle, tuck the top end of sack down under cinch rope from in front, double back over in the middle and cinch tight. Half-hitch and tighten the pack at the side, throw the rope over the top and around the cinch rope at opposite side, then back over to left side, behind, and tighten, but not so much as to injure the dishes. You will find it will ride all right and gives no extra weight to pack. Caution the mozo to be careful when the mule gets out of the trail, so that he does not knock the pack off under low branches of trees. I have packed dishes in this manner for years and they are still in good condition. A piece of canvas, 3 or 4 ft. square, spread on the ground makes a good table-cloth.

Be sure and get corn for your mules when passing some ranch during the day, put it in a sack and pack it on top of the cargo; you will find it at nearly all ranches and they will always sell to a traveler, just as they will always keep one over night. You are never turned away from a house in Mexico; at the poorest peon's or the rich haciendado you are made welcome to the best they have, and it is often hard to pay for it. Whenever they leave it to you to set the price, always pay what is fair and right, neither too much nor too little, but the customary price. Give your mules corn both night and morning; they will eat more when fed at night, but they are not nearly so apt to stray off. The morral makes a good nose-bag to feed them in. Put a small cowbell on the lead mule, and have the mozo take them to a place in advance of you, so that if they return during the night they will pass near you, as they will take the same trail back they were driven out on. Nine times out of ten the bell will awaken you, and the mozo can get up and drive them back; he will do this no matter how dark. It is best to always see personally that the mules are fed. When traveling it is best to lead and have the mozo keep the pack animals up with you; you will travel as far in a day, and if there is any accident, or the mozo needs help with the packs, you are there. When you go ahead and leave the mozo he may stop to visit or loiter on trail, then later run the mules to catch up, and your mules will soon be sore-backed.

If you do not pack to exceed 150 lb. on a mule, they will easily keep up with you; traveling in the mountains 25 to 30 miles per day, or in the level country 40 to 50 miles per day. Nine to ten hours in the saddle, day after day, is enough for man and beast. Take off the packs and saddles at noon and loosen up the cinches of *aparajos*. Just a lunch at noon and a short rest is sufficient, then camp earlier at night. Be sure and take plenty of small change with you to buy corn, eggs, fruit, fodder, etc., as it is almost impossible to make change at the ranches; if you cannot make change, you cannot buy. Of course, if you are only going a two or three days' trip, you do not want to bother with a lot of provisions; but even then you should pack some coffee and sugar in your morral.

When depending entirely upon the country, a visitor from the United States not accustomed to hardship is pretty apt to be disgusted; then nothing will look good to him, and he will probably not invest. By all means feed him well, take good care of him, and if you have anything of merit, you can interest him. Many a deal has been lost by not properly attending to such details. I once took a millionaire, who weighed 220 lb., and had never been on a mule, nor on a horse for 40 years, on a 6-day trip into the mountains, camping out. We made the deal and the return trip with satisfaction to every one; the investor said he enjoyed it and had had the best time of his life. Don't get angry at your mozo and swear at or strike him, as it does no good, and is only an injury to yourself. Don't expect too much of him; remember that you only pay him 50c. per day. It is both proper and wise to speak the time of day, or *adios*, when you meet natives on the trail; and it is necessary to always pass to the left when you meet in Mexico.

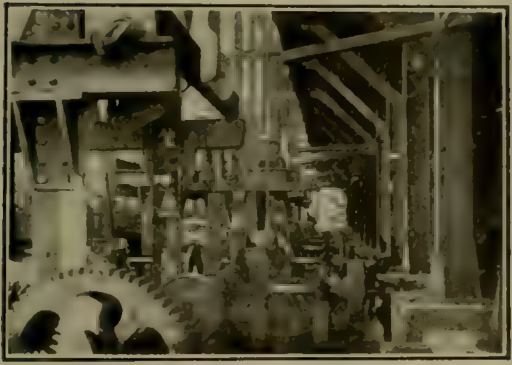
THROUGHOUT the coast region of British Columbia deposits of magnetite are found which are high in iron and low in phosphorus. These deposits occur at the contact of igneous intrusives with some sedimentary rock, usually limestone. The deposits are very irregular in their outcrops and nothing definite as to the size and shape of the orebodies can be predicted. They belong to deposits of the pegmatite type, and presumably have a greater extension in depth than in either breadth or length. Usually a series of outcrops is found along the line of contact, varying from a few square feet in area up to deposits 150 ft. wide and several hundred feet in length. Little is known as to their depth, though several deposits have been opened by adits to a depth of 100 ft. At the Paxton mine on Texada island the ore is exposed by a tunnel for a width of 75 ft., at a depth of about 500 ft. from its highest outcropping on a hill above.

Recent Developments in Diamond Mining

By C. A. [illegible]

There has, within the last few years, been a distinct revival of interest in diamond mining, and a great deal of prospecting has recently been undertaken in various parts of the world. Discoveries in Africa have been particularly abundant. When in Amsterdam and Brussels, some weeks ago, I was informed of a number of good finds that had been made near Lake Tanganyika in the Haut Katanga country, which is now being opened by railroads from both the south and west; and also in German Southwest Africa, Rhodesia, and provinces of the Union of South Africa. Exploration is, furthermore, being quietly carried on in the southernmost districts of the Congo State, in the interest of a French-Belgian syndicate, and some interesting developments have already resulted. Meanwhile minor operations in Brazil, Arkansas, and other parts of the New World, and isolated finds elsewhere, are sufficient to lead to further activity, which will result in a considerable extension of the industry. The following may, therefore, be of interest.

WASHING PANS, GRINDING MILLS ABOVE.



DRIVING MECHANISM OF MILLS.

In the early days of diamond mining the material in which the precious stones were found was hoisted from the pits and sent to what were known as 'depositing sites,' where it was spread out in a layer 12 to 18 inches thick and allowed to weather so that the blue ground or hard rock composing it would disintegrate. This, however, took about six months for its complete accomplishment, and not only kept a great deal of capital idle during that period, but also afforded opportunity for the theft of many of the larger stones, no matter how carefully the sites were guarded.

Of recent years, therefore, there have been installed what are known as 'direct-treatment' plants, of which those operated at Kimberley, in South Africa, by the De Beers Syndicate, are the most notable. Here the material, as mined, passes through gyratory breakers, of standard Gates construction, and is reduced to about $1\frac{1}{2}$-in. size. Thence it is delivered to trommels, which screen out all material larger than $\frac{1}{2}$ in. The oversize goes to light crushing rolls, set with $\frac{3}{4}$-in. gap, and their product, after again being screened, is sent with the fine from the first trommels to washing pans.

GRINDING MILLS, VOORSPOED D. M. CO.

ELEVATORS AND GENERAL VIEW OF ARRANGEMENTS FOR GRINDING AND WASHING.

These pans are one of the most interesting features of diamond mine equipment. They are constructed with the object of forming a thin sludge, too thin to carry any diamonds, but thick enough for the overflow of lighter minerals. As the constant agitation in the pans tends to break up the particles of clay, the diamonds are exposed, and the clay and other light material is washed over into the discharge.

The revolving mechanism of the pans consists of stirrer arms, fitted with blades of steel which clear the bottom by about 1 in. These are so designed that their action continually shifts the heavy material, which drops to the bottom of the pans at the outer edge. For this purpose the stirrers are arranged in spiral form. The feed is introduced at the periphery of the pan, so that the line of its entrance is at a tangent, and the discharge is through a small hole, about 1½-in. diameter, at the bottom of the pan.

The material recovered consists of a variety of minerals, including garnet, olivine, and other stones, in addition to the diamonds. Further concentration therefore becomes necessary. For this the first step is jigging; but, owing to the small difference in specific gravity between diamond and garnet, for example, the separation made by this means is not very close. After passing the jigs the product is either sorted by hand or else is allowed to flow over greased tables.

The greased table is an invention of George Labram and consists merely of a feed-box with a table, below, which has a riffled top. On this grease is smeared about ½ in. thick. The action of the table is based on Labram's discovery that garnet and olivine have no affinity for grease, but that diamonds, the moment they touch the greasy surface of the table, will stick. After a certain quantity of concentrate has been allowed to pass over the table, through the use of a liberal volume of water, the grease is removed, heated, and run off, leaving the diamonds in the bottom of the vessel. After this, the diamonds are boiled in sulphuric acid, to remove dirt and impurities, and then sorted.

The De Beers Syndicate has introduced an innovation in the final stages of diamond recovery, by putting the product of the jigs through a process of magnetic separation. This is kept strictly secret, so much so that even directors of the Syndicate have been refused admittance to the mill, which is always kept locked. It is, however, stated on good authority that a modification of the Wetherell process is used, under patents which the De Beers Syndicate controls.

One great advantage of magnetic separation is the fact that it dispenses with the use of a large quantity of water, which, despite the efforts to conserve the supply by using it over and over again, is a serious problem for a hot, dry country, where the losses from evaporation are so great. The accompanying illustrations were secured at the plant of the Voorspoed Diamond Mining Co., where the blue ground is harder than that of the De Beers deposits, and a different process is used in the initial stages.

After crushing in gyratory breakers, the material is delivered to special mills, which are similar to the mills used in ore reduction, taking the place of crushing rolls. They consist of two heavy rollers, with chilled iron treads, revolving on a manganese-steel pan having 1-in. perforations in the bottom. The rollers do not ride on the pan, but are provided with a check which is set so that they come within no more than ¾ in. from the perforated plate. The material fed to these mills is crushed fine enough to pass through the holes at the bottom, after which it is delivered by gravity to washing pans like those above described. From this point the usual course of treatment proceeds, except that the Voorspoed Mining Co. has additional mills placed below the pans last mentioned. These take the discharge from hydraulic separators and grind it for further treatment in the pans. The separators are set so as to have an underflow of material, say ¾ to 1 in., as there are very few diamonds of this size, and they find that it pays to grind that fine. In former times, when richer deposits were being worked, diamond mining companies were afraid to do this, for fear of crushing diamonds of great value; but the system now is to offer a bonus for the finding of large stones, and, owing to the number of hands through which the material passes, any such are almost always found by the native 'boys' before reaching the crushing rolls or grinding pans.

It is, of course, well known that careful precautions are taken against the theft of rough diamonds by the men employed in the mines; but few Americans probably realize how rigidly they are watched. The natives, who have the best opportunities of coming in contact with the stones, are kept in compounds, which amount to prisons. During their entire time of service they are not allowed outside of these compounds, when off duty, and upon leaving the company's employ they are subjected to a most searching examination, both inside and out, cathartics being freely used. Upon arriving in the detention compound, they also have two great pieces of stiff leather padlocked on their wrists, so as to prevent them from using their hands in any way, and these are not removed even at mealtime. For the week of their stay, they are fed by attendants. Despite these excessive precautions, however, there is still a good deal of illicit diamond buying going on in South Africa.

For the photographs reproduced herewith and the facts relating to equipment, I am indebted, through a friend, to Edward L. Bateman, of Johannesburg.

Control of Thermal Operations

By G. K. Burgess

*The past ten years have witnessed great strides in the development of the manufacture and use of pyrometers. Formerly the question usually asked by an engineer responsible for the control of some process involving change of product or output with varying temperature, was, "Do I need a pyrometer, and is there a reliable one?" Today he knows he needs one, and asks which is the best for his purpose. The Bureau of Standards carries on correspondence with the users of such instruments, endeavoring to furnish them with the information best adapted to each case, although no pretence is made of replying to the often asked question, which is the best pyrometer. In a similar way, advice has been furnished to universities and technical schools regarding the formation of courses of instruction in heat measurements, the installation and design of new apparatus, and the testing with the highest possible accuracy of instruments to be used in numerous experimental investigations.

To still further aid in the dissemination of a uniform temperature scale, preparations are being made for the distribution of samples of pure metals and salts of certified melting points, thus permitting anyone to check thermometric or pyrometric apparatus in place. As a preliminary to this, a careful survey of the reproducibility of the thermal behavior of such materials from several sources of supply has been made. Among the other investigations under way or in immediate contemplation, that have a bearing on the control of thermal operations, may be mentioned studies of thermal properties of steels and refractories, including in both instances the purest obtainable materials and the commercial products; the properties of steam with respect to turbine design; the melting points of the elements and of some pure salts and alloys; gas thermometry; the temperatures of incandescent lamps; the corrections to be applied to optical and radiation pyrometers when sighting on steels, bronzes, clays, and so forth, and the comparison of the laws of radiation on which the estimation of the highest temperature is based.

Some of these experimental problems have been undertaken at the suggestion of interested individuals or corporations, who often are in a position to furnish materials that may sometimes be difficult to obtain otherwise. Indeed, the Bureau is at times in the happy but embarrassing position of being offered a great many more opportunities of this kind than it can embrace.

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*Abstract of a paper delivered before the Congress of Technology, at Boston, April 1911.

Quarter-Centennial of the Michigan College of Mines

By Ross D. Leisk

The Michigan College of Mines, at Houghton, Michigan, will during the week beginning August 7, commemorate the twenty-fifth year of its existence by a quarter-centennial reunion. The celebration will be an affair of moment and of great interest to mining engineers the world over. Among the well known men who will be present and take part are George Otis Smith, Director of the United States Geological Survey; Chase S. Osborn, Governor of Michigan; Henry S. Drinker, president of Lehigh University; Charles Nagel, secretary of the Department of Commerce and Labor; J. Parke Channing; and George W. Perkins.

Mr. Perkins will speak on the relation of capital to labor from a mining standpoint. Mr. Drinker will take for his topic the relation of mining and mining corporations to conservation. Mr. Channing will contrast conditions at the establishment of the Michigan College of Mines with those of the present day. Mr. Osborn will talk of the relation of the State to technical education as embodied in the mining college. Mr. Smith will speak of the immediate relation of geology and the United States Geological Survey to mining.

MINING AND MECHANICAL BUILDING, MICHIGAN COLLEGE OF MINES.

The reunion will open Monday, August 7. On the afternoon of August 8, Messrs. Nagel, Osborn, and Channing will make addresses beneath an immense canopy where about 4000 people can be seated. On the evening of August 8 the alumni banquet will be held. At this banquet 800 covers will be laid. On Wednesday morning a general meeting of the alumni of the college will be held, and it is expected that a national alumni organization will be formed. There are at present a number of district associations, the Copper Country M. C. M. Club, the M. C. M. Club of Chicago, the Minnesota Association of the M. C. M., and the Southwestern Association of the M. C. M. On Wednesday afternoon Messrs. Drinker, Perkins, and Smith will speak. The evening will be devoted to class reunions and dinners to be followed by parades and illuminations.

Thursday morning and afternoon will be spent in an excursion to the mines, mills, and smelters on the north side of Portage lake. A train will leave Houghton and will carry the alumni to the mills and power plant of the Calumet & Hecla Mining Co., going from there to the Wolverine and Mohawk mills at Gay, where luncheon will be served. Returning, stops will be made at the North Ahmeek and at the Red Jacket shaft of the Calumet & Hecla. In the evening there will be class dinners and later the play, 'In Tobero,' will be presented by the college students. On Friday morning an excursion to mines, mills, and smelters on the south side will be made. The party will have a train over the Copper Range railroad and will visit the newer mines, mills, and Michigan smelter along this line. The celebration will come to a close Friday afternoon. The mine owners of the district are taking an unusual interest in the celebration, and financial and other aid has been proffered the college to insure its success.

The Michigan College of Mines was established by act of legislature in 1885, and since then has graduated [illegible] students. Its oldest building is Hubbell Hall, in which the sciences, mathematics, mineralogy, and geology are taught. The other buildings are the mechanical building, the mining building, the chemistry building, the metallurgy building, the library, and the college club house and gymnasium. The school operates a stamp mill and has its own power plant.

New York Metal Market

L. Vogelstein & Co. furnish the following report on the York metal market:

Copper.—The market is without particular feature, aside from the fact that the temporary lull in demand seemingly does not demoralize producers, as formerly, into cutting prices, and though consumers as yet are not satisfied that a conservative policy will be followed by the large producers, the undercurrent is not weak. Europe continues to buy freely. June statistics showing a decrease of 10,000,000 lb. in foreign and domestic stocks have had a good effect. In spite of large exports last month and during July to date, foreign stocks show a decrease of 1323 tons since June 30. Domestic copper deliveries, as usual, have closely followed the pig-iron output. During the first six months of this year the pig-iron output fell from 14,763,229 tons to 11,470,728 tons (22%), and copper deliveries from 173,337 tons to 150,574 tons (13%). The recent improvement in iron and steel clearly foreshadows a larger copper consumption. In fact, business in manufactured copper is undoubtedly improving, consumers admitting that they are fairly supplied with orders, and barring unexpected developments of an unfavorable character we expect this improvement to continue. While domestic consumption, as indicated by the Copper Producers' figures for June, is still unsatisfactory compared with former years, there has been a substantial increase compared with earlier months of this year. The large European shipments, together with decreasing visible stocks, show that the so-called hidden or invisible supplies abroad have been absorbed. There is every reason to believe that the average deliveries over the rest of the year will not fall below the figures of last month, and the per diem production, being already large, is not likely, at least for the next several months, to so increase as to offset the June improvement. Without deterioration of the statistical position, there is no doubt of the ability of prices to maintain themselves on the present level or even do better.

Spelter has lost some of its recent rapid advance owing to the evident unloading of speculatively held stock on the rise. Demand, however, continues good and a careful canvass of the situation seems to prove that the market is extremely sound. Stocks consist of very few parcels strongly held, while consumers are indifferently supplied and spot shipments command a premium. Producers sell forward freely against ore purchases because there is a fair margin of profit, instead of a loss as heretofore. The improvement in iron and steel, if it holds, may likewise be expected to favorably affect the spelter market.

Lead is moving satisfactorily considering the lack of enthusiasm which buyers display for it, as for all other metals, and any increase of activity will disclose absolute barrenness of stocks in the hands of producers as well as consumers. In fact, the only bar, in our opinion, to rapid advance in lead is the low price prevailing in Europe, which would permit delivery in the United States of lead exbonded warehouse, Government reports showing considerable stocks still held in bond. The market is very strong. Maintenance of present prices is seemingly assured, and a further rise by no means improbable. A review of the metal markets shows to what extent they all depend upon the general business situation. This latter is at present waiting on definite information from the West, and while the former brilliant crop prospects have suffered some impairment, the outlook is still for satisfactory harvests which will be followed by greater activity in all lines.

Tin.—Straits shipments for the first half of this month are cabled July 18 as 2375 tons and for the whole month are estimated at 4900 tons. If so, shipments for the seven months ended July 31 will have decreased 582 tons compared with the corresponding period last year. Some light as to future shipments is obtainable from figures of ore arrivals in the Straits Settlements. Owing to drought earlier in the year these arrivals January 15 to May 15 averaged only 943 tons per week, while May 15 to July 15 the average has been 1082 tons per week, or more than last year. In both 1909 and 1910 the Straits shipments were larger in the second than in the first six months, and there seems no reason to apprehend a different situation this year. On the other hand, deliveries in the United States are usually larger during the first half of the year, the excess of the first over the second six months having averaged for the past nine years, two thousand tons. To June 30, there had been a decrease of 2100 tons in U. S. deliveries and nearly 1900 tons in European deliveries, without corresponding reduction in output, with the result that whereas the total visible decreased 5218 tons in the first six months of 1910, it decreased only 589 tons in the first six months of 1911. In both Europe and America these decreased deliveries probably represent to some extent drafts on invisible supplies, though over here possibilities in that direction were limited. In Europe also the use of 'non-statistical' brands has been a contributing factor, but in this country all brands are included in statistics, and a decrease undoubtedly occurred, in harmony with pig iron and copper. While these conditions hold, tin is worth its present price only by virtue of the Syndicate. Ex-syndicate it would not sell within £50 of its present price. It should be remembered, however, that when the corner collapsed the Syndicate loaned but did not sell its tin, and is still in absolute control, and while from a statistical point of view there is nothing to warrant higher prices there is likewise nothing, so far as can be seen, to weaken this control or to bring about lower prices at present except by consent of the Syndicate.

Monel Metal

Cast monel metal has a tensile strength of 70,000 lb. per square inch, while the rolled metal is much stronger, having a tensile strength of 80,000 to 100,000 lb. per square inch. An exhaustive series of comparative tests has shown its superiority to copper and bronze under corrosive influences either in salt water, acid liquors, or under atmospheric conditions. The metal machines readily and can be forged, soldered, brazed, or electrically welded.

Monel metal contains approximately 67% nickel, 27% copper, and 6% of other metals, principally iron and manganese. In appearance it cannot be distinguished from pure nickel and takes the same finish. Its great strength, together with its extreme incorrodibility, admirably adapt it for use in marine work and engineering construction, for parts that come in contact with salt water and for valves and fittings that are subjected to superheated steam.

In general, the metallic materials of engineering may be divided into three classes: (1) irons and steels; (2) brasses and bronzes; (3) 'white metals'; or, to classify more accurately: A, alloys with an iron base; B, alloys with a copper base; C, alloys with a tin or zinc base. These three last classes are widely known and their properties under the usual conditions of service are fairly well understood.

While in the individual alloys of each series the properties of the base are modified or in some cases widely changed by the alloying material, still certain definite properties of the base remain unchanged throughout and characterize every alloy of which it is the foundation. The white metal iron gives in all irons and steels a magnetic white alloy with high strength when alloyed with carbon, a tendency to rust, and a strikingly high modulus of elasticity which remains practically constant throughout all the range from the softest wrought iron to the hardest steel. Similarly, copper makes its individuality felt throughout the brasses and bronzes. The red color may be masked and is at times entirely hidden, the hardness may vary from that of the most plastic and ductile alloys up to those which readily scratch glass, and the strength and ductility may vary greatly, but throughout they remain copper alloys, non-magnetic, with far greater resistance to corroding agencies than any iron or steel, and with the same low modulus of elasticity that marks pure copper. In like manner the so-called 'white metals', no matter how alloyed or treated, remain zinc or tin alloys; marked out from the steels and the brasses and bronzes by their fundamental constitution and its entailed properties.

In the monel metal alloys the foundation is nickel, and throughout their entire range the characteristics of that metal are impressed strongly upon all the physical properties. Nickel in its affinities and properties shows great resemblance to both iron and copper. Like iron, it forms a series of alloys with carbon, giving the complete range from those similar in carbon content to the very mildest steels up to those similar to cast iron. This carbon, while having an important bearing on the properties of the metal, does not have the overwhelming influence that carbon has on all classes of iron and steel, since nickel does not have with carbon the series of molecular rearrangements and changes in the solid which impart the varying qualities to annealed, hardened, and tempered steel. It has further a magnetic transformation point exactly similar to that of iron, being magnetic at temperatures below 325° C. and non-magnetic above that point. It has also a high modulus of elasticity, being next to iron in that respect. Its resistance to corroding agencies is well known.

All of these properties are carried to some extent into the nickel-copper alloys. The degree varies with the percentage of contained nickel, since nickel and copper in alloying form no compounds or eutectics, but simply go into solid solution in each other. In the alloys of low nickel content these properties are not very well marked, being masked by the large amount of copper present, but when the nickel exceeds 50% the alloy changes to a nickel alloy and with increasing percentages the alloys show more and more clearly the influence of that metal.

Monel metal, with its 67% nickel, shows a very successful balance between the copper alloy on one hand and pure nickel on the other; and has a remarkable likeness sometimes to steel and sometimes to bronze in its physical properties. In its tensile strength it markedly resembles steel. This is most clearly shown by the high modulus of elasticity and by the results of tensile tests. This resemblance is further noticeable in the torsion tests and in the high relation that the true elastic limit as determined with an extensometer bears to the commercial elastic limit or yield point as measured by 'drop of beam' on the testing machine.

The melting point is high (1360° C.), being nearly 300° C. above that of pure copper, and is directly dependent upon the nickel content, as is its high resistance to oxidation when hot. In its electrical properties monel metal resembles more the non-ferrous alloys; especially the 'resistance' alloys, having a high resistance and a comparatively low-temperature coefficient. Like copper and unlike steel, it cannot be welded under the hammer, but can be autogenously welded either by electricity or with an oxy-acetylene flame.

An accident recently occurred where the foreman in charge of a boiler-house opened a valve and allowed hot water and steam to blow into the ash-pit of a boiler, seriously scalding one of his helpers, who had told him a few minutes before that he was going into this pit to do some work. Six months earlier the manager talked to this foreman about carrying out a rule in regard to locking valves for the protection of men under similar conditions, and he scouted the idea that he might ever make such a mistake.

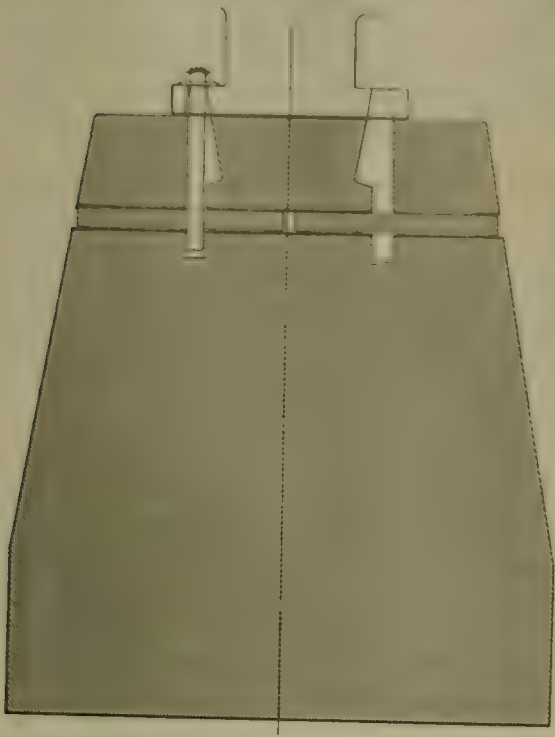
Discussion

Readers of the Mining and Scientific Press are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. The selection of any contribution is determined by its probable interest to the readers of this paper.

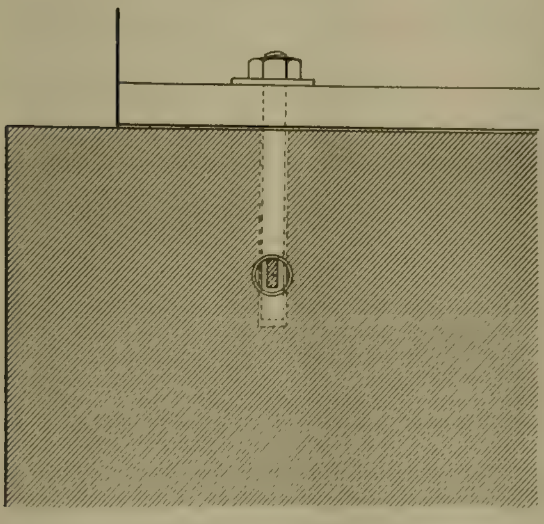
Battery Foundations

The Editor:

Sir—In replying to 'Puzzled Engineer', M. P. Boss shows a plan of anchorage in battery foundations which I believe is along the line of improvement over the long anchor-bolts that have been in general and universal use during the past. Other things being equal, the longer a thing is, the more weak spots it contains. However, I do not like the method Mr. Boss uses in fastening his bolts to the concrete of foundation, as much less of the strength of a given bolt is thus used, for such an uneven pull upon only one side of the head of a bolt has a tendency to rip the bolt from that side, and then the rest is easy. I here show a plan for heavy stamps. Bolts are 2½ in. by 2 ft. 4 in. long, with a slot cut in the lower end 1¼ by 3½ in., through which a key is placed, the nut is then turned up hard, which in turn pulls the key strong against the top side of a 4-in. pipe or casing. The offset is to allow for the passing of the mortar, when removing the bolt. Six instead of eight of these 2½-in. bolts should be ample. No doubt a 6-in. pipe or casing would give much more room for a man's arm, while removing broken parts. I have not tried this plan, nor have I heard of it being used, but I believe it is simple and efficient. I would be pleased to have some opinions given regarding the same.



FOUNDATION BOLTS HELD BY KEYS.



CROSS-SECTION, SHOWING KEY.

C. H. Waters.

Ruch, Oregon, July 29.

Alaskan Mining Laws

The Editor:

Sir—Complaints are made in mining journals, as well as by competent men engaged in the Government service, concerning the evils of so-called blanket location in Alaska. These evils are a great drawback to capital and private operators in developing the country. The United States mining laws have been discussed by competent and able men, and, comparing them with the mining laws of the world, I can not see where they can be improved, except in one respect.

In order to interest capital inducement enough must be given to justify the investment; in other words, ground enough should be obtainable to justify the expenditure of large sums of money for development, as men are entitled to a fair percentage to secure them for money invested. My suggestion is as follows: First, anyone who fails to do the necessary assessment work on his or their ground within the specified time shall be compelled to record the same in the District Recording Office as a forfeiture, within 30 days after the time expired; second, the Recorder shall be compelled to stamp on the face of the original the date and year thereof, under penalty if failing to do so; third, anyone who fails to comply with these rules and regulations shall be fined at least $200 and given one year in jail for attempt to defraud the United States Government out of public land.

The above additions to our mining laws, I believe, would relieve the present condition to a great extent, perhaps do away with all the evils in the near future, and give better security for capital invested, as it would show a clear record and would give no chance for a controversy to a prior locator who is not *bona fide*.

H. W. Reeth.

Bethel, Alaska, June 30.

Pitch of Ore-Shoots

The Editor:

Sir—I have read with much interest the discussion concerning surface indications of ore-shoots, and would like to hear a few words on another question allied to this. I have worked for many years following rich ore-shoots, and have noticed that, as a rule, the shoots pitch to the south and west. I use the word pitch, to distinguish from the dip and strike; so, if a vein strikes north and south, and we have an orebody showing on the surface, I would look for the ore in depth on the south of the outcrop.

Several other miners and prospectors whom I have talked with have noticed this same fact, and perhaps the contributors who have already given us some valuable material will help us again on this question.

Sonora.

Nacozari, Mexico, July 18.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE areas of circles are to each other as the squares of their diameters. For this reason, a 6-in. pipe has a greater capacity than two pipes each of 4-in. diameter.

ANGLESITE is a natural sulphate of lead. It is an abundant ore in some localities, but cannot be said to be of wide general distribution.

TANTALUM is little used in the United States, only a small quantity being produced. A little is imported from Germany, but the use of tungsten in incandescent lamps has proved so satisfactory that the demand for tantalum will probably not be greatly increased.

ALTHOUGH the United States uses 43% of the world's output of tin, it is not an important producer of that metal. Tin is produced in Alaska and South Dakota, but not in large quantities. Several thousand tons of tin are recovered from used tin cans and other waste.

REVERBERATORY-FURNACES fired with crude petroleum, when properly handled, have about double the capacity of a similar furnace fired with wood. This makes the treatment of ore in the oil-burning furnace cheaper than where wood is the fuel.

THE first gold-mill ever sent to Japan went there in 1869 from the Vulcan foundry at San Francisco, California. It had 10 stamps and was designed for dry crushing. There were in the equipment several iron amalgamating barrels, each weighing 1175 lb. The total weight of the shipment was 35 tons.

NITRE and borax do not commonly occur together, as the nitre is much more soluble than the borax. But if solutions containing both salts were completely evaporated, the borax would deposit first, forming the bottom layer, with the nitre overlying it. The two salts may be readily separated by fractional crystallization.

NATIVE SULPHUR is of not uncommon occurrence in mines. It is the result of the decomposition of pyrite generally. Sometimes it is found in cavities previously occupied by auriferous pyrite, the gold and sulphur being together. An occurrence of this character is found in the Padre mine on Mount Gleason, in Los Angeles county, California.

NITRATES can be detected qualitatively in the field by the brown fumes given off when the substance is heated with litharge or bisulphate of potash, in a closed tube. An easy crude test is to mix the substance containing nitrates with some carbonaceous substance, such as charred filter paper, and heating, when the mixture will deflagrate. Saltpeter can be distinguished from sodium nitrate by the taste, and by the color of the flame before the blowpipe. It is also slightly more deliquescent.

WOOD ALCOHOL, acetic acid, and acetone are the chief constituents of pyroligneous acid. A small amount of tar oil, which cannot be separated mechanically, is present in the solution. In the distillation of hardwoods in the northern United States, the pyroligneous acid is manufactured into wood alcohol and acetate of lime. The process consists in heating the acid, thereby distilling over the alcohol and the acetic acid, and leaving the tar oil as a residue. This distillate, which contains the acetic acid and alcohol, is piped to another still, where lime is added. This, combining with acetic acid, forms calcium acetate, which remains in the still when the alcohol is driven off.

BOG ore deposits and similar varieties are due to circulating surface water and vegetable acids, which dissolve iron from the higher lands and deposit it again in bogs and lakes. Deposits are small in size, but are remarkable in that they are renewed after an interval of a few years. Bog ores have been mined in Quebec for several centuries. Another sub-type of limonite ores is due to the weathering in place of ores of the carbonate or pyrite type. The oxidized carbonate ores of Londonderry, Nova Scotia, are an example.

HEAD SAMPLES, whether from cars, chutes, or feeders, when taken by hand, constituting what are known as 'grab' samples, afford only an approximate idea of the value of the ore coming to the mill. Where no amalgamation is practised in the mortar, perfectly reliable samples may be taken as the sand issues from the battery, by the employment of properly designed automatic sampling machinery, using one which takes all of the stream at regular intervals, in preference to one that takes a portion only of the stream all of the time.

DECAY of wood is due to the growth of microscopic fungi which flourish under proper conditions of heat, moisture, and air. When completely excluded from the air, as when submerged in water, wood will remain sound for long periods without requiring preservative treatment. Wood is composed of fibre and cellular tissue. The fibre is quite durable and, by itself alone, resists attack on decay germs, but the cellular tissue, composed largely of albuminous substances, which act as soil and sustenance for the growth of decay organisms, soon breaks down, involving the destruction of the whole substance of the wood.

PYROLUSITE is a soft black mineral, of the composition MnO_2, and can be easily distinguished from other manganese minerals by its softness and black streak. It represents the final stage in the alteration of manganese minerals. The larger part of that mined in this country comes from Virginia, Georgia, and Arkansas, although deposits exist in many other States. Pyrolusite is used in the manufacture of chlorine and oxygen, and in the preparation of spiegeleisen. It is also used in coloring and decoloring glass, and as an oxidizing agent in varnish and paint. The crude ore is quoted at $10 to $25 per ton in San Francisco.

THE enlarged-homestead law permits the entry by one person of 320 acres of Government land in the arid States which is not, in the understanding of the Government, susceptible of irrigation. As under the 160-acre homestead law, this land can be acquired by the settler from the Government free of cost, on compliance with the regulations requiring residence and cultivation. The determination of what lands are subject to these double-sized homesteads devolves upon the Secretary of the Interior, and since the passage of the act in February 1909, 190,254,495 acres have been designated by him as subject to entry in units of 320 acres. Every month additional lands are thus designated, 90,242 acres having been added to the total in June.

TO obtain the flow of the stream in second-feet roughly, select some portion that is as straight and uniform as possible, for, say, 300 ft., and then measure the width and depth at six or eight places, from which may be obtained an average width and depth. This multiplied together will give the average cross-section in square feet. Next drop a float on the water, noting the number of seconds it takes to travel the given distance. From this can be calculated the velocity of the water in feet per second. Multiply this by the average cross-section in square feet and the product will be the cubic feet per second of flow. As the surface velocity is somewhat greater than the average velocity, the result should be reduced one-fifth. For larger water-powers, more accurate methods, using the weir or current meter, should be resorted to.

Special Correspondence

JOHANNESBURG, TRANSVAAL

Monthly Gold Output Nearing £3,000,000.—Summary of Production.—[illegible].—At[illegible] Railway [illegible].—May [illegible].

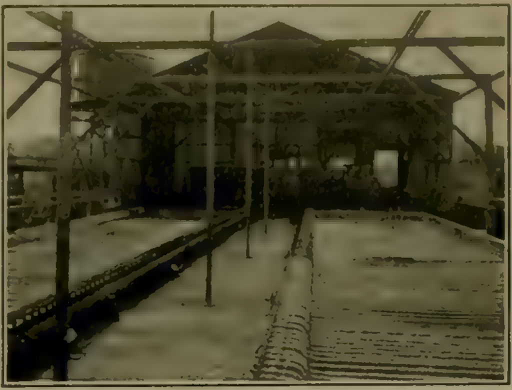
There is every indication that the gold output of the Transvaal will soon exceed £3,000,000 per month, and unless something untoward happens, this position should be attained in the month of July. May was another record month, the total mineral output, according to the official mining statistics, being as follows: gold, £2,920,806; coal, £89,950; tin, £48,738; lime, £9614; silver, £8072; flint for tube-mills, £750; miscellaneous minerals, £100; total, £3,078,230. The value of the output of diamonds is not declared monthly in the official returns, owing to the Premier mine being the only working mine of any importance in the Transvaal, all the other diamond mines being merely prospecting ventures. The following summary of the sources of the Transvaal gold production will show how little of the precious metal is produced outside the fields of the Rand:

	Ounces.	Value.
Witwatersrand, including Heidelberg and Klerksdorp	667,664.341	£2,836,056
Ottoshoop	86.420	367
Pretoria	38.286	163
Barberton	8,251.748	35,052
Lydenburg	11,406.240	48,450
Pietersburg	168.922	718
Totals	687,615.957	£2,920,806

With the starting of the new mill at Brakpan, the reappearance of the Meyer & Charlton, growing outputs from Randfontein, and return to normal rate of production at the East Rand Proprietary mines, there should be no difficulty in producing a £3,000,000 output for the month of July.

Mention has already been made of the unsatisfactory outlook for the Transvaal coal industry, on account of the continued steady decline in pit-top selling prices, and if this continues the Transvaal will soon be competing for the questionable honor of ranking with Japan and India as being one of the cheapest coal countries in the world. For a long time the selling price remained in the neighborhood of 5s. per ton at the pit-tops, but about a year ago a downward tendency set in. Prices continued to decline until for the month of May the average selling price was 4s. 8.21d. per ton. The average pit-top selling price seems to have resolved itself into one of railway position with regard to the Rand, the question of quality being of little or no importance. For instance, the Springs coal, owing to its close proximity to the Rand, commands 5s. 9d. per ton for coal running up to 30 or 40% of ash content, while Middelburg coal with less than half that percentage of ash, realizes only 4s. 6d. per ton. In the outside districts farther from the Rand, the average pit-top selling price is only 4s. 5d. per ton. This low selling price is caused by the Consolidated Gold Fields of South Africa having gone to Breyton in the Ermelo district for its coal supplies, where the railway rate is about a shilling per ton higher to the Rand than that from Middelburg district. This higher railway rate naturally affects adversely the pit-top price. Formerly the rate was two shillings higher, but by agreement between the railway and the Consolidated Gold Fields, a shilling reduction in the railway carriage has been made, much to the chagrin of the local Coalowners' Association and the companies owning collieries in the Middelburg district. Protest meetings are being held in the Middelburg district, and the lower railway rate allowed for carriage of coal from more distant fields is being denounced as preferential and unfair to those who have sunk capital in establishing collieries in the Middelburg district on the basis of the old railway rates. The question for some time has been hotly discussed, and may lead to friction [illegible] and perhaps a quarrel between the Coalowners' Association on the one hand, and the South African Railways and the Consolidated Gold Fields of South Africa on the other.

The most prominent feature connected with the returns of the base mineral output of the Transvaal in May was that of tin ore, which was again a record value of £48,738 out of a total base mineral output value for the month of £[illegible]. No copper ore was shipped during May, nor, for the matter of that, was there any zinc produced. Magnesite from the Malelane deposit ceased to figure in the list after a regular appearance for some time. It seems not at all unlikely that tin may soon displace coal and become the second most important mineral production of the Transvaal. Very good accounts still come to hand from northern tinfields; two large and promising mines have established themselves as dividend payers, and with proper and careful management other properties are likely to follow in their footsteps. The tin industry of the Transvaal has a short but checkered history extending only over a period of eight years. When first discovered in the Bush, the tin prospect caused considerable excitement, as the prospects were alluring, but experts who should have known better, added materially to the excitement by their unjustifiable and optimistic reports. The district was never more than a prospect, and it remains one still, although one German expert compared the district to the Rand goldfields, much to the disadvantage of the latter. These experts have learned better since then, and so have those who speculated on their advice and lost, with the result that the more recently discovered Waterburg tinfields have been and still are regarded with suspicion by speculators. The first discoveries spoken of petered out in depth, and that district became discredited. Some of the discoveries in the Waterburg district, too, have not turned out well, but others have far exceeded expectations, and, speaking generally, this field promises sooner or later to make up for all the disappointment suffered in the Bushveldt tinfields.



FILTER-PLANT, CROWN MINES.

One peculiar feature about the increased outputs of gold almost every month is that the profits do not seem in the aggregate to increase in the same proportion, and the only inference to be drawn from this is that either the grade must be declining or the costs of working increasing, or perhaps both may be occurring. This, however, seems to have been happening for the past six half-years. The tonnage milled has been steadily increasing. It has increased by at least 200,000 tons during the last year, but the value obtained, although it has increased, has only done so to about 50% of what it should have done had the value been maintained. As far as can be seen at present, the profits in the aggregate during the current six months will again show a decline. At all events, the profit-earning capacities of the mines must not be judged by the gross output. F. H. Hatch has recently estimated that the deposits can be worked to a depth of 6000 ft., corresponding to a life of 35 years.

AUSTRALASIA

STATE COLLIERIES.—PAPUAN COAL.—AUSTRALIAN AND AMERICAN COPPER PRODUCTION.—AUSTRALIAN GOLD MINERS' WAGES.

The system of State collieries—which forms one of the planks of the platform of the Labor party in Australia and New Zealand, as being a step toward the nationalization of the industry -is by no means an unqualified success, the miners' unions refusing, as a rule, to permit the work to be conducted on a commercial basis. In New Zealand it is asserted that the State collieries do not pay their way, and that considerable quantities of New South Wales coal have to be used. In 1910 the output was 281,630 tons, being a decrease of 5321 tons compared to the previous year. In Victoria the State mine at Powlett river has materially affected privately owned collieries, by reason of the higher wages offered and lighter conditions of labor, but the quality of the coal obtained is stated by the New South Wales Under-Secretary for Mines to be inferior. It is the same with the coal from the State mines at Collie, Western Australia. The New South Wales Government has introduced a bill into the State Parliament for the establishment of three State-owned collieries, although the output in the northern district has been considerably decreased and large numbers of miners are unemployed.

There is reason for believing that the reports of payable coal seams in Papua are well founded. An expedition sent out by the Papuan Development Syndicate of Sydney to explore the country in which indications of coal were found a couple of years ago, has found three seams of excellent quality, one 12 ft. thick, and two 3 ft. thick each. The coal is easily got at, but the country is difficult of access. The syndicate has obtained a reward concession of two miles, which is reached by cutting a track through the dense tropical vegetation a distance of twenty miles from the Kikori river.

Although copper is one of the most plentiful of minerals in Australia, the cost of production in some places is considerably in excess of what it is in America, thus placing it at a disadvantage in the market. For instance, in South Australia it cost the Wallaroo & Moonta M. & S. Co. in 1910 £54 11s. 2d. per ton to produce refined copper by mining and cementation and to place f. o. b. ocean steamer, as against £53 3s. 11d. in 1909. The average selling price in 1910 was £58 7s.; consequently the profit per ton of copper produced was only £3 8s. 10d. per ton. This does not compare favorably with the figures supplied by some of the American mines, the Anaconda, for instance, where the cost of production, including all charges, is from £39 13s. 4d. to £42 per ton. The largest production is in Queensland and Tasmania, which furnished in 1909 copper and ore worth £1,461,234, against £878,754 from the other States.

A demand for higher wages and improved conditions of labor is being made by a number of gold miners employed on the Ballarat, Bendigo, and other Victorian fields. The increase represents an advance of something like £1,000,000 per annum on the cost of gold production in the Commonwealth, forming a heavy handicap on industry. The reason advanced is the increased cost of living, a natural result of the artificial raising of the rates of wages in almost every branch of productive and distributive industry by the Australian trades unions, which are seeking to secure uniform rates of wage and conditions of labor throughout the Commonwealth. The effect on Victorian gold mining alone, should the demand be persisted in, will be most serious. In 1908 the calls actually paid amounted to £395,887, while the dividends totaled only £319,293, leaving an actual loss of £76,594, without taking into account the interest on the capital invested or depreciation. In 1909 the amount paid in dividends showed a decrease, and there was no improvement in 1910. There are about 50,000 gold miners employed in the Commonwealth, and should the cost of production be increased, the closing of mines which barely pay their way, or are worked at a loss, will become necessary.

ELY, NEVADA

DEEPENING GIROUX SHAFT.—CHARACTER OF ORE.—WORKING LOW-GRADE ORE AT NEVADA CON.—REOPENING THE VETERAN.—RUTH MINES.—PROGRESS AT BLACKHORSE.

The management of the Giroux Consolidated has stated that it will sink the Giroux shaft from the 1400 to the 1800-ft. level. The shaft, which has five compartments and is said to be the largest in the State, is being sunk in solid limestone. Cross-cuts have been driven from the 700, 1000, 1200, and 1400-ft. levels to the Alpha orebodies, which are being extensively developed. The continuation of the big shaft from the 1400 to the 1800-ft. level is an indication that the management is satisfied with the ore above. Only two compartments of the shaft will be sunk to the 1800-ft. level, after which a station will be cut and the other three compartments raised to the 1400-ft. level. The management now is experiencing difficulty with soft ground and water in the cross-cut on the 1400-ft. level, which is making 650 gal. of water per minute, the full capacity of the pump on that level of the mine. Development of two orebodies on the 1200-ft. level is being pushed rapidly. The ore carries native copper and oxide, and is of sufficient grade to stand shipping to the smelters of Utah, where it will be treated until the company decides upon the erection of a plant of its own.

The Nevada Consolidated is now producing about 11,000 tons of ore per day, all of which comes from the Copper Flat pit, and is handled by steam-shovels. For some weeks the company has been mining and treating very low-grade ore, said to average less than 1% copper, from which it is able to make a profitable extraction. This would not be possible were it not for the fact that all other ore and waste had been removed. To carry on further development it was necessary to remove this low-grade ore, and as an experiment, a test run of the ore was made through one section of the concentrator at McGill, twenty-one miles distant. At present two sections of the plant are running on the ore, which is returning a good profit. The company is also mining a large tonnage of oxide ore averaging from 3 to 5%. This ore is crushed at the concentrator and stored away for future use. It is too low grade to treat with the present equipment, but it is probable that the company will erect a leaching plant, when this class of ore will be found very profitable. Both in Spain and Japan copper ores have been treated by leaching processes at a profit, and some similar process will probably be adopted here.

It is expected that the company soon will resume operations in the Veteran mine, which has been shut down on account of labor troubles for the past two years. In this property the caving system was inaugurated, and was working successfully when trouble arose with the miners over the contract system. The ore averages between 3 and 4%, and carries considerable iron, which is of advantage in smelting the product of the Nevada Consolidated mines, which carry a considerable amount of silica. It is expected that the Ruth mines of the Nevada Consolidated, which are extensively developed, will be opened for production during the present year. The Ruth property has 13,000,000 tons of ore developed, which will be mined by the caving system and hoisted to the surface through the Star Pointer shaft, which has not been used since its completion more than three years ago. The company is by no means short of ore for its steam-shovels, but will resort to deep mining, especially during the winter months, when much difficulty is experienced with frozen ore from its surface deposits.

Considerable mining is now going on in the eastern portion of White Pine county, especially at Blackhorse, where the Amalgamated Nevada Co. is operating extensively. The company recently started two shafts for deep development work, to test its ground. Its 10-stamp mill at San Pedro is running on part time, and is said to be making a close saving. The company has expended more than $200,000 during the past two years in the purchase of property, equipment, and development.

LONDON

Activity in Old Cornish Shafts.—Radium Production at St. Ives.—Electric Plant at Giew Tin Mine.—Murex Process at Broken Hill.

As I have often stated in these columns, the mistake made by Messrs. Schiff and Dietzsch in connection with their various Cornish ventures is that they erect expensive surface plants before knowing what ore is available in the old properties they take up. They started work eleven years ago at the Hingston & Clitters mines in East Cornwall, and they have since then reopened groups of abandoned mines near Truro, and near St. Ives, and have also acquired the West Kitty and other properties in the neighborhood of St. Agnes. Though large sums have been spent, no profit has yet been earned. The venture at St. Ives has been rendered attractive by the radium boom. The company, St. Ives Consolidated Mines, was formed just three years ago, and work has been centred on the Trenwith mine, which yields pitchblende, and on the Giew tin mine. The Trenwith has been unwatered, and a subsidiary company, the British Radium Corporation, is extracting uranium and radium compounds at the laboratory at Limehouse, London, under the scientific direction of Sir William Ramsay. Up to the time of writing, £10,098 has been received from the sale of radium and uranium compounds, while orders valued at £4300 are in course of execution. The directors do not say how much of the products are radium and uranium compounds respectively. At the Giew tin mine unwatering was at first undertaken with a Cornish pump, but subsequently an electrical installation was provided. The electric generating station contains Diesel oil engines. Twenty stamps and a concentrating plant have been erected and they started work at the beginning of 1911, chiefly on dump material. Up to June 19 the amount of tin concentrate sold to the smelters was 25 tons.

Additional leases have been acquired, including the Trink Hill, and an old dump. The latter is estimated to contain sufficient tin to warrant the erection of another 20 stamps. At the Giew mine the water-level has been lowered to 480 ft. below adit, or about half the depth of the former workings. A vast amount of work has been done in clearing old adits and shafts and putting them in order, and the report of Ferdinand Dietzsch, the engineer, gives details on this point. It is not possible, however, to obtain from the report any idea of the ore reserves or of the prospects of the mines as producers of profitable ore.

It is announced that a radium spa at St. Ives is about to be started. The capital of the company is £220,000, of which £80,000 is in cumulative 6% preference shares and £140,000 is in ordinary shares, the latter being the purchase price paid to the parent company, the National Minerals Corporation, for the leases. The expenditure during the period from October 1, 1909, to December 31, 1910, was £70,850, of which £44,954 was on plant, machinery, buildings, and surface works, and £13,555 on development. There is a liability of £23,850 for money advanced by the National Minerals Corporation. Presumably the finances will have to be rearranged shortly, as the probability is that further working capital will be required.

Two years ago there was a tremendous boom in the shares of the Murex Magnetic Co., which was formed by people identified with the Shell Oil Co., for the purpose of working A. A. Lockwood's invention for magnetically concentrating non-magnetic sulphides. The principle on which the process was based consists of the addition of a small proportion of magnetic substance such as magnetite or sulphide rendered magnetic by a roast, and agglomerating the particles by means of some organic substance such as oil in emulsion of water, the agglomerated particles then being removed by passing the pulp under magnets. The boom was a perfectly ridiculous performance, quite unwarranted by any practical results thus far obtained, but recognizing that the process had a scientific substratum, *The Mining Magazine* published a detailed description of what the inventor and promoters claimed. Fairly good results have been obtained at the Cordoba Copper Co. in Spain. But the venture at Broken Hill was the great sheet anchor, and the results of the trial plant erected there were eagerly awaited. It is a disappointment therefore to find that the plant has failed. The plant was being tried on Block 14 ore, of which there is a large reserve of too low a grade to treat by the usual methods. Altogether, 1521 tons of sulphide ore was mined for the purpose of testing the process, averaging 12%, lead, 8¾%, zinc, and 9¼ oz. silver. In the last continuous run of the plant, 661 tons of ore was treated assaying 12%, lead, 8¼%, zinc, and 8⅔ oz. silver, and 185.6 tons of concentrate was produced, assaying 31%, lead, 21%, zinc, and 19⅔ oz. silver, being an extraction of about 72% of the lead and zinc and 61% of the silver. The other part of the Murex process, namely, the separation of the two sulphides by means of silicate of soda, has not been a success so far, but experiments are still being made. The engineer of the Block 14, H. Voss Smith, has therefore abandoned the plant, and other steps are being taken for the beneficiation of the large amount of sulphides still in the mine. George Weir, the manager of the North Broken Hill, has been asked to examine the mine and the mill and make suggestions as to the best course to pursue. The Murex company has many contracts in other parts of the world and the measure of success attending them has not yet been announced.

SILVERTON, COLORADO

Bagley Adit Work.—Vermillion Ships Ore.—Hydro-Electric Plant at Sunnyside Mine.—Pride of West Closed.— Revive Mine Owners' Association.

The Frisco Tunnel Co., operating the Bagley adit at Animas Forks, has connected with the old Red Cloud shaft through a three-compartment raise. The property is closed temporarily, pending an examination of the orebodies exposed and the completion of arrangements for milling. The Bagley adit is over 11,000 ft. long and has cut several veins in addition to the Red Cloud. These carry valuable gold, silver, lead, zinc, copper, and iron ore. The Vermillion is operating steadily, milling 75 tons per day and shipping a large amount of crude ore from a recent discovery on the Equator claim. The company employs 75 men. The ore and concentrate are hauled by wagon one and one-half miles to Animas Forks, the nearest railroad point. The Sunnyside mine is operating its new hydro-electric plant, situated at Midway. The plant consists of one Pelton water-wheel and two generators with a total capacity of 600 kw. The plant has been supplying 300 hp., but this has now been increased to 400 by enlarging the transformer capacity. The current was formerly carried from the plant to the mine, about three miles, at a voltage of 2300. At present the voltage used is 10,000. The mill is running steadily and dropping 40 stamps, the full capacity.

The Gold King, at Gladstone, is running at half capacity, but the concentrate is poor and the life of the leasing company probably will be short. The mine needs considerable development, and can hardly be expected to pay until this work is done. The Silver Lake is pushing development and employs 18 men. The mill was to have started on July 10, but is still idle. It is rumored that it will be operated after August 1 and will mill 50 tons per day. The Iowa Tiger Leasing Co. has failed to discover the suspected orebody, but development is being pushed vigorously and the lessees are confident that new ore will be found. The average grade of concentrate has fallen from $40 to $35 per ton, net smelter returns, within the past two months. This is due to a decline in the percentage of lead from 40 to 30. The mill is grinding 100 tons of ore per day, but produces only 12 tons of concentrate. The King mine is being developed by the King United M. Co., but no report of progress is available. The owners of the Hercules are in Silverton to perfect plans for the future operation of this mine. The Bandora mine, on South Mineral Creek, is being examined by Richard

Parker, of Denver. At this mine recently a vein of rich silver ore was discovered, but the extent of this is not known. The Ledge mill started July 23, and, when the new machinery is adjusted, is expected to handle 200 tons per day. This will give 50 tons of concentrate, in the proportion of 15 tons 50% lead to 35 tons 40% zinc, both carrying about $2 gold and $5 silver per ton. This mine, under the present lessees, has had a checkered career, marked by mismanagement and interference with the local managers on the part of stockholders. It is now managed by W. Z. Kinney, manager of the Gold King mine in its best days, and he is expected to put the mine in its right position as one of the San Juan's best producers. The mine has a large tonnage of lead-zinc ore blocked out and the problem at present seems to be entirely a milling one. The mill operated during the summer and fall of 1910, but saved only a fraction more than 50% of the assay value of the heads. The new machinery is relied upon to increase this saving to a minimum of 75%, but the result is doubtful, as the installation is entirely experimental and includes jigs, which were tried and failed to give satisfaction under previous managements. It is only just to Mr. Kinney to state that he is in no way responsible for the new equipment, as he only recently assumed the management and the plant was turned over to him as it is operating at present.

The negotiations for the sale of the Congress have failed and the owners have leased the dump and all the old workings above the 72-ft. level to local people and work started July 24, with a force of two men for the present. The Pride of the West has closed after shipping several cars of lead ore. The company's affairs are reported as badly tangled, and inside friction seems to have been the real cause of the shut-down. A delegation from the Denver Chamber of Commerce visited Silverton July 12 as the guests of the Commercial Club. The visitors inspected a number of the large mines and returned to Denver, where they will report to the Chamber of Commerce on the mining resources of this district and offer suggestions for the improvement of local conditions. The Mine Owners Association has been revived and most of the principal operators of the district have joined. This association was formed during the labor troubles in Colorado to handle questions arising at that time, but as there is no trouble of any kind now and no reason to suspect any in the near future, the association will devote its time to matters of general interest and endeavor to better existing conditions in regard to milling, shipping, and smelting. These matters will be carefully studied in an effort to raise the percentage of saving in the mills, and to secure equitable freight and treatment rates.

NEW YORK

Dullness of Markets.—Possible Change of Ownership of Ohio Copper.—Chino.—Copper Situation.—Consolidated Gold Fields Activities.—Pioche Complexities.—Spelter Statistics.

There is but one fruitful topic of discussion in Eastern financial markets during this remarkable season, the prevailing dullness, the reason therefor, the Federal prosecutions, past, present, and future, all tending to one everlasting always persistent query: when is the turn in affairs to come? It does not need to be added that market operations are meaningless. For the past month a certain volume of trading has been maintained in order that the utter lack of public support might not be so obvious. Mining markets are deserted. The holders of copper shares seem to have withdrawn entirely from all operations. The larger copper producers claim to be enforcing some degree of curtailment, but there is no great hope of an improved report covering July output. Consumers are not stocking up and the export demand is not making any such record-breaking showing as it did in June.

Further details as to the possible acquirement of Ohio Copper by the Guggenheim interests are being made public. It is said that an offer of 80 has been made for two-thirds of the unplaced bonds, provided the Catrow interests will agree to take the rest of the bonds, and provided further that 100% stock bonus goes with the bonds. The offer would seem a fair one in view of a sale at auction recently when a large block of Ohio bonds sold under 30. When the market is in the doldrums no prophecy can be made as to the effect of news, either good or otherwise. In June, the Greene-Cananea made a low record cost of 9c., and the market slumped steadily, losing more than a point without any reaction. While the talk of curtailment is heard as ground for hope of a better metal market, there is also to be noted the progress made by the properties just coming into production. Chino is apparently to make good a reasonable part of the extravagant things Lawson said about it some years ago. The power-plant is to be turned on within the next four weeks, and the first ore will go through the mill before the end of August. It is anticipated now that Chino will be producing on a basis of 55,000,000 lb. annually on January 1. The Chino ore reserve is now estimated at 51,500,000 tons averaging a little better than 2.28% copper, and there is a large territory yet to be explored. Seven drills are in operation, and additional ore is being steadily developed.

When the copper situation is analyzed the complete control of the low-grade milling properties is so apparent that there seems to be no other factor worthy of lengthy consideration. It is safe to say that during the next few years the deep-level mines must be governed almost wholly by the action of the porphyries. For the time being merger talk has been dropped entirely, and until a great change in the politico-legal aspect of business affairs occurs, is not likely to be revived. L. D. Ricketts of the Greene-Cananea Copper Co. is to have charge of the reconstruction of the plant of the Arizona Copper Co. The committee of directors visiting the property have reported favorably upon a new smelter site, and the installation of reverberatory furnaces. The work will involve the expenditure of some $1,500,000, which will be supplied by the sale of debentures in Scotland.

There has been some forced liquidation in the Canadian mining issues, both in Cobalt and in Porcupine stocks. The decline in Nipissing brought out a rumor of a cut in the dividend. A cabled inquiry sent to George H. Earle, now in Europe, brought a specific denial of any such intended action. There have been many cases of financial distress since the Porcupine fire, and it is not to be wondered at that the market has been under pressure. The action of Hollinger has shown manipulation a little too plainly, and the public has not taken it as well as was hoped, nor has any degree of market cohesion been established. The position of the Consolidated Gold Fields of South Africa in regard to the Rea mines is still doubtful, though a semi-official announcement has been made to the effect that the company is entirely out of Porcupine. It is now said that this company is to organize a subsidiary with $8,000,000 capital for work on this side of the water, and that some large interests in the Yukon country have been taken over on the advice of John Hays Hammond.

As repeated announcements of the completion of the Nevada-Utah-Amalgamated Pioche merger have been made, it has become a fixed custom to follow up each one with a denial. Now, the announcement is made final that deeds and stocks have been exchanged and the Nevada Utah now controls every important mine in the district, except the Prince Consolidated. The much involved, doubled, and twisted organization of the Nevada-Utah is now to be further complicated by the creation of the Amalgamated Pioche Mines Corporation which will hold the physical title to all the properties, and which will in turn be controlled by the Nevada-Utah through stock ownership.

Statistics compiled by the U. S. Geological Survey show that the production of spelter for the first six months of 1911 was 140,196 short tons, a gain of more than 5000 tons over half the record output of 1910. Of this 5135 tons was made from foreign ore. Spelter stocks were reduced from 23,232 tons to 17,788 tons. Imports remained the same, but exports were nearly double those of half the preceding year. The apparent consumption of spelter was 135,497 tons.

General Mining News

ALASKA

Petitions for the establishment of an Alaska coal mining commission to operate public coal lands in the territory have been circulated in Seattle, Washington. The petitions are to be sent to President Taft and Congress. It is asked that the commission have authority to build railroads from the mines to Controller bay, build docks, bunkers, and accommodations for ships, maintain colliers, and establish Government bunkers at Seattle, Tacoma, and other Puget Sound points from which to sell coal direct to the people.

Treadwell District

The Alaska Treadwell Gold M. Co. for the month ended July 26 has issued the following report: Mill time, 31 days. Full mill of 240 stamps ran 29 days, 22 hr., 45 min.; water power, 27 days, 8 hr., 27 min.; steam power, 2 days, 14 hr., 18 min. 300-stamp mill, water power, 30 days, 16 hr., 45 min. Ore crushed, 84,840 tons, as follows: 240 mill, 33,460 tons; 300 mill, 51,380 tons. Sulphides saved, 1568 tons, as follows: 240 mill, 610 tons; 300 mill, 958 tons. Estimated gross value of free gold, $99,579.23; estimated gross value of sulphides, $84,653.77; estimated total production, $184,233; estimated total realizable value, $179,035.54.

Operating expenses, $92,232.30; net operating profit, $86,803.24; construction expenses, etc., $17,688.51; yield per ton of ore milled, $2.17; stock of broken ore increased 906 tons. Development work, 618 ft., as follows: 1450-ft. level, 40 ft. in ore, average assay value, $4.06; 1600-ft. level, 541 ft. in ore, average assay value $5.76; 37 ft. in waste.

The Alaska Mexican G. M. Co. for the month ended July 26, has issued the following report: Mill time, 31 days. Full mill of 120 stamps ran 30 days, 16 hr., 52 min.; water-power, 30 days, 16 hr., 52 min. Ore crushed, 18,694 tons. Sulphides saved, 450 tons. Estimated gross value of free gold, $22,113.68; estimated gross value of sulphides, $26,283.35; total, $48,397.03; less value 479 tons United ore, $1304.08; total production, $47,092.95; total realizable value, $46,622.02. Operating expenses, $27,235.13; net operating profit, $19,386.89; construction expenses, etc., $3495.93. Yield per ton of ore milled, $2.52; stock of broken ore increased 4030 tons. Development work, 136 ft., as follows: 1210-ft. level, 5 ft. in waste; 1320-ft. level, 27 ft. in ore, assay value 43c., 58 ft. in waste; 1570-ft. level, 25 ft. in waste; shaft, 21 ft. in waste.

For the same month the Alaska United G. M. Co. has the following report: Mill time, 31 days. Ready Bullion mill (120 stamps) ran 30 days, 3 hr., 1 min.; water-power, 26 days, 3 hr., 42 min.; steam-power, 3 days, 23 hr., 19 min. 700 Ft. Claim mill (100 stamps), ran 30 days, 14 hr., 35 min.; water-power, 16 days, 9 hr., 39½ min.; steam-power, 14 days, 4 hr., 55½ minutes.

	R. B. Claim.	700 Ft. Claim.
Ore crushed, tons	18,902	15,603
Sulphides saved, tons	462	285
Estimated gross value of free gold	$20,868.50	$18,448.30
Sulphides	20,117.07	13,764.84
Total production	$40,985.57	$32,213.14
Total realizable value	40,575.72	31,904.05
Operating expenses	$28,797.92	$23,962.50
Net operating profit	11,777.80	7,941.55
Construction expenses, etc	2,280.11	6,701.67
Yield per ton milled	2.16	2.06

Development work: Ready Bullion Claim, 387 ft.; 1350-ft. level, 167 ft. in waste; 1800-ft. level, 112 ft. in ore, assay value, $2.81; 1100-ft. level, 108 ft. in waste. 700 Ft. Claim, 654 ft.; 1210-ft. level, 342 ft. in ore, assay value $2.32, 18 ft. in waste; 1320-ft. level, 182 ft. in ore, assay value $3.62; 1600-ft. level, 112 ft. in waste. Stock of broken ore: R. B. Claim, 1871 tons; 700 Ft. Claim, 7040 tons.

Ketchikan

The Mt. Andrew mine is delivering 100 tons of ore over the aerial tramway to the bunkers on the beach daily. The steamship *Meteor* loaded 2000 tons of ore at Sulzer from the Jumbo mine on July 5 for the Ladysmith, B. C., smelter. The remainder of the ship's cargo consisted of 1000 tons of marble from Tokeen inlet and consigned to the factory at Tacoma. Several new discoveries have been reported from the head of Portland canal, the ore in that part of the district is principally lead, silver, and gold.

Valdez

An orebody has been discovered at the Ibex mine near the glacier, it is reported, which it is believed will average $40 per ton. Some of the ore assayed as high as $340 per ton. The vein at a depth of 60 ft. was 3 ft. wide, and apparently was widening.

Yukon

The Yukon Gold company is delivering material on claim No. 7 for the first dredge on Eldorado creek. Ground broken by the early prospectors, 15 years ago, will be worked over by the dredge. Another dredge will work on No. 6 claim, above Bonanza.

ARIZONA

Mohave County

The transfer of the Gold Road property to the United States S. R. & M. Co. is said to be the largest mining deal in the history of Arizona. The purchase price was $1,600,000, of which $1,200,000 was delivered to the owners and $400,000 to the bondholders of the Gold Road company. The price originally asked was $2,000,000.

CALIFORNIA

Inyo County

The official report of the Skidoo M. Co. for June is as follows: Amount company ore milled, 1331 tons; amount of lessees' ore milled, 142 tons. Time lost, 5½ days. Value of bullion produced, $14,696.19; value of cyanide produced, $4153.68; royalties and custom milling, $888.55; total receipts, $19,738.42. Cost of development, $667.93; cost of operation, $7673; total, $8340.93. Net profits for month, $11,397.49.

Kern County

A Cuplin pneumatic gold separator is being constructed at the old Goler dry-washing fields, nine miles west of Randsburg, by a Chicago syndicate, state press reports. R. W. Fairfoull is at Randsburg for the syndicate. The machine will be one of the largest portable dry-washing plants ever built. In the early days hundreds of men found employment at the fields, where they used the small hand dry-washing machines. Some made small fortunes, but the diggings afterward were practically abandoned.

Nevada County

(Special Correspondence.)—The North Star Mines Co. has placed an order for a large electric pump, to be installed in the Providence shaft of the Champion group. The Providence mine has been one of the most prolific and profitable producers of the group now comprising the Champion holdings. The working force has been increased, 60 men now being on the payroll. Driving from the 1000-ft. level of the Champion shaft will commence shortly, according to reports. Arrangements have been practically concluded for the taking over of the California mine, about four miles from Grass Valley, by the Scribner-Onn Gold Mining Co. The California has been developed to some extent and shows ore of fair grade. The Scribner-Onn interests control the West Point, Dolly Madison, and Alta mines, in the Rough and Ready district, and are said to be planning to take over other groups. San Francisco capital is largely interested. The management expects to have the new plant at the Union Hill mine in commission early in the fall. The renewed reports that the California Midland Railway Co. plans the early building of its line from Marysville to Grass Valley has reawakened interest in the copper properties in the Spenceville district. The

Iron Mountain mine, considered the best property in the section, is controlled by the U. S. Smelting, Refining & Mining Co. Otto Wascott and associates are developing a nearby group and expect the presence of excellent grade ore. The Midland is expected to traverse the district, as the surveyed route passes through the Spenceville road.

Nevada City, July 29.

PLACER COUNTY

George Hetersall, F. S. Morgan, C. B. Brown, H. Brown, J. Botte, and A. Nicholls have bonded the Heath placer mine, one mile from the Lost Emigrant mine. The ore will be stamped at the Lost Emigrant mill.

TUOLUMNE COUNTY

(Special Correspondence.)—The Black Oak is employing a crew of about 40 men. Shipments of the richer ore are being made regularly to the Selby smelter, the balance being milled at the property. The outlook is said to be more promising than at any time in the past.

The Starr King mine, near Tuolumne, shut down a few years ago after the destruction of the mill by fire, has been unwatered for inspection by prospective purchasers. It is said rich ore was uncovered on the bottom level, 800 ft. deep, just before the burning of the mill.

The New Albany, owned by the United Mines Corporation, is being operated with renewed activity. It is said that 600 tons of ore recently milled averaged better than $25 per ton. Extensive repairs are being made to the mill, during the progress of which work only one-half of the stamps are in operation.

Preparations are under way for the resumption of development operations at the Crystalline mine, near Jamestown, owned by C. F. Stater. It is reported that the Gold Wing mine, four miles south of Tuolumne, is to be reopened.

The Mansfield gravel mine, on Yankee hill, acquired recently by T. C. Crawford, is soon to be operated again. Gravel containing gold has been found on the Davies ranch, near Columbia. A three-compartment shaft will be sunk. A Keystone drill was used in prospecting. Forty men are employed at the Dutch mine and the 20-stamp mill is in continuous operation on ore of good grade. The Phoenix Lake M. Co. will erect a mill on its property near Confidence in the near future.

The Center Ledge M. Co. has taken a bond on the New York Tunnel mine, on Table mountain, near Rawhide, agreeing to pay $4000 for the property. During the life of the option the company must extend $300 each month in development and pay 20% of the gross output of the mine to the owners, J. R. and T. M. Bevan. A crew of 8 men is employed at the Gem mine, near Confidence, operated by J. N. Wagner and others, and prospects are reported as being good. A long pipeline has been laid. The Alta Vista Co., of Los Angeles, has acquired by bond the Fair Oaks mine, near Confidence.

Tuolumne, July 30.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence.)—Georgetown is to have a [illegible] concentrating plant. It is thought the town board will act favorably on a request by J. J. Kirksey, of Denver, president and general manager of the Kirk M. & M. Co., for a grant to a millsite and water rights. Mr. Kirksey promises to have the mill running in six months.

Sinking will be started next week on the Headlight shaft, American Sisters mine, which has been unwatered to the 300-ft. level. [illegible] is manager.

Richards & Co., leasing the Seven-Thirty mine on the Republic vein, is shipping to smelters, the ore bringing, it is said, 375 to 425 oz. silver per ton.

Georgetown, July 28.

(Special Correspondence.)—Work on the [illegible] property, [illegible], has been resumed through the Tunnel and [illegible]. Machinery is being installed at the New [illegible] mine. [illegible] will start in 60 days.

Idaho Springs, July 28.

GILPIN COUNTY

(Special Correspondence.)—Ore shipments from Central City for June were 40% heavier than a year ago. Development is being resumed on the Maine mine, an early-day producer. Free gold has been discovered at the 150-ft. level of the Pine Cone property in Wide Awake district. New machinery recently was purchased.

Central City, July 26.

At the Mountain Monarch mine, at Perigo, an ore-shoot assaying over $170 per ton was discovered while sinking the shaft. Assays of ore from stopes above the adit-level showed returns of $14 to $22 per ton.

The Pierce M. Co. has discovered a good vein 42 ft. below the 400-ft. level in the Pierce mine, Lake district. Frank Hardy is manager.

G. W. Adams, manager of the National mine, below Black Hawk, is experimenting with a Dietz 2-hp. electric drill, operated from a 5-hp. motor. So far the results have been satisfactory.

Sinking on the Chase mine, Willis gulch, has been suspended, owing to an increased flow of water.

The Pittsburg mine recently shipped two lots of ore, of which the first carried 12.24 oz. gold, 12.80 oz. silver, and 14.50% copper, and the second 3.4 oz. gold, 6.56 oz. silver, and 4.20% copper. The 800-ft. level has been cleaned out and retimbered, and stoping and raising from this level has been commenced.

In a report for the Frontenac-Aduddell mill, S. B. Tyler, superintendent, gives the following statement of mill and mine costs for May, when in 29 days 5700 tons of ore was treated: Labor, cost per ton, 44c.; power, 20c.; supplies, 1c.; maintenance, 3c.; assaying, 4c.; superintendence, 1c.; total, 73c. The mill and mine, which are at Black Hawk, are owned by the Frontenac Con. Mines, Ltd., an English concern, and the mill, started in March, is said to mark a new era in the treatment of the low-grade sulphide ores of that district.

IDAHO

OWYHEE COUNTY

Press reports state that the Kittie Burton M. Co., at Indian creek, is taking $10,000 a month from mill plates, and that the run for the past four months totals $40,000 in bullion. A carload of concentrate sampling $40 per ton is reported shipped from the property.

An air-pass line is being placed in the upper levels of the Rainier mine.

SHOSHONE COUNTY

Hecla Mining Co., operating at Burke, paid its ninety-seventh dividend of $20,000 at the rate of two cents per share on July 20. One hundred and ten thousand dollars has been disbursed since January 1, 1911, and $2,220,000 to date. The company is a Spokane corporation with a capital of $250,000, divided into 1,000,000 shares of the par value of 25 cents each. James F. McCarthy, of Wallace, is president.

SHOSHONE COUNTY

On Friday, August 4, the Bunker Hill & Sullivan M. & C. Co. paid dividend No. 167, of $65,400, making the total amount of dividends paid $12,898,050.

MICHIGAN

HOUGHTON COUNTY

The annual report of the Calumet & Hecla M. Co. shows its total assets to be $9,150,754; liabilities, $582,897; surplus $8,576,856. The refined copper output for the year ended June 30 was 71,476,881 lb., against 72,108,577 lb. in the previous year, and 82,816,230 lb. for the year ended June 30, 1909. The refined copper output was the smallest in 17 years. The ore stamped amounted to 2,795,514 tons at a mine cost, exclusive of construction, of $1.92 per ton. The report, in regard to stamp-mills, states: "Experiments which have been conducted on a commercial scale for the past two years have demonstrated that the conical pebble mill has a greater capacity, and, on account of grinding finer, permits of greater extraction in treatment of conglomerate sand than the Chilean mill, with which the present re-crushing plant is equipped. The grinder mill also permits of much cheaper construction, and plans are now being prepared for a re-crushing plant with pebble mill. Experiments have also shown that sand lying in Torch lake can also be treated at a substantial profit. The proposed re-crushing plant will have a capacity of about 3000 tons per day."

MONTANA

Fergus County

Kendall Mining Co., owning a mine of the same name at Kendall, controlled by Finch & Campbell, of Spokane, paid its regular monthly dividend of two cents per share, or $10,000, on July 20. The disbursements this year amount to $70,000, and the total to date, $1,595,000. The capital is $500,000.

Work has been started with drilling machines to prospect 400 acres of placer ground on Libby creek, in the Libby district, to test its adaptability for dredging purposes. J. Y. Ownbey and G. F. Hinton, representing outside capitalists, have charge. There is a large acreage of ground on Libby creek which, it is believed, will prove suitable for dredging.

(Special Correspondence.) R. H. Wing, president of the New Victor-Empire Mining Co., has returned to Spokane after having let a contract for the extension of the tunnel 250 ft. on the company's property on Granite creek, ten miles south of Libby, to N. W. Murray, of Butte. The price to be paid is $8 per foot. The tunnel in which he will work is now in 1088 feet.

The object in driving the tunnel is to get under a big iron capping which is found on top of the mountain and which can be traced for 1200 ft. down its side. It is 24 ft. wide. In this iron capping ore has been found in small quantities which goes as high as $700 per ton in silver, and this same character of ore has been found in the lower workings.

The company has an air-compressor, operated by water-power, and has sufficient capital to carry out the present plans.

Libby, July 30.

Silverbow County

The Butte & Superior at Butte is planning to put in a 500-ton concentrating plant to treat its ore, which now is shipped to a custom smelter eight miles from Butte. C. M. McNeill and D. C. Jackling are inspecting the property.

Paul Walcott and W. J. Dason, of Butte, have taken an option on the Black Friday mine, Radersburg district.

NEVADA

Elko County

The Gold Circle Crown M. Co. is planning to extend the west adit to meet ore-shoots believed to be beyond the point reached. The adit is now 500 ft. in the hill. The company expects soon to build a mill. S. M. Levy, of Salt Lake, is general manager. The claims are patented, according to press reports.

Esmeralda County

Eleven bars of gold bullion, valued at $283,100 and weighing 1115 lb. recently were shipped in one day by the Goldfield Con. M. Co. to the Selby smelter at San Francisco. Two of the bars weighed 123 lb. apiece and were valued at $31,300 each. The smallest bar was valued at $19,800. The shipment was sent under double guard. The bars had the highest average value of any shipment sent by the company on any one day.

(Telegraphic Correspondence).—Estimated July production of the Goldfield Con. M. Co., 29,174 tons; gross value recovered, $790,000; operating expenses, $220,000; net profit for month, $570,000. Mines are looking well.

Goldfield, August 2.

(Special Correspondence.)—Announcement is made of the formation of a $10,000,000 company, known as the Goldfield Deep Mines Co., and incorporated under the laws of the State of Washington, which has purchased the control and treasury stock of the Goldfield Merger Mines Co. and will at once begin development by sinking a 4-compartment shaft to a depth of 2000 ft. The project has the financial backing of former Senator William A. Clark, of Montana, whose brother, J. Ross Clark, of Los Angeles, head of the Clark railroads, is the president of the new company, its other officers being C. O. Whittemore, vice-president and general counsel of the same roads, with John Erikson, of Seattle, former president of the Merger Mines Co., and C. F. Redman, general agent of the railroads, additional directors. This news comes as the fruition of recent reports that Clark and others were negotiating for the control of Merger Mines, and sets at rest other rumors, discredited in this correspondence, that W. A. Clark and F. M. Smith were about to combine in the acquisition of the Merger control upon a partnership basis, a highly improbable situation in view of the rivalry in business and conflicting interests of the two men. In a statement made here Mr. Whittemore said that the Goldfield Deep Mines Co. is to be a holding corporation, and the operations of the Merger company and of other companies of which it may secure control will be conducted independently of the Deep Mines Co. The latter has purchased the entire treasury stock of the Merger company, paying the sum of $250,000 into the treasury of the latter, or about 30c. per share. The Merger Mines Co. has been reorganized with C. O. Whittemore as president, John Erikson, Claude Smith, John M. Grace, and W. H. Comstock, directors. In addition to 3,000,000 shares of Merger Mines stock, the Deep Mines Co. has 3,967,000 shares of its own stock in treasury, with which to acquire additional stock of the Merger and stock of other mining corporations. Stock of the new company will be exchanged share for share for outstanding stock of the Merger company. It is said that the new deep shaft will be sunk at some distance from the old 600-ft. shaft and on the Moonshine claim. The Merger Mines Co. was a consolidation of the St. Ives, Velvet, Potlatch, and Gold Horn companies, the territory owned comprising 138 acres. The St. Ives is patented and the rest are surveyed for patent. A considerable quantity of rich ore has been produced by lessees from above a depth of 250 ft. The ground is in a solid block and is bounded by claims of the Consolidated Mines Co., the Florence, Jumbo Extension, Atlanta, Blue Bull, Lone Star, and Spearhead.

Goldfield, August 1.

L. L. Mushett, of Tonopah, and several associates will soon commence operation on a lease obtained from the Manhattan Con. M. Co., covering the main working shaft.

Nye County

(Special Correspondence.)—The North Star Co. has commenced driving from the 950 and 1250-ft. levels to open the ore supposed to exist beyond the fault. On the 950-ft. level the stope exposed 18 in. of ore for a distance of 80 ft. until cut off by the fault. A raise will be made from the top of the stope along the hanging wall of the fault. This is expected to result in recovering the vein. From the 1250-ft. level a cross-cut is being driven to penetrate the Mizpah fault, estimated to run 30 to 40 ft. thick. In the upper levels good ore continues to be developed. The West End is sending out east and west drifts from the 500-ft. level. At the Big Four mine, at Manhattan, the shaft is being sunk to the 400-ft. level with three shifts employed, and from this point drifts will be sent out to the vein. On the 300-ft. level the lessees state the vein is 5 to 10 ft. wide, with 4 ft. averaging $50 per ton. The rest is said to run $15 per ton. Because of lack of milling facilities the lessees have been forced to cease the treatment of their ore, the custom mill having contracts for the handling of ore from other properties. The Tarash lease on the Big Four has its shaft down 90 ft. A whim has been installed, and sinking will continue to the 150-ft. point, from which cross-cutting will be conducted. The Watson lease is also sinking to open a diagonal vein. It is stated that the Big Four company will pay a dividend early in August, the second of the year.

Tonopah, July 28.

NEW MEXICO

DONA ANA COUNTY

Development work on the Memphis mine, near Las Cruces, will be started soon. M. J. Dailey is manager.

GRANT COUNTY

Press reports state that the Lanumex M. Co., operating near Hachita, has discovered a rich vein of lead-silver ore at a depth of 30 ft. The vein is 3 ft. wide and high grade.

SOCORRO COUNTY

(Special Correspondence.)—The product for the first half of July of the Socorro mines amounted to 15,000 oz. gold and silver bullion and 5 tons of high-grade concentrate, from an ore treatment of about 1800 tons. In addition to the average product from all the stopes, high-grade ore is now being mined between the third and fourth levels. An order has been placed for three De La Vergne high-compression oil engines of a combined capacity of 540 hp., for October delivery. These will be installed at the mine and mill, thus avoiding a 3-mile transmission loss over the line from Whitewater. The large wood reserve at the latter point will be used only in cases of emergency after the oil engines are placed in regular commission.

The Ernestine Mining Co. has also placed an order for three De La Vergne oil engines, which will be delivered about the same time as those of the Socorro mines. On August 1 the preliminary work of grading, foundations, etc., for this equipment, will be started and everything will be ready to receive the machinery on its arrival. The company continues paying dividends regularly, the third within four months having been recently disbursed. At the Deadwood mines the mill is now exceeding all past records in tonnage treated, having practically doubled its output within the last three months. At the Gold Dust mines work is progressing steadily with three shifts in the lower tunnel, and a good rate of advance is being made. Good ore is being found in the drifts from the new shaft of the Maud Mining Co. The Mogollon Gold & Copper Co. is making a raise from the east drift in Little Charlie in good ore.

Mogollon, July 28.

OREGON

BAKER COUNTY

Anthony Mohr has closed a deal for the sale of the Bi-Metallic mine in the Greenhorn, Oregon, district to a Portland syndicate. The price was not made public. The property was owned by Andrew Larson. More than 1000 ft. of underground prospecting has been completed. The new owners will drive a cross-cut tunnel to give an added depth of 300 feet.

JOSEPHINE COUNTY

As a result of the Southern Oregon and Northern California Mining Congress, recently held here, a movement has been set on foot to obtain for mineral prospectors the right to kill buck deer for actual use at any time. Other projects urged by the convention were: a permanent organization of the Congress, in harmony with the American Mining Congress and the Oregon State association; a request for co-operation from Alaska and Washington for a square deal for Alaska and other parts of the West; opposition to the policy of the department in the arbitrary withdrawal of lands from mineral entry; the completion of the geological survey of Oregon with regard to mining districts; re-adjustment of railroad rates to aid mining; increased appropriation for the Federal Mining Bureau. The next session will be held at Medford January 17 and 18.

UTAH

SALT LAKE COUNTY

The Alta Consolidated Mining Co. has been organized by Tony Jacobson and associates of Alta. It has 11 claims, of which several are patented, in the upper part of the Alta district in the Wasatch range. It is capitalized at $300,000, divided into 300,000 shares, par value $1 each. Modern machinery will be secured at once for equipping a mill. The company's board of directors include Mr. Jacobson, president; J. H. Winwood, engineer, vice-president; V. S. Snow, secretary and treasurer; A. O. Jacobson, superintendent; and H. Wonder. Silver, lead, copper, and gold have been found in this one-time abandoned district.

The Utah Mines Coalition Co. expects to ship within a month 40 tons of ore daily from its mine in the Big Cottonwood district. R. H. Strickland is general manager. The main raise, it is reported, has advanced 100 ft. in good ore, and will soon connect with the old workings.

WASHINGTON

FERRY COUNTY

(Special Correspondence.)—Smelter returns for the San Poil Con. M. Co. show 127.9 tons treated, assaying $3814. Freight and treatment charges were $996, leaving a net return of $2818, or $22 per ton. Two cars shipped later assayed $26 per ton in gold and $7 in silver.

As soon as the air-pipe can be laid from the San Poil mine power-house to the Trade Dollar mine, the latter will be opened. The company soon will be in the market for a new hoist, etc. Address the San Poil Con. Co., Republic.

The Illinois Copper & Silver M. & M. Co. has purchased machinery for resuming work on the Illinois group in August. J. D. Davis, superintendent, is on the ground.

Republic, July 25.

(Special Correspondence.)—The Ben Hur Leasing Co. has on the first level 600 tons of ore broken and awaiting milling treatment which assays about $10 per ton.

At the Surprise mine from a point 280 ft. down the main incline shaft a cross-cut is in 40 ft. toward the vein, which it will intersect at a vertical depth of 300 ft. It has 72 ft. farther to run. A big breast of $8 to $10 ore has been found just north of the Jim Clark adit. From No. 2 raise to the winze intermediate level a 200-ft. drift has intersected eight or nine feet of the vein, and in driving on it 150 ft. the ore samples assayed from $10 to $160 per ton, but neither the hanging nor foot-wall has yet been touched.

At the Black Tail mine, on the adit level, 15 ft. north of the winze, the ore on a cross-vein, just broken into, assays $132 in gold and $18.70 in silver, total $150.70 per ton.

Republic, July 28.

STEVENS COUNTY

(Special Correspondence.)—A vein of galena 14 in. wide has been discovered at the Butte & Washington mine.

The Alice E. mine will be in the market soon for machinery, including a diamond-drilling outfit. Address, George Robertson, manager, Orient, Stevens county.

Orient, July 25.

CANADA

BRITISH COLUMBIA

A 2-ft. vein of solid ore has been discovered at the 1200-ft. level of the Rambler-Cariboo mine, W. E. Zwicky, manager. Two other veins will be met soon, it is believed. A mill will be built when the route of a proposed branch of the Canadian-Pacific from Three Forks to Bear Lake is known. A. F. McClaine of Spokane is president.

At the Standard the orebody has been found in the No. 6 adit-level, which is 240 ft. below the No. 5 level, where the most extensive work has been done in the big ore-shoot.

T. Walter Beam of Denver, representing the shareholders of the controlling interest in the Hedley Gold mines and the Nickel Plate mine, has secured an option until September 1, on the Nugget mine in the Sheep Creek district.

ONTARIO

(Special Correspondence.)—Despite the Porcupine fire the ore shipments for 1911 will not be less in value than in 1910. The fact that higher-grade ore on the average has been shipped and that considerable bullion has been sent out, will make up for the discrepancy and bring the total valuation above that of last year. A statement issued by the La Rose on July 1 shows cash in bank and value of ore in transit and at smelter, $1,184,242; ore sacked for shipment, $162,311; total, $1,346,553. Half of the output now comes from the Princess and Lawson properties. At the Princess an orebody 8 in. wide carrying 4000 oz. per ton has been found at a depth of 250 ft. in a winze sunk from the 250-ft. level. Good ore is being extracted from the roof of No. 8 stope at the Lawson property. Work will shortly be begun on the Violet property, the old shaft of which is being unwatered. A statement of the condition of the Nipissing on July 1 shows cash in bank, [illegible], ore in transit and at smelters, $464,118, ore sacked for shipment, $251,957; total, $1,419,280. The Coniagas has declared a dividend of 6%, with a bonus of 3%, making 27% in all for this year. The Crown Reserve has issued a statement for the six months ending with June, which shows a production of 1,482,904 oz. of silver at a profit of $654,287. After paying a royalty amounting to [illegible], the amount of $530,641 was distributed in dividends, at the rate of 30% for the half year. The Temiskaming has issued a statement showing a surplus of $309,951 on July 1. The general manager reports that at the west of the property, underground operations have met the pre-Cambrian diabase formation, which is entered by vein No. 4 with apparent loss of valuable ore, although as yet there has not been sufficient work done to prove definitely whether ore occurs in this formation or not. Veins No. 1 and 3 are being opened up at the 575-ft. level without any indication of a change from the Keewatin formation, and some rich ore has been found in patches. It is hoped that when the ore-shoot now being mined on the 500-ft. level is reached at the lower depth, good ore will be obtained. Two good veins have been found at the Ophir. One of them averages 2 ft. in width and yields good concentrating ore. The other, about 500 ft. distant, is 3 ft. wide. This mine is likely to become a producer in the near future.

Toronto, July 28.

(Special Correspondence.) The Porcupine G. M. Co. will immediately construct a 100-ton mill and a power-plant, plans for which, drawn up by C. H. Poirier, manager for the company, have been approved by the directors. An eight-drill compressor, with boilers, drills, and a new hoist, will be ordered.

The main shaft will be sunk to the 200-ft. level, where cross-cuts will be run to tap the No. 2 and 3 veins. The latter, found just before the fire at the 100-ft. level, is 18 ft. wide, and assays from wall to wall, according to report, more than $15 per ton. The wall-rock also carries milling ore. Drifts will be driven on the No. 3 vein 90 ft. to a shaft which has been sunk to a depth of 65 ft. on the vein. About 451,000 shares of treasury stock remain unissued. The company has ample funds on hand.

Cobalt, July 27.

The Oliver Silver M. Co., Ltd., has let a contract to sink a 100-ft. shaft on its property near Calcite lake, Montreal River district. The company has five claims, and in the course of assessment work three or four veins showing native silver were discovered.

The Philadelphia Syndicate, organized to rehabilitate the Cobalt Central M. Co. and to take the Standard Co. out of liquidation, has issued an appeal to shareholders to take stock in the new organization so that work may be resumed. The property purchased includes 200 acres, patented, and a 100-ton concentrating mill. The Powell, Big Pete, and other mines are on the property.

The Plenaurum Mines, Ltd., headed by W. S. Edwards, of Chicago, which controls the Western Armstrong-Booth claims, has been capitalized at $2,500,000 in 500,000 shares. Of these, 100,000 will be issued in Canada. It is reported 50,000 have been subscribed in London.

YUKON

In an informal talk with representative Dawson citizens July 13, F. T. Congdon, member of parliament (for Yukon affairs) stated that it is believed some workable plan may be devised whereby the poor man may acquire large grants of dredging ground. Press reports state that he intimated that the features objected to in the former concessions would be eliminated in the proposed large leases. A miner's license covering any number of claims without increased fee may be adopted. He stated that with both the United States and Canada it is becoming the settled policy to grant only leases, not patents for mining properties. Representation would apply under all leases, and in default the property would revert to the Government. No rental charges would be made on placer claims. The new code is to apply where the Federal Government has full authority, including Yukon and all other territories, parts of British Columbia, and parts of one or two other provinces. All mining laws are to be made uniform. The mining act is to have five divisions relating to general mining, placer, quartz, oil and petroleum, and, finally, probably water and gas. The act is to be automatic. Mr. Congdon heartily endorsed reciprocity and was pleased at the growing good feeling between the United States and Great Britain.

PHILLIPINE ISLANDS

BENGUET

(Special Correspondence.) The 10-stamp mill of the Headwaters M. Co. is ready to commence operations. Besides 1100-lb. stamps, the mill is equipped with Hardinge conical tube-mill, Callow dewatering cones, Frenier pumps, two Pachuca tanks, and a Ridgway filter. Amalgamation is not employed, the process of extraction being an all-cyanide one. The company expects to treat 60 to 70 tons per day slimed to 150 mesh. The mill-heads will average $9. C. T. Durell is superintendent and G. Weedon mill foreman.

Plans have nearly materialized to put the Benguet Con., at one time the leading producer of this district, once more in a position to do justice to its ore deposits. This company has been more or less crippled since the big *baguio* of 1909 carried off its cyanide plant. Fortunately, the upper part of the mill was left standing, though the concentrating tables and all below them were carried away. By cutting expenses almost to a vanishing point and choosing the best of the ore, Nels Petersen, the manager, has been able to keep things going, though the ore only plates 40% of the assay values. A few days ago the Consolidated company shipped a bar weighing 172 oz. to Manila, the output of the little 6-stamp mill for the past month.

HEADWATERS MILL.

The Major mines have been pegging along with their 6-stamp mill, testing out the various ores on their property, which is a large one. They are now erecting a 30-ton cyanide plant which they hope to have completed next month. The plant was designed by Huxley St. John Brooks, the company's metallurgical engineer, who is in charge of construction.

Baguio, June 15.

MEXICO

HIDALGO

The reorganization of the Santa Ana y Anexas Co. of Pachuca, say press reports, is almost completed, and ore extraction will be started in the near future. A new skip-road and head-frame have been built and the main shaft has been secured with masonry and retimbering. A Westinghouse motor of 225 hp. will supply the motive power.

SONORA

A report just issued by the Creston Colorada company at Torres, states that the mill in the past five months has crushed 82,300 tons, at an average cost of $3.40 per ton.

Company Reports

PORTLAND GOLD MINING CO.

The seventeenth annual report of this company, which operates mines at Cripple Creek and mills at Colorado Springs and Victor, Colorado, shows that during the year ended February 6, 1911, 67,515 tons of ore was mined and shipped to the mills at Colorado Springs. This ore had a gross value of $1,241,168, or an average of $18.32 per ton, and was mined and milled at a net cost of $987,042, leaving a profit of $367,380, as $113,254 was recovered by the new mill at Victor from ore that was formerly regarded as waste. Miscellaneous income increased the profit to $373,501. As depreciation upon mines and mills, $241,871 was allotted, and $240,000 was paid in dividends, leaving a balance to be carried to the 1911 account of $2,402,105. The cash on hand January 1, 1911, amounted to $134,849. During the year $136,632 was spent upon the construction of the new mill, built at Victor at an elevation of 10,400 ft. This has a capacity of 350 tons per day, and is so nearly automatic that in addition to the metallurgists, machinists, and electrician, only four men are required to operate the plant at full capacity. It was first designed to treat the dump ore, but as the present daily production of waste is nearly equal to the capacity of the mill and can be delivered to the mill at the same cost as placing on the dump, it is used as mill-feed. The ore as taken from the mine is much harder than that on the dump, and in order to crush the tonnage for which the mill was designed it was necessary to install an additional Chilean mill. One man with an electric larry transports from shaft No. 2 to the mill, 1000 ft. distant, all the ore the mill can treat in 24 hr. Arrangements will be made later to withdraw large quantities of waste that have been used as filling for stopes, replacing it by tailing from the mill. The work of the mill during the past six months has demonstrated that the low-grade ore can be successfully treated by the Portland process at a good profit. It is probable that the mill will be increased to a capacity of 500 to 700 tons per day within a year or two. The Portland G. M. Co. is capitalized for $3,000,000 in 3,000,000 shares. The gross production of the company to date has been $31,262,515, and dividends have been paid aggregating $8,677,080. The Portland is one of the best known companies of the cripple Creek district, and is notable for the large profits made and the skill and good management shown in its operations.

UNITED STATES SMELTING, REFINING & MINING COMPANY

The fifth annual report of this company, with which is affiliated the U. S. Smelting Co., The Needles M. & S Co., The U. S. Mining Co., the Centennial-Eureka M. Co., the Richmond Eureka M. Co., the Mammoth Copper Co., Compania de Real del Monte y Pachuca, the U. S. Stores Co., the U. S. Metals Ref. Co., and the International Metals Selling Co., shows that for the year ended December 31, 1910, the earnings of the companies, after charging cost of production, selling expense, and repairs, were $3,738,541. From this, $1,067,069 was deducted for depreciation, improvement, and reserve, and $187,154 for administrative and legal expense, leaving a net profit of $2,484,318, which, added to the undistributed surplus of $1,715,231 from the previous year, amounts to $4,199,549. Of this, $852 has been applied as dividends on the minority stock of subsidiary companies, $1,701,701 as dividends on the preferred stock of the U. S. S. R. & M. Co. at the rate of 7% per annum, and $702,101 as dividends on the common stock at 4% per annum, leaving an undistributed surplus of $1,794,895. In the balance sheet the cost of the properties is given as $41,577,092, against which have been issued 351,103 shares of common stock at $50 each, with $175 scrip, and 486,320 shares of preferred stock, of $50 each, with $250 scrip. The report concludes with brief summaries of the operation of the subsidiary companies for the year.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS.

LOCATION OF MINING CLAIM IN FOREST RESERVE.—USE OF SURFACE FOR SALOON

The location of a mining claim within a forest reserve does not operate to withdraw the land embraced therein from the jurisdiction of the Secretary of Agriculture, nor does it give to the locator, acquiring possessory interest only, any authority to use the surface for the erection and maintenance of a saloon without a permit from the Secretary of Agriculture.

United States *v.* Rizzinelli, 182 Federal, 675, August 1910.

LOCATION OF MINING CLAIM IN FOREST RESERVE

The United States statutes permit any person to enter upon the forest reservations for the purpose of prospecting, locating, and developing the mineral resources thereof, provided such person complies with the rules and regulations covering such forest reservation. The statutes also provide that any mineral lands in any forest reservation shall be subject to location and entry under existing mining laws. It is also provided by statute that the claimant shall have the exclusive right of possession and enjoyment of all the surface of any claim, and of all veins, lodes, and ledges throughout their entire depth, the top or apex of which lies inside of such surface lines, extended downward vertically. Under these statutes the rights of a locator of a mining claim within the boundaries of a forest reserve are substantially the same as those of one who locates a claim upon the public domain. Under these statutes the question has arisen as to the meaning and construction of the clause providing that "the claimant shall have the exclusive right of possession and enjoyment of all the surface." In passing upon this particular question a Federal judge in the District of Idaho said substantially that the Government confers upon a locator the right of possession and enjoying the surface of a mining claim for mining purposes without the payment of any consideration whatever, and offers for a small consideration to convey to him the entire estate. It gives the mineral to him who finds it, and, for purposes incident to the extraction thereof, permits him to possess and use the ground in which it is found. It does not give him the ground, but empowers him to purchase it, and he may do so if he desires its permanent and unrestricted use. But the statute gives the locator nothing but the right of present and exclusive possession for the purpose of mining. It does not divest the legal title of the United States, or impair its right to protect the land and its product. The two titles recognized by the Government confer totally different rights. One confers the right of the locator to the possession of the land for the purpose of carrying on his mining operations as long as he performs the required conditions. Subject then to the locator's legitimate use for mining purposes, the Government continues to be the owner of the land and is interested in conserving its value and preventing injury and waste. It therefore follows that forest reserve lands embraced in a mining claim continue to constitute a part of the reserve, notwithstanding the mineral location, subject, of course, to all legal rights and privileges of the locator. The paramount ownership being still in the Government, and it also having a revisionary interest in the possessory right of the locator, the Government accordingly has a valuable estate which is necessarily a substantial property right of the Government. Under this construction the locator's rights are not curtailed; there is no intrusion upon his possession; his right of enjoyment is not necessarily qualified or infringed by the intention of the forest reserve. He may possess and utilize the entire claim, including the surface, for all purposes and to the same extent for and to which he could have possessed and used it if no forest reserve existed.

United States *v.* Rizzinelli. 182 Federal, 675. Aug. 1910.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

Z. CUSHING is at Juneau.

C. H. PEARCE is at Cordova.

F. L. SIZER is in San Francisco.

S. W. MUDD is in San Francisco.

M. D. SHIPMAN has gone to Ouray.

FRANCIS DRAKE is in San Francisco.

F. G. CLAPP is at Pittsburg for a few days.

G. H. GARREY has returned to San Francisco.

W. W. MEIN is now residing at San Francisco.

JOHN W. YOUNG was in San Francisco last week.

C. W. EVANS, of Virginia City, Nevada, is in San Francisco.

M. D. DRAPER is at Chitina, Alaska, for the Hubbard-Elliott syndicate.

FRANK BERRY, of Fairbanks, Alaska, is at the St. Francis hotel, San Francisco.

H. A. KELLAR has been examining the Mother Lode mine at Kennicott, Alaska.

F. W. TRAPHAGEN has been at Tacoma and San Francisco for the U. S. Bureau of Mines.

R. S. TARR and LAWRENCE MARTIN went in to Fairbanks, Alaska, from Cordova in July.

F. H. PROBERT is making an examination of the Begoles Mines Syndicate at Goldfield, Nevada.

J. B. UMPLEBY has gone to Idaho for this summer's field-work with the U. S. Geological Survey.

J. F. B. ERDLETS has been examining prospects in the McKinlay Lake district near Cordova, Alaska.

COURTENAY DE KALB has been investigating the San Antonio mine, San Antonio de la Huerta, Sonora.

H. G. WALKER and B. C. STANNARD, who have been visiting southwestern Alaska, have returned to Tacoma.

R. B. BRINSMADE left St. Louis recently for Mexico, where he will spend several weeks in various mining camps.

HEINRICH RIES was at Glacier, B. C., during the week and has gone to Vancouver, on his way to San Francisco.

HORACE H. HOWARD, consulting engineer for the Globe Exploration Co., New York City, is in the Porcupine district.

GEORGE J. HOUGH, metallurgist and chemist of Denver, recently purchased the leading assay office at Salida, Colorado.

JOHN B. CLEVELAND is to take over the management of the West Dome, succeeding R. A. WEISS, who lost his life in the fire at Porcupine.

H. A. ROESLER, a graduate of the Missouri School of Mines in the class of 1903, has been appointed instructor in metallurgy and ore-dressing at that institution.

JOSEPH A. HOLMES, director of the Bureau of Mines, left Washington July 5 for a trip to the Pacific coast and then on to Alaska. He was in San Francisco, but has left for Juneau, Alaska, and will return to Washington within two months.

D. A. MCMILLEN, chief consulting engineer for the Globe Exploration Co., New York City, is spending a few weeks in central and southern Mexico examining properties for the interest of the company.

B. A. SEITZ, one of the heaviest owners of the Lucky Tiger mine, Sonora, was seriously wounded recently at Kansas City. While taking a walk he was hit by a bullet fired into the crowd by a fleeing diamond thief.

Obituary

LINTON B. SUTTON, one of the well known mining engineers of America, died in New York on June 11. He was born at East Liverpool, Ohio, in 1866, and graduated from the Michigan College of Mines in 1889. For nine years his work was in the Lake Superior district, where he had experience in mining on a large scale, and made a reputation as a thoroughly competent mine manager. This led to his being invited to join the engineering staff of S. Neumann & Co., where his first commission was to examine the copper deposits in Namaqualand. Completing that work, he went to Johannesburg, and eventually became general manager for the Randfontein Deep, Ltd. Later he was engaged in important gold-mining investigations in Madagascar, after which he returned to Johannesburg, and for a brief period was acting consulting engineer for the East Rand Proprietary Mines. Mr. Sutton returned to the United States in 1907 and in March 1909 became assistant to Pope Yeatman, consulting engineer for the Guggenheim Exploration Co., taking part in the development of the Nevada Consolidated, Copper River, Esperanza, and other important mining enterprises. In 1910 Mr. Sutton was made consulting engineer for the Esperanza Mining Co., which position he held at the time of his death. A thoroughly lovable man, he was warmly appreciated in his profession, in which he had many admirers and friends.

Recent Publications

MINERAL RESOURCES OF WYOMING. Bulletin 1, Series B. By C. E. Jamison. 102 pp. Cheyenne, 1911. This little volume, compiled from various sources, chiefly the bulletins issued by the late W. C. Knight, is a brief summary of the mineral resources of Wyoming, more than one-half of the pages being taken up by a reprint of the mining laws of the United States.

MEDELLIN, EL 20 DE JULIO DE 1910. Published by *la Sociedad De Mejoras Publicas*, in commemoration of the first centenary of the independence of the Republic of Colombia. N.p., n.d. This handsomely illustrated and printed volume, issued in Spanish, French, and English, will surprise many citizens of the United States, who are accustomed to think of Colombia as a land of forest and streams, inhabited by a sparse population dependent upon agriculture for a livelihood. To all such the photographs of cotton spinning and weaving mills, chocolate manufactories, and a host of other industries will be something of a revelation.

The following publications of the Bureau of Mines have recently been received: 'Apparatus and Methods for the Sampling and Analysis of Furnaces Gases,' by J. C. W. Frazer and E. J. Hoffman; Bull. 12, pp. 22, ill., 1911. 'Fees for Testing Explosives,' Schedule 1, pp. 6, June 1, 1911. 'Briquetting Tests of Lignite,' by C. L. Wright; Bull. 14, pp. 64, ill, 1911. 'Sampling of Coal in the Mine,' by J. A. Holmes; Technical Paper 1, pp. 18, ill, 1911. 'The Escape of Gas from Coal,' by H. C. Porter and F. K. Ovitz; Technical Paper 2, pp. 14, 1911.

The issuing of a series of 'Technical Papers,' of which the first two are listed above, is a most commendable innovation. In the carrying on of research, many details of minor importance are necessarily investigated, which, not being directly related to the main subject, can not properly be included in the principal report. Unless published in technical journals, as is sometimes done, the results of such work are practically lost to the profession, but when sent out in the form of brief papers, will undoubtedly be of great assistance to other workers. It also furnishes an excellent means of giving out preliminary reports of progress, and is a further evidence of the desire of the Bureau of Mines to be of service, both prompt and effective, to the mining industry.

Mine.	Location.	Controlling Parties.	General Office.	1910 Production Lb. (1)	Prospective Rate of Production within Two Years.	(1) Cost per lb. Cents	No. of Shares Issued	Par Value
Amalgamated Copper	Butte, Mont.	Standard Oil	New York	167,000,000 (2)			1,538,879	$100
Ahmeek	Calumet	Calumet & Hecla	Boston	11,845,000	20,000,000	11	50,000	25
Allouez	Calumet, Mich.	Calumet & Hecla	Boston	4,657,000		11½	99,511	25
Anaconda Copper	Butte, Mont.	Amalgamated	New York	224,000,000 (3)		9½	4,320,000	25
Arizona Copper	Clifton, Ariz.	Scotch Ints.	Scotland	33,150,000		9¼	2,947,018	5s
Boleo Copper	Mexico	Rothschilds	Paris	26,200,000		6¼ (5)	120,000	100
Butte Coalition	Butte, Mont.	Amalgamated	New York	(6)			1,000,000	15
Braden Copper	Chile, S. A.	Guggenheims	New York		37,000,000 (4)	7½	2,200,000 (7)	5
British Columbia	Greenwood, B. C.	Newman Erb	New York	7,400,000	12,000,000	9	591,709	5
Butte Balaklava (9)	Butte, Mont.	Duluth Ints.	Duluth	2,428,346		6½ (8)	250,000	10
Calumet & Hecla	Calumet, Mich.	Agassiz-Shaw	Boston	71,500,000		8½	100,000	25
Calumet & Arizona (19)	Bisbee, Ariz.	Calumet & Pitts. Int.	Calumet	[illegible]		8 1-3	200,000	10
Centennial	Houghton	Calumet & Hecla	Boston	1,552,500		14½	90,000	25
Cerro de Pasco	Peru, S. A.	Haggin-Hearst-Morgan	New York	34,700,000		6½	100,000	100
Chino Copper	New Mexico	Hayden-Stone	New York		50,000,000 (4)	8	800,000 (21)	5
Copper Range	Houghton, Mich.	W. A. Paine	Boston	32,700,000		8½ (24)	394,333	100
East Butte	Butte, Mont.	W. A. Paine	Boston	8,000,000 (10)		8	300,000	10
First National	Shasta Co., Cal.	[illegible]	New York	8,450,000		11 (11)	600,000	5
Franklin	Houghton, Mich.	S. R. Dow	Boston	968,333	6,000,000 (4)	11 (23)	166,342	25
Giroux Con.	Ely, Nevada	Cole-Ryan	Duluth		10,000,000 (4)	9	1,500,000 (7)	5
Granby Con.	Phoenix, B. C.	American Metal Co.	New York	20,000,000		10½	147,862	100
Greene Can.	Cananea, Mex.	Cole-Ryan	New York	46,400,000	70,000,000	11	2,486,512	20
Imperial Copper	Silver Bell, Ariz.	Dev. Co. of America	New York	7,861,000 (17)		10	500,000	10
Inspiration	Globe, Ariz.	Gunn Thompson	New York		80,000,000 (4)	9	1,100,000 (21)	10
Isle Royale	Houghton, Mich.	Calumet & Hecla	Boston	7,507,000		11 8-10	150,000	25
Lake Copper	Ont'n'gon Co., Mich.	W. A. Paine	Boston		10,000,000 (4)	8	100,000	25
Mason Valley	Mason, Nevada	Gunn Thompson	New York		12,000,000 (4)	8	234,000 (7)	5
Miami Copper	Globe, Ariz.	General Dev. Co.	New York		60,000,000 (4)	9	745,235 (7)	5
Mohawk Copper	Calumet, Mich.	Stanton	New York	11,400,000		11 3-10	100,000	25
Nevada Con. (20)	Ely, Nevada	Utah Copper Co.	New York	65,500,000	70,000,000	8 9-10	1,998,762	5
North Butte	Butte, Mont.	Cole-Ryan	New York	25,267,092		10 1-3	410,000	15
Ohio Copper	Bingham, Utah	F. Aug. Heinze	New York	6,300,000 (13)	25,000,000	10½	1,216,380 (7)	10
Old Dominion	Globe, Ariz.	Phelps-Dodge	New York	17,712,723 (14)		10½	293,245	25
Osceola	Calumet, Mich.	Calumet & Hecla	Boston	19,500,000		9½	96,150	25
Parrot (15)	Butte, Mont.	Amalgamated	New York				229,850	10
Phelps-Dodge	Arizona and Mexico	Phelps-Dodge	New York	116,888,000 (16)		8½	450,000	100
Quincy	Houghton, Mich.		New York	22,517,000		10½	110,000	25
Ray Con. (17)	Kelvin, Ariz.	Aldrich-McNeil	New York		80,000,000 (4)	9	1,350,000 (7)	10
Shannon Copper	Clifton, Ariz.	N. L. Amster	Boston	17,000,000		11½	300,000 (7)	10
Shattuck-Ariz.	Bisbee, Ariz.	Duluth Ints.	Duluth	14,751,000		5 8-10 (8)	350,000	10
South Utah M. & S.	Newhouse, Utah	Samuel Newhouse	New York	943,810 (22)	6,000,000	11	600,000 (7)	5
Sup. & Boston	Globe, Ariz.	Houghton Ints.	Houghton	1,827,000		9½	233,827	10
Sup. & Pitts.	Bisbee, Ariz.	Cole-Ryan	Calumet	26,183,140		8½	1,498,601	10
Superior Copper	Houghton, Mich.	Calumet & Hecla	Boston	3,225,000	10,000,000	9	100,000	25
Tamarack	Calumet, Mich.	Calumet & Hecla	Boston	11,063,000		14 7-10	60,000	25
Tennessee Copper (18)	Ducktown, Tenn.	Lewisohn Bros.	New York	12,429,000		10 6-10	200,000	25
Tuolumne	Butte, Mont.	Butte Ints.	Butte	8,500,000		7 (8)	800,000	1
United Verde	Jerome, Ariz.	W. A. Clark	New York	38,000,000		(9) (5)	300,000	10
Utah Copper (20)	Bingham, Utah	Guggenheims	New York	122,000,000	210,000,000	7 8-10	1,612,849 (7)	10
Utah Cons.	Bingham, Utah	Standard Oil	New York	7,450,471	—	12	300,000	5
U. S. Smelting	Arizona, Utah California Mexico, Nevada	Boston Ints.	Boston	25,000,000		(19)	Com. 351,105 Pfd. 486,219	50
Wolverine	Calumet, Mich.	Stanton	New York	9,057,000		7½	60,000	25

Mine.	ESTIMATED EARNINGS PER SHARE. 11 Cts.	12 Cts.	13 Cts.	14 Cts.	15 Cts.	16 Cts.	STOCK QUOTATIONS. High 1906 H	1906 L	1907 H	1907 L	1908 H	1908 L	1909 H	1909 L	Low 1910 H	1910 L	Rate and Amount of Last Dividend	Date of Last Payment.
Amalgamated Copper	$1 90	$3 04	$4 08	$5 12	$6 22	$7 28	118¾	92½	121½	41½	88½	45½	96½	65	90½	55½	50Q	Feb. 27, 1911
Ahmeek		2 36	4 72	7 08	9 44	11 80	110	75	120	65	125	82	235	125	275	160		
Allouez		23	70	1 16	1 63	2 11	55½	31½	74½	20	41½	24	62½	34	58	31		
Anaconda Copper	70	1 32	1 86	2 38	2 91	3 44	76	55½	75½	25½	53½	27½	54½	37½	54	33½	50Q	Apr. 10, 1911
Arizona Copper	17	28	40	51	62	73											1s 3d SA	
Boleo Copper																		
Butte Coalition	53	.81	1 08	1 34	1 61	1 88	42	25	39½	10	29½	13½	33½	21½	25½	15½	25Q	Mar. 1, 1911
Braden Copper	58	75	92	1 09	1 26	1 43							5 7-16	3½	7½	3½		
British Columbia	25	37	50	62	75	87	16	12½	14½	3½	6½	3½	9	4½	8½	4½	12½Q	Mar. 1, 1911
Butte Balaklava (9)	41	51	61	70	80	90					11	5	15½	6	18½	4½	50	Aug. 1, 1910
Calumet & Hecla	17 87	25 02	32 17	39 32	46 47	53 62	910	675	1000	535	700	565	693	583	685	500	6 00Q	Mar. 24, 1911
Calumet & Arizona	3 72	5 12	6 52	7 92	9 33	10 73	183	107	198	80	120	83	119	96½	103	44½	1 00Q	Mar. 27, 1911
Centennial					08	28	40½	17½	47	13	37	20	45½	20	38	13½		
Cerro de Pasco	8 67	12 14	15 61	19 08	22 55	26 02												
Chino Copper	1 87	2 50	3 12	3 75	4 37	5 00							13	6½	23½	9½		
Copper Range	1 91	2 76	3 61	4 47	5 32	6 17	88½	66½	105	44½	83½	53	88½	68½	85	58	1 00Q	Apr. 1, 1911
East Butte	80	1 06	1 33	1 60	1 86	2 13	14½	9	15½	6	10	7½	16	10½	14	8½		
First National	.14	28	42	56	70	84	16	8	12½	1½	3½	1½	4½	2½	6½	1 15-16		
Franklin		36	72	1 08	1 44	1 80	25½	14½	20½	6	19½	6½	19	11	22½	9		
Giroux Con.	.12	20	27	33	40	48	14½	6½	10½	2½	7½	2½	12½	6½	12½	6		
Granby Con.	67	2 03	3 36	4 71	6 06	7 40	150	93	152	60	109½	78½	110½	91	111½	20	1 00	Dec. 20, 1910
Greene Can.		.19	37	56	.75	94	28½	21½	25½	5½	13	6½	14½	9	11½	6½		
Imperial Copper		07	23	39	54	70											20	June 1907
Inspiration	91	1 36	1 82	2 27	2 72	3 18							9 9-16	8	10½	6½		
Isle Royale		.10	61	1 11	1 61	2 12	29½	15½	26½	11½	28½	17½	33½	23½	28½	13½		
Lake Copper	3 00	4 00	5 00	6 00	7 00	8 00			8	6	14½	5	74½	16	94½	29½		
Mason Valley	1 43	1 90	2 36	2 83	3 30	3 78							3 5-16(23)	11½	11½	6½		
Miami Copper	1 07	1 60	2 14	2 67	3 20	3 74					18½	8½	28½	12½	28½	18½		
Mohawk		80	1 94	3 08	4 22	5 37	85	54½	98½	37	73	45	70½	57½	75	43	1 00	Feb. 1, 1911
Nevada Con.	1 33	1 66	1 98	2 30	2 63	2 95	23	13½	20½	6	20½	8½	30	16½	22½	17½	37½Q	Mar. 31, 1911
North Butte	41	1 03	1 64	2 27	2 88	3 50	117½	74½	120	30	88½	60½	85½	47	50	18	50Q	Apr. 22, 1911
Ohio Copper	02	07	12	17	22	26					8½	2½	8½	3 15-16	6	1 5-16		
Old Dominion	52	1 13	1 72	2 34	2 93	3 54	68½	33	63	18	60½	28½	69	47½	55	29½	25Q	Apr. 6, 1911
Osceola	3 04	5 07	7 08	9 12	11 14	13 18	151	93	181	71	125½	77	170	122	166	114	4 00SA	Jan. 26, 1911
Parrot	31	52	73	93	1 14	1 35	48	22½	28	8½	31½	10½	36½	10	21½	11	15	May 29, 1911
Phelps-Dodge	7 14	9 74	12 34	14 94	17 54	20 13							252	175	250		2 50	Mar. 20, 1911
Quincy	1 02	3 07	5 12	7 16	9 21	11 26	114	80	148	70	100	77	99	83	92	66	1 00Q	Mar. 20, 1911
Ray Con.	1 18	1 77	2 36	2 95	3 54	4 13							27½	7½	27½	15		
Shannon Copper		26	77	1 28	1 80	2 30	18½	7½	24½	7½	19½	9½	17½	13½	19	8½	50	July 1, 1907
Shattuck Ariz.	2 18	2 60	3 02	3 44	3 86	4 28					19	12½	23	15½			1 00Q	Jan. 20, 1911
South Utah M. & S.		11	22	33	44	55							4 9-16	3½	4½	90		
Sup. & Boston	12	19	27	35	42	51							18	13	18	4½		
Sup. & Pitts.	39	57	74	92	1 09	1 27	29½	12	29	7	20½	14½	16½	12½	16½	9	38	Apr. 17, 1911
Superior Copper	64	97	1 29	1 61	1 93	2 26					36½	11½	67	33½	60½	26		
Tamarack					55	2 40	122	90	170	81	88	56	90	62	78	43½	4 00	July 23, 1907
Tennessee Copper	25	87	1 48	2 10	2 72	3 34	52	40	53½	17	52½	25½	49	33½	40½	19½	1 50	Jan. 28, 1911
Tuolumne	27	34	41	48	55	61							4½	3½	4½	2½	15Q	Feb. 15, 1911
United Verde																	75 per month	Apr. 3, 1911
Utah Copper	2 42	3 18	3 93	4 70	5 45	6 20			39½	13	52½	20	66	39½	60½	39½	75Q	Mar. 31, 1911
Utah Con.			25	50	75	1 00	80½	52½	70	26½	50	20½	49½	17½	46	12½	50	Jan. 15, 1910
U. S. Smelting Com.	On a 4 % dividend basis						68	51	70	24½	46½	28½	50	30	55	30	50Q	Apr. 15, 1911
U. S. Smelting Pfd.	On a 7 % dividend basis						47½	43	49	27½	47	37	54	44	53½	45½	87½	Apr. 15, 1911
Wolverine	5 63	7 24	8 85	10 47	12 08	13 69	180	131	198	92½	165	113½	158	130	130	102	5 00SA	Apr. 1, 1911

Production, Estimated Earnings, and Dividends of the Important Copper Mines of the United States, Mexico, and Canada

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Market Reports

LOCAL METAL PRICES

San Francisco, August 3

Antimony	11–12½c	Quicksilver, flask	$40
Electrolytic copper	14–15½c	Tin	47–48½c
Pig lead	4.75–5.25c	Spelter	7–7½c

Zinc dust, 1600 lb. casks, per 100 lb., small lots $9.00–9.75, large $7.80–8.50

METAL PRICES

By wire from New York

Average daily prices in cents per pound

Date	Electrolytic Copper	Lead	Spelter	Silver, per oz
July 27	12.43	4.50	5.74	51⅞
" 28	12.45	4.50	5.74	52
" 29	12.43	4.50	5.78	51⅞
" 30	Sunday		No market	
" 31	12.45	4.50	5.80	52⅛
Aug 1	12.45	4.50	5.85	52⅛
" 2	12.45	4.50	5.85	52⅜

ANGLO-AMERICAN SHARES.

Cabled from London.

	July 27. £ s. d.	Aug 2. £ s. d.
Camp Bird	1 9 6	1 9 3
El Oro	1 3 6	1 2 9
Esperanza	1 16 10½	1 16 0
Dolores	1 6 0	1 6 0
Oroville Dredging	0 6 9	0 6 9
Mexico Mines	7 3 9	7 2 6
Tomboy	0 19 10½	0 19 4½

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing prices. Aug. 2.		Closing prices Aug. 2.
Amalgamated Copper	$66	La Rose	$4
A. S. & R. Co.	77⅞	Mason Valley	9
Braden Copper	6⅛	Miami Copper	21⅜
B. C. Copper Co.	4⅜	Mines Co. of America	5
Butte Coalition	18⅜	Nevada Con	18⅞
Chino	22	Nevada Utah	⅜
Davis Daly	⅞	Nipissing	8⅜
Doble	1⅛	Ohio Copper	1⅜
Dolores	5	Ray Central	1⅜
First National	1⅛	Ray Con	17
Foley O'Brien	1⅜	South Utah	⅜
Giroux	5⅞	Superior & Pittsburg	16⅛
Goldfield Con.	5⅜	Tenn. Copper	38
Greene-Cananea	7	Trinity	4⅜
Guanajuato Con	⅜	Tuolumne Copper	4
Hollinger	11¼	United Copper	2⅜
Inspiration	8⅜	Utah Copper	48⅜
Kerr Lake	5	Yukon Gold	4

COPPER SHARES—BOSTON.

	Closing prices. Aug. 3.		Closing prices Aug. 3.
Adventure	$6½	Mohawk	$46
Allouez	30	North Butte	31
Calumet & Arizona	55	Old Dominion	44
Calumet & Hecla	445	Osceola	98
Centennial	10	Parrot	11
Copper Range	59	Santa Fe	1⅜
Daly West	5¼	Shannon	10
Franklin	10	Tamarack	34
Granby	33	Trinity	4
Greene Cananea, ctf.	7	Utah Con.	17
Isle Royale	16	Victoria	1⅜
La Salle	3½	Winona	8
Mass Copper	7¾	Wolverine	109

(By courtesy of J. C. Wilson, Mills Building.)

NEVADA STOCKS.

San Francisco, August 3.

Atlanta	$.18	Mayflower	$.06
Belcher	.50	Mexican	3.82
Belmont	6.65	Midway	.17
B. & B.	.16	Montana Tonopah	.71
Booth	.08	Nevada Hills	3.95
Chollar	.15	Ophir	1.87
Combination Fraction	.11	Pittsburg Silver Peak	.80
Con. Virginia	.83	Round Mountain	.63
Florence	1.47	Sandstorm Kendall	.06
Goldfield Con	5.85	Savage	.11
Gould & Curry	.12	Tonopah Extension	.90
Jim Butler	.27	Tonopah of Nevada	5.75
Jumbo Extension	.21	Union	1.47
MacNamara	.18	West End	.51

(By courtesy of San Francisco Stock Exchange.)

OIL SHARES

San Francisco, August 3

Associated Oil	$0.40	Palmer	$1.33
Bay City New Stock	—	Palmer Union	42
Brookshire	1.03	Peerless	6.00
Caribou New Stock	7	Premier	65
Claremont	1.10	Producers	2.10
Coalinga National	3	Republic	60
Con. Midway	10	Sauer Dough	1.60
Crescent	11	Silver Tip	1.30
Empire	1.00	S. A. & McKittrick	13.00
Enos	50	S. W. & B.	70
Maricopa National	22	Sunset Monarch	62
Monte Cristo	2.00	Turner	1.12
Nevada Midway	16	United Oil	70
Occidental	—	Wolverine	40
Pacific States Petroleum	85	W. K. Oil	2.00

(By courtesy of San Francisco Stock Exchange.)

Current Prices For Chemicals

(Corrected monthly by Braun-Knecht-Heimann Co.)

Prices quoted are for ordinary quantities in packages as specified. For round lots lower prices may be expected, while in smaller quantities advanced prices are ordinarily charged. Prices named are subject to fluctuation. Other conditions govern Mexican and foreign business.

	Min.	Max.
Acid, sulphuric, com'l, 66°, drums, 100 lb.	$0.75	$1.00
Acid, sulphuric, com'l, 66°, carboy, 100 lb.	1.00	1.50
Acid, sulphuric, C.P., 9-lb. bottle, bbl., lb.	0.13	0.18
Acid, sulphuric, C.P., bulk, carboy, lb.	0.09½	0.12
Acid, muriatic, com'l, carboy, 100 lb.	1.60	2.00
Acid, muriatic, C.P., 6-lb. bottle, bbl., lb.	0.15	0.20
Acid, muriatic, C.P., bulk, carboy, lb.	0.10½	0.15
Acid, nitric, com'l, carboy, 100 lb.	5.25	6.50
Acid, nitric, C.P., 7-lb. bottle, bbl., lb.	0.16	0.22
Acid, nitric, C.P., bulk, carboy, lb.	0.12½	0.15
Argols, ground, bbl., lb.	0.20	0.25
Borax, cryst. and conc., bags, 100 lb.	2.75	3.85
Borax, powdered, bbl., 100 lb.	3.00	4.00
Borax glass, gd., 30 mesh, cases, 100 lb., tin lined	10.00	13.00
Bone ash, 60 to 80 mesh, bbl., 100 lb.	4.50	5.50
Bromine, 1-lb. bottle, lb.	0.55	0.65
Candles, adamantine, 12 oz., 40 sets to case	3.50	4.15
Candles, adamantine, 14 oz., 40 sets to case	4.00	4.55
Candles, Stearic, 12 oz., 40 sets to case	4.95	5.50
Candles, Stearic, 14 oz., 40 sets to case	4.65	5.20
Clay, domestic fire, sack, 100 lb.	1.50	2.00
Cyanide, 98 to 100%, 100-lb. case, lb.	0.20¾	0.24¾
Cyanide, 98 to 100%, 200-lb. case, lb.	0.20	0.24
Cyanide, 127-129%, 100 lb. case, lb.	0.27½	0.28½
Cyanide, 127-129%, 200-lb. case, lb.	0.26¾	0.27½
Lead acetate, brown, broken casks, 100 lb.	8.75	9.00
Lead acetate, white, broken casks, 100 lb.	10.00	10.25
Lead acetate, white, crystals, 100 lb.	11.75	12.25
Lead, C.P., test., gran., 100 lb.	13.00	15.00
Lead, C.P., sheet, 100 lb.	15.00	18.00
Litharge, C.P., silver free, 100 lb.	10.50	13.00
Litharge, com'l, 100 lb.	7.50	9.00
Manganese ox., blk., dom. in bags, ton	20.00	25.00
Manganese ox., blk., Caucasian, in casks, ton (85% MNO_2—¾% Fe)	42.50	50.00
Nitre, double ref'd, small cryst., bbl., 100 lb.	7.00	8.00
Nitre, double ref'd, granular, bbl., 100 lb.	6.50	7.50
Nitre, double ref'd, powdered, bbl., 100 lb.	7.25	18.00
Potassium bicarbonate, cryst., 100 lb.	12.00	15.00
Potassium carbonate, calcined, 100 lb.	15.00	18.00
Potassium permanganate, drum, lb.	0.11	0.12½
Silica, powdered, bags, lb.	0.03	0.05
Soda, carbonate (ash), bbl., 100 lb.	1.50	1.75
Soda, bicarbonate, bbl., 100 lb.	2.00	2.50
Soda, caustic, ground, 98%, bbl., 100 lb.	3.15	3.50
Soda, caustic, solid, 98%, bbl., 100 lb.	2.65	2.85
Zinc shavings, 800 fine, bbl., 100 lb.	10.75	11.75
Zinc sheet, No. 9—18 by 84, drum, 100 lb.	9.50	10.50

L. Vogelstein & Co. report the following figures of German consumption of foreign copper for the months January to June, 1911:

	Tons.
Imports of copper	90,281
Exports of copper	4,093
Consumption	86,188

as compared with consumption during the same period in 1910 of 79,488 tons. Of the above quantity 78,454 tons was imported from the United States.

Current Prices for Ores and Minerals

(Corrected monthly by Atkins, Kroll & Co.)

The prices are approximate, subject to fluctuation, and to variation according to quantity, quality, and delivery required. They are quoted, except as noted, f.o.b. San Francisco. Buying prices marked*.

	Min.	Max.
Antimony ore, 50%, per ton	*$20.00	$25.00
Arsenic, white, refined, per lb	0.01¾	0.02¼
Arsenic, red, refined, per lb	0.06¾	0.07¼
Asbestos, according to length and quality of fibre, per ton	100.00	350.00
Asbestos, lower grades, per ton	10.00	100.00
Asphaltum, refined, per ton	15.00	20.00
Barium carbonate, precipitated, per ton	42.50	45.00
Barium chloride, commercial, per ton	42.50	47.50
Barium sulphate (barytes), prepared, ton	20.00	30.00
Bismuth ore, 10% upward, per ton	*75.00	upward
Chrome ore, according to quality, per ton	10.00	12.50
China clay, per ton	15.00	20.00
Cobalt metal, refined, f.o.b. London, per lb	2.50	
Coke, foundry, per 2240 lb	15.00	17.50
Diamonds:		
Borts, according to size and quality, per carat	2.00	15.00
Carbons, according to size and quality, per carat	75.00	100.00
Feldspar, per ton	5.00	25.00
Firebrick:		
Bauxite, per M	175.00	
Magnesite, per M	190.00	275.00
Silica, per M	42.50	47.50
Flint pebbles for tube-mills, per 2240 lb	15.00	25.00
Fluorspar, per ton	10.00	15.00
Fullers earth, according to quality, per ton	20.00	30.00
Gilsonite, per ton	35.00	40.00
Graphite:		
Amorphous, per lb	0.01	0.02½
Crystalline, per lb	0.04	0.13
Gypsum, per ton	7.50	10.00
Infusorial earth, per ton	10.00	15.00
Magnesite, crude, per ton	7.50	10.00
Magnesite, dead calcined, per ton	22.50	27.50
Magnesite, brick (see firebrick).		
Manganese ore, oxide, crude, per ton	10.00	25.00
Manganese, prepared, according to quality, per ton	40.00	120.00
Mica, according to size and quality, per lb	0.05	0.30
Molybdenite, 95% MoS_2, per ton	400.00	500.00
Monazite sand (5% thoria), per ton	150.00	200.00
Nickel metal, refined, per lb	0.45	0.60
Ochre, extra strength, levigated, per 100 lb.	2.25	3.25
Platinum, native, crude, per oz	30.00	40.00
Scheelite (see tungsten ore).		
Sulphur, crude, per ton	15.00	25.00
Talc, prepared, according to quality, per ton.	20.00	50.00
Tin ore, 60%, per ton	450.00	475.00
Tungsten ore, 65%, per ton	487.00	520.00
Vanadium ore, 15%, per ton	200.00	250.00
Wolframite (see tungsten ore).		
Zinc ore, 50% up, per ton	*15.00	20.00

Catalogues Received

Hayton Pump Co., Quincy, Ill. 'Hayton Turbo-Centrifugal Pumps.' Illustrated. 16 pages. 6 by 9 inches.

National Pulverizer Co., Denver, Colorado. 12 pages. Illustrated. 3½ by 6¼ inches.

McKiernan-Terry Drill Co., New York. 'Hammer Drills.' 12 pages. 6 by 9 inches.

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EDITORIAL

GOLD is said to have been discovered near Rogers, Arkansas, by a man working under supernatural guidance. It would take some such help to find real gold in the Ozarks, though many good mines of other metals have been found without any mysterious assistance from spirits.

WORKMEN'S COMPENSATION ACTS are having difficulties in threading the mazes of constitutionality. The employers' liability law, enacted by the New York legislature, has been declared unconstitutional, and a similar question has arisen in regard to the law enacted in Washington, the text of which we recently published.

POSTAL SAVINGS BANKS were opened at New York, Boston, and Chicago recently. In Boston 208 accounts were opened with an average deposit of $10.75, and in New York 172 accounts with an average of $22. When the system is thoroughly established it should greatly aid in the forming of the habit of saving among miners, as well as other wage-workers.

INTERNATIONAL CO-OPERATION is pleasingly shown in the recent treaty concluded between the United States, Russia, Canada, and Japan, covering the hunting of fur seals in the northern Pacific and Bering Sea. Sealskins are of such value as to form a potent lure for pelagic hunters, whose depredations bid fair to exterminate the herds. Under the present arrangement Canadian and Japanese hunters will have scope for their activities, and the herds will be protected.

MICHIGAN COLLEGE OF MINES has been celebrating its twenty-fifth anniversary, and its quarter century of good work is well worthy of celebration. We printed last week an account of the plans for the occasion, and in this issue we publish the address of Mr. George Otis Smith, director of the United States Geological Survey, who appropriately chose for his subject the relation of the Survey to the public lands. We hope to print others of the addresses delivered, for notable occasions give rise naturally to notable discussions.

GOLDFIELD is, properly enough, much elated at the report that the Goldfield Merger Mines Company is to undertake deep development. The area controlled by this company is well situated and includes the St. Ives, Velvet, Gold Horn, and other properties in which good ore has been mined to a depth of nearly 300 feet. The proposal to sink to 2000 feet is a bit daring, though geologists and engineers familiar with the ground feel confident that workings may be planned which will certainly intersect the veins at that depth. Whether these veins will be found to contain ore of high or low grade can not be predicated, but at least it is a legitimate, even though venturesome, bit of prospecting. The statement that Mr. W. A. Clark is backing the enterprise has created astonishment, since that experienced miner and investor is not known as one who takes risks. Ordinarily, Government bonds, rather than deep shafts in unproved territory, appeal to him. Probably the real principals have not been announced.

COMSTOCK mines, as a result of the discoveries in the Mexican workings, threaten to become again producers of ore rather than assessments. The Mexican company has, in fact, paid a dividend, the first in years, though the mill, now building, will not be ready for weeks. The management is to be congratulated on the improved condition of things. At the same time we are reminded of the fate of a wily Colorado promoter who once in an optimistic moment paid a dividend. Speaking of it afterward, he said it was a horrible mistake, as it created a fairly insatiable demand for other dividends, which ultimately led to his undoing.

WET PROCESSES were used in most of the early American cement mills. Less than twenty years ago it was difficult to get favorable consideration for any property where dry mixing and fine grinding were essential to success. Improvements in grinding apparatus and introduction of the rotary kiln have long since given the advantage to mills using the dry process. In Michigan, where marl and clay are used, wet grinding and updraft kilns are still the rule. A wet slurry, however, is difficult to handle, being too thick to pump and too thin to spade easily. The intermittent kiln is also expensive, and the continuous process of burning is greatly to be preferred. On another page we publish a brief note on the recrudescence of the wet process in Germany, where it is used to meet special conditions of supply of raw material. It does not seem likely that such mills will become common. While in devising a means of using the rotary kiln to burn wet slurry, one of the chief objections to the old mill is removed, the result is not entirely satisfactory, and there is always the mechanical problem of handling sticky material in large quantities.

THOSE who have followed the Sugar Trust investigation, and recall the enmity between Spreckels and Havemeyer and Arbuckle, are wondering if a peaceful revolution has come upon us. To call upon John Arbuckle for his testimony in regard to trade combinations when this picturesque old wrecker, hero of many a financial battle in the Street and many a struggle with wind and wave in his pet pastime of raising sunken ships, was too ill to leave his bed, to carry Federal indictments into the inner circle of the family of Morgan may not seem a matter of wonder to the jaded reader of daily scare heads. But if one of the old guard of the days of McKinley, the late Mark A. Hanna, for instance, could know, he would surely turn in his grave. In the life of Richelieu there came a moment when, against his enemies, he invoked the power of the Church of Rome, and even as his enemies drew back awed, the power that was his passed from him. Today the house of Morgan stands many times multiplied in strength, held far more in fear and awe than ever at any time heretofore, and even with the ripening years, with honors almost worldwide, come prying committees who question the great rewards for the Steel Trust flotation and who insist that our most prominent financiers must testify even as other American citizens. The International Harvester Company, especial creation of Mr. G. W. Perkins, until recently a pillar in the house of Morgan, is to come under scrutiny next. The accusing voices in Wall Street say that Washington is playing politics at the expense of all business progress. On the other hand, observers whose horizon is not limited by Trinity Church at one extreme and the East River at the other, realize that there is a persistent and growing demand, that will not be denied, for the enforcement of measures that will shake off the influence of the closely allied combinations that now control so many lines of human industry.

The Controller Bay Controversy

An unfortunate and bitter word-battle has sprung up over the action of the President in opening to entry certain lands valuable as railway terminals on Controller Bay in Alaska. He is charged with "betraying" the public interest, and he has replied in a lengthy and heated message to the Senate, employing words and phrases quite as vigorous as any that gave tang to the notable communications of his immediate predecessor. Those who recall Mr. Taft's castigation of Mr. J. F. Wallace when the latter resigned as Chief Engineer of the Isthmian Canal Commission, need no reminder of his ability and willingness to use direct language when he thinks the occasion demands. Evidently when writing this message Mr. Taft felt justified.

We count ourselves good conservationists, indeed many of our readers protest that our sympathies lie too strongly in that direction, but in this case we fail to see any adequate cause for so great a storm. While we do not accept the President's evident feeling as to the large amount of "unscrupulous and corrupt misrepresentation of the wicked," we confess to a suspicion that there has been a well engineered effort to put the President 'in a hole.' This is all the more regrettable in that it is entirely unnecessary. No observer of current affairs, friendly or unfriendly to the President, can have failed to note an ability on his part, amounting almost to genius, to 'get in wrong'—to use an expressive colloquialism. He does even the most excellent things in a most unfortunate way, and intensifies popular mistrust even while trying to correct a blunder. This must be remembered in any attempt to interpret his acts.

The facts in the present case are simple and, in the main, are undisputed. The Bering River coalfield, as is well known, lies about twenty-five miles back from the southern coast of Alaska. It contains a large amount of valuable coal, and transportation lines from the mines to the coast are certain to be important and profitable at some time in the future. There are three feasible routes, some of them easily open to more than one line of railway. The Copper River & Northwestern railway, owned by the Alaska Syndicate, has a harbor and terminals at Cordova. It has a survey from Katalla Junction to the coalfield and is prepared promptly to lay the necessary track whenever mines are opened. While this route, from colliery to harbor, is the longest of the three that must be considered, it can be completed with the smallest amount of additional investment. Whatever may be done in regard to other roads this line seems certain to be built, since the demand for coal for the road and for towns and mines along the line will force its construction. A second route is to Katalla Bay. A number of surveys have been made along this route, and the Alaska Syndicate, after expending considerable money on a line to this point, abandoned it. It is the general consensus of opinion of those on the ground that a really safe harbor here could only be constructed at a prohibitive expense. The third route is to Controller Bay. Prior to 1907 this body of water was thought to be too shallow and too unprotected to offer any possibilities worth considering. It was then learned that a deep channel extended up the bay, between Kanak and Wingham islands and back of Okalee spit, to within approximately three and a half miles of the shore. While the detailed map made by the Coast & Geodetic Survey was not available until 1910, enough was known before then to permit a fair appraisal of the worth of the harbor. When Mr. E. C. Hawkins investigated the harbor situation for the Alaska Syndicate and recommended abandonment of the work at Valdez and Katalla and concentration at Cordova, he knew enough about the Controller Bay channel to condemn it. This was before the land had been withdrawn from entry; it then was freely available to anyone who had or could buy certain sorts of land scrip, and there was no conceivable reason why if the Morgan-Guggenheim Syndicate wanted the harbor it should not have been taken. After a study of the whole situation Mr. Hawkins recommended Cordova as the best railway terminus, and work was accordingly centred there and the road was built to the copper mines. It is his opinion of the probable low comparative value of the Controller Bay harbor. Mr. Hawkins was followed by the Army, the Navy, and the Geological Survey, officers from each recommending its abandonment so far as governmental use was concerned. Others refused to accept this conclusion, and among them was Mr. Richard S. Ryan, who organized the Controller Railway & Navigation Company, made surveys to the coalfields, filed on a right of way December 14, 1910, secured the exclusion of the necessary land from the Chugach National Forest, and promptly filed on the maximum amount of land, 160 acres, fronting on the bay. Additional claims supposed to have been made in his interest were made nearby. It is alleged, though denied, that in securing the release of the land he used the personal influence of Mr. Charles H. Taft, and that the withdrawal by executive order rather than by proclamation, gave Mr. Ryan's company, because of prior information, important advantages. This loses point when the President shows that, despite all the publicity since, a large amount of land and frontage still remains available to anyone else who may care to take it. It furthermore seems clear that even granting that Mr. Ryan was favored in the matter, he has no monopoly, nor can he acquire any monopoly of the frontage, because of reservations required by law in favor of the United States. Mr. Ryan's company can even now only reach deep water by means of a pier more than three miles long, which can only be built under a revocable permit issued by the United States Government. There seems also to be no question that the land was not properly forest land; being valuable neither for its trees nor for conserving rainfall. It was included in the Chugach Forest to save the terminals, not to save the trees; and, after having traveled some miles over these coast flats, we are quite disposed to agree that the Forest Service did right in recommending its elimination. It is true that the area might have remained in the Forest and railway and terminals have been built under revocable permit or lease, as the pier must be in any event, but we do not believe that desirable or necessary in this case; the rights of the public being sufficiently guarded otherwise.

Much has been said to the effect that Mr. Ryan is acting in behalf of the Morgan-Guggenheim syndicate. We have already indicated reasons, aside from stout denials on all sides, why this may well be doubted. Our own belief, after having discussed the matter on the ground with men of all shades of opinion, is that Mr. Ryan is not backed by the Alaska Syndicate, but is merely a promoter who sees a chance to get hold of something that will sell. We are further of the opinion that if the Controller Railway & Navigation Company ever carries out its plans and builds a railway, the Alaska Syndicate will be practically forced to buy the line. There is not likely to be enough business for some time to adequately support two railways at low rates, and the plain lesson of American railroad history is that under such circumstances the lines are combined, directly or indirectly, and rates put high enough to pay interest on the whole investment—and an indefinite amount of water. In other words, if the proposed railway be built, users of Alaska coal will have to pay a higher price in the end than if there be only one road. More money will have been invested, and the amount of traffic remaining practically the same, higher rates will be necessary. Recent decisions have placed Alaska railways under the Interstate Commerce Commission, but in fixing rates, whoever does it, the investment must be taken into account. Many times in the past, competing railways have been built to sell, but it is not considered sound public policy to encourage such enterprises. In the general chorus of condemnation raised by this issue, our own protest for fairness to the existing railway will probably be lost, but until there is enough traffic or probability of enough traffic to support two lines, we do not believe in encouraging investment of more capital. The Alaska Syndicate has spent large sums of money to furnish much needed transportation in Alaska. It will have to spend many millions more before any profit can be earned, and, whether it be composed of the Morgan-Guggenheims or of widows and orphans, it should not be exposed to unwarranted and competitive railway building.

Definite Information

Among the most vivid recollections of our youthful days is that of a history teacher, of Celtic ancestry, who, in response to our blundering attempts to explain the causes of the Punic wars, or to outline the Delian Confederacy, would pound the desk and exclaim: "That won't do! I want some definite information!" The experience of more mature years discloses this as the general attitude of mind of the business world, and properly so. Mr. Gradgrind was greedy of facts, but, valuable as facts are, much of their usefulness is lost unless they are shown in their proper relations, and thus become available as information. How rare definite information is can be quickly perceived by the perusal of reports, technical journals, and even text-books. Traced back to its source, this lack of information is usually due either to the absence of accurate observation, or to the omitting to make a detailed contemporaneous record of the facts observed. The temptation is always strong to put off the making of a record until 'a more convenient season'; there is always some obscure point that can be cleared up later, some bit of information that can easily be obtained from some one who is absent, and it is more comfortable and convenient to write notes in the library than in the mine, with the candle guttering on the pages and water drops accurately 'holing out' in the narrow gap between the hat-brim and the edge of the collar. But even the most experienced observer finds, in making his record, that additional observation is necessary to fill in gaps. If the record is contemporaneous, the supplementary observations are easily made and the record becomes complete; the information is definite. Once the survey is closed, the mine left, the district quitted, the opportunity is gone, and there is no recourse except to leave the gaps, or to 'fudge' them in. It must be regretfully admitted that the latter method is far too prevalent. It may be argued that 'fudging' is sometimes not only permissible, but even proper, just as draughtsmen, having accurately delineated the essential features of a mechanism, frequently draw a wavy line to cut off some non-essential, or mark its position with a simple cross. But the analogy is faulty; the drawing shows its limitations upon its face, but a 'fudged' record gives no indication that all portions are not equally trustworthy, and may lead to disastrous results when unexpected dependence is placed upon the untrustworthy portions. No engineer would think of placing a rotten plank across a winze in an unused portion of the mine in order to give a false appearance of completeness of safeguards. Yet this analogy with the fudging of records is more accurate than the one first cited. Records should be contemporaneous, they should be detailed, they should be complete, but first, last, and all the time, they must be trustworthy, and then there may be obtained from them definite information upon which reliance may be placed.

The Mining Industry and the Public Lands

By George Otis Smith

[*]The increasing share which the United States Geological Survey has been asked to take in the public land administration by the Interior Department has brought many of the problems connected with the public-land laws more directly to the attention of those charged with the work of the Survey. For over thirty years, however, these problems have interested the Survey geologists, who have had exceptional opportunities for first-hand observation in nearly all the important mining districts of the country, and for almost as long a period the engineers of the Survey have been in touch with the irrigation and power developments in the public-land States. This intimate experience with both field conditions and administrative problems justifies an expression of opinion which may be appropriate to this occasion.

The objects to be sought by amendment of the public-land laws are: first, purposeful and economical development of resources for which there is present demand, with retention of such control as may insure against unnecessary waste or excessive charges to the consumer, and second, the reservation of title in the people to all resources, the utilization of which is conjectural, or the need of which is at least not immediate. The means that are essential to the attainment of these objects are: first, the classification of public lands; second, the separation of surface and mineral rights; and third, the disposition of lands on terms that will secure the highest use, enforce development, and protect the public interest. Legislation based on these principles will not only secure the positive benefits of immediate utilization, but will also avoid the evils of speculative holdings of lands by fictitious use or by admitted non-use, for the future enjoyment of the unearned increment or of the profits of monopolization. With actual development made a condition of possession, and with land classification and separation of estates made preliminaries of disposition, the present-day utilization by individuals or corporations and the reservation to the people for future use become at once possible without conflict of interests.

The classification of the public land is essential to the administration of not only such laws as express the principle of separation, but also of those whose purpose is to promote the highest use of the land. Land classification is first of all the determination of the best use to which each particular portion of the public domain can be put, and by the organic act of March 3, 1879, this duty was specifically imposed upon the Director of the Geological Survey. Under the withdrawal act of June 25, 1910, classification is made possible in advance of disposition, and disposition can be postponed to await needed legislation.

The second step, both in principle and practice, appears to be that of making possible by legislation the separation of surface and mineral rights whenever the two estates have values which can be separately utilized. A notable advance in public-land legislation was the passage of the acts of March 3, 1909, and June 22, 1910, which provide that patents issued thereunder grant title to the surface of the land only, and thus permit agricultural development, while at the same time the United States retains title to the underlying coal deposits.

On the subject of water-power legislation the position of the Geological Survey is essentially that set forth in January of this year in a report addressed to the Secretaries of the Interior and of Agriculture by a joint committee representing the two Departments. The legislation there outlined would provide for lease of public and reserved lands of the United States valuable for water-power development for a fixed term, not to exceed 50 years, with moderate charges for use and occupancy of the land, and revocable only upon breach of conditions, or on account of the charge of excessive rates to consumers. These leases should be identical in terms, whatever the Department under which they are granted, with joint and uniform regulations governing all matters relating to water-power development of land belonging to the United States. Provision should also be made for periodic and equitable readjustment of charges, transfer of leases, preferential rights to renewal, and compensation for improvements at the termination of the leasehold. The law should specifically recognize water-power use as dominant, and both insure to the lessee undisturbed occupancy of the land needed for such use and reserve for future utilization all the land believed to possess value for water-power development; these lands to be designated by the President, but to be open to other entry subject to this reserved right wherever separation of the water-power use and other use is possible.

The chief advantage of land withdrawal and classification lies in the essential relation to the principle of proper disposition of the public domain, the real purpose of public-land administration being to secure such reservation or disposal of the people's land as will assure its highest use. The question of amendment of the present laws relating to the disposition of coal, oil, gas, and phosphate deposits on the public domain is recognized as fairly before the public by the specific mention of these minerals in the withdrawal act.

The coal-land law is unquestionably the most satisfactory of the present mineral-land laws in that it admits of the placing of an adequate valuation upon the deposits, and in the administration of this law the purpose is not only to base the appraisal price upon the quantity and quality of the coal present, and to give consideration to every known physical and commercial factor affecting the value of the deposits, but also to make the selling price approach as nearly as possible the present purchase of a royalty under a leasehold. Thereby it is intended to permit purchase for immediate development, and at the same time to prevent or at least discourage purchase for long-time investment or for monopolization. So many factors, however, require consideration that an ideal adjustment of the values is well-nigh unattainable for many if not for most coal lands, and on this account a strong argument may be made for support of the lease over the sale system. Under leasehold it would be comparatively easy so to adjust the relationship between ground rental and royalty as to prevent the acquisition of coal deposits until such time as their development should be profitable. On the other hand, it is possible, under the present law, and it is the policy in its administration, to readjust the prices from time to time, either by reduction to encourage development in special cases, or, more commonly, by raising the price on account of increased value due to new discoveries or to changed commercial conditions. Hardly less important, moreover, is the better control possible under a lease system, although against the advantage of such control must be weighed the cost of Federal management and the possibilities of inefficient administration or even maladministration. The present coal-land law, however, has one serious defect, which should be remedied if a leasing law is not enacted. The restriction of area that may legally be acquired to a maximum of 160 acres for an individual and 640 acres for an association is not in accord with good mining practice. The fixed charges on the cost of a modern coal mine, provided with the up-to-date equipment necessary to conserve life and property and to assure maximum recovery, are too high to be assessed against the tonnage of so limited a tract, especially if the coal seam is of moderate thickness. A law designed to promote the practical utilization of coal deposits, whether the system contemplates sale or lease, must provide for the holding of a large enough unit to permit the opening and equipment of a modern mine and to warrant its operation on an economical scale. Without such provision for commercial operation, too great an advantage is secured to the land-grant railroads and large coal companies already in possession of considerable areas of high-grade coal.

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[*] An address delivered at the quarter-centennial of the Michigan College of Mines, August 9.

The present uncertainty whether the phosphate rock of the public land should be entered under the lode law or under the placer law is conclusive evidence of the need of legislation. As a matter of fact, neither of these laws is more applicable to the acquisition of beds of phosphate-bearing limestone than it would be to that of coal beds. The realization that the phosphate deposits are more extensive than was known or suspected when the Survey geologists began land-classification work in Idaho and Wyoming does not lessen, but rather increases, the urgency for a leasing law which will provide for the utilization of this large supply of mineral fertilizer, so as to meet both present and future needs.

The most urgent need of legislation for the disposition of mineral deposits is in the case of oil and gas. It is most apparent that the placer law, which is none too well adapted to meet modern conditions in mining placer gold, is wholly inadequate as a method of dealing with public oil lands, inasmuch as the discovery of oil is a late stage in the exploration and development of the land claimed under the law. Thus, large expenditures, extending over several months, if not years, are necessary before any right is acquired against the Government, and during all this time there is lacking any legal protection of the oil prospector against unscrupulous claimants or competitors better backed by capital. The need for remedial oil legislation is somewhat less acute than it was a year ago, by reason of the passage of the act approved March 2, 1911, the effect of which is to validate a class of claims which, while clouded by the construction which the Department was forced to place upon the misfit placer law, under which title to oil lands must now be made, were *bona fide* in that the inception of their development antedated the oil-land withdrawals. This enactment was in accord with the spirit of the withdrawal act, which provides for the protection of equities already established.

The need for a better law is, however, imperative, and the legislative action demanded by the situation should not be limited to an attempt to revamp the general placer law, but should be the enactment of an altogether new measure, especially adapted to provide for the sane and equitable development of this industry in the future. First, the new law should authorize the issue of exploratory permits, granting to individuals or associations the exclusive privilege of occupation, the sole condition of such a grant being diligent and adequate prosecution of development work, measured by the expenditure of fixed sums within certain periods, with possibly the payment of a small fee to the Government in lieu of such expenditure during the first six months. The issue of this permit should preferably be limited to one to each citizen or association of citizens, although after the lapse or surrender of such a permit the former holder should be allowed again to apply for an exploratory permit. In the second place, the law should provide that upon discovery, the holder of the permit be given a leasehold title with a royalty varied to meet local and actual conditions. The 'wildcatter', or prospector in unproved country, whether such unproved territory is classified on geological evidence as oil land or not, should be given special privilege to offset his greater risk. This privilege might take the form of an increased acreage, held both under permit and under lease, or a practical exemption from the payment of royalty, merely a nominal rental being charged under the lease. The chief advantage of the leasehold for oil over a fee-simple title lies in the prevention of monopolization through large holdings. Such large holdings without production would be guarded against by a ground rental sufficiently high to discourage the acquisition of lands except for immediate and continued development, although provision should also be made in the lease for surrender under terms which would protect the Government. This indirect control of development would be preferable to the direct enforcement, by forfeiture, of continuous production, which should be avoided because of the danger of disturbing the delicate equilibrium between supply and demand. Transfers of interest, under either permit or lease, should be permitted because of the absolute necessity in most instances of securing capital for both drilling and operating an oil well. The law, however, should set forth the purpose of such control of transfer, which would be to provide protection for the original locators, most of them men of small means, and more especially to secure the prohibition of too large holdings of Government leases by big companies.

Proposed amendments of the well established laws relating to metalliferous minerals always raise the warmest discussion. With the opinion of mining men in general favoring revision of the mining laws of the United States, and with commission after commission appointed by various bodies to suggest improvements, the statutes have remained practically unchanged for nearly forty years, while the geology of ore deposits and the technology of metal mining have made marvelous progress.

The law of the apex has proved more productive of expensive litigation than of economical mining. In many of the more recently established and more progressive mining districts this statute has been made inoperative by either common agreement or compromise between adjoining owners. Its repeal could not affect established equities under patents already granted, but would render possible more certain property rights in large mining districts as yet undiscovered, where new and valuable claims will be located 100 years from now. The unit of disposition should be the claim, preferably square, limited on its four sides by vertical planes, and of a size sufficient to allow the miner occupying two contiguous claims to follow the vein or lode to considerable depth, even if its dip is only 45°. Such definition of a mining claim is found practicable in both Mexico and British Columbia, and in the latter country the change from the apex law was effected without trouble or confusion.

The same knowledge of natural conditions that leads to the suggestion of a repeal of the law of apex forces the further suggestion that discovery of ore in place can not be made universally a prerequisite to the location of a mining claim. Geologic study of ore deposits has furnished examples in a number of regions where the present law can not be complied with, although rich deposits exist underground and their extent can be more definitely surmised than in most cases where ore is discovered at the surface. To meet such actual conditions the law should provide for the acquisition of metalliferous mineral land classified as such upon the basis of adequate geologic evidence, whether actual outcrops are present or not.

Most important, perhaps, in any amended mining law would be provision for enforced development, a principle expressed, it is true, in the present law, but not effective in its workings. A requirement of actual use as a condition of occupancy of mineral land can not be regarded as either novel or radical. As regards the large acreage of undeveloped land in many mining camps to which patent has already been issued, it is perhaps true that the situation is without relief, unless the Western Australia plan is adopted, whereby the Government steps in and permits mining under a lease, the proceeds of which are assessed, collected, and paid over to the owner. The principle invoked seems to be that no property owner can rightfully oppose the development of the State.

In the case of unpatented claims a remedy should be sought for what has been termed "the paralysis of mining districts", and the rigid requirement of annual assessment work should be made actual and effective by inspection and supervision, in order to put an end to the present procedure of allowing a claim to lie idle for practically two years after its location, not to mention the many localities where claims are held year after year with only perfunctory compliance, or even without any performance of assessment work—a type of local disregard for law that is in striking contrast to the observations accorded to the district customs and regulations of earlier days, whereby the right of possession was made absolutely dependent upon continuous operation.

The remedy, then, for the existing evil of idle mining property must be sought either in the adoption of leasehold, under which the Government can enforce operation, a system which fully attains the desired end of promoting mining development in Australia and New Zealand, according to the report made in 1907 by A. C. Veatch, geologist for this Survey, to the President, or in the thorough revision of the existing system. Radical amendment to the present law would be necessary in order to secure something more nearly approaching equality of opportunity. Some limitation should be put on the number of claims which an individual can locate in each mining district, and the prevention of monopolization would be furthered by the rigid enforcement of assessment development. The record of claims kept by a local official elected by the miners should be reported promptly to the nearest land office in order to furnish the Federal Government with a notice of the intention of the claimant, and thus to initiate the operation of effective inspection, the purpose of which would be to enforce the use and development of mineral land as contemplated in the law.

Whatever the details that may characterize this or that amendment to the public-land laws, the essentials to be sought are development of those resources for which there is present need and the protection of the other resources for which there is no immediate demand. To this end the lawmakers, in my opinion, should concern themselves more in retaining such control as will prevent either non-use on the one hand, or waste on the other, than in devising means of increasing the public land receipts by heavy royalties on the producing coal mine or hydro-electric plant. Tax the idle property instead. Through the full development of the mineral industry, the National can secure indirect benefits far in excess of any direct profits in the form of fees or royalties.

Cement Manufacture in Germany

By Otto Schott

*Many of the works situated in the north of Germany make their cement from the chalk on the coast and on the Baltic islands, and are forced to use at the same time a clay containing much sand and flint. They have, like most of the works in England, always given preference to the wet process. Chalk and clay contain naturally a high proportion of moisture and are so soft that they can be reduced to the requisite fineness without mills, simply by washing. In these factories the raw materials are washed very thin with about 80% of water, and, according to the arrangement of the plant, the stones and the coarse sand either settle to the bottom as the heavier constituents, or they are separated from the thin slurry by screens. The slurry runs from the washing basins into large settling basins, where it is allowed to settle. The water collecting on top is drawn off from time to time, and the sun and air help gradually to dry out the water remaining in the slurry until it becomes stiff enough to be dug out with a spade and pressed into bricks for the shaft or ring kilns, which are still used by most of the factories that work on the wet process. Some of these factories, however, have recently installed rotary kilns, and pump the slurry, containing 40 to 55% of water, direct from the settling basins into the kilns. It is often months before the slurry gets the consistence desired, and it is certainly a disadvantage of this wet process that so much time is lost before the product made months before can be actually turned into profit. Enormous sums are often represented by this half-finished product.

The wet process is considerably more advantageous, when pure chalk and clay are to be had, and it is not necessary to pay attention to eliminating impurities in the shape of quartz, sand, and flint. The addition of 40% water then suffices to grind the material in the wash-mills. This slurry is then simply run into the so-called mixing basins, where it is stirred up until the mixture is uniform. It is not necessary to thicken further this 40% slurry, and it can be pumped direct to the kilns. With these two ways of wet preparation it is presumed that the chalk and clay are naturally so soft that no special mills are necessary for grinding.

But it should especially interest producers in America that recently some works have started to prepare hard materials like limestone in the wet way by using special mills. This so-called thick slurry process has so far been introduced in Germany at seven factories, of which I inspected five during my last stay. Before I give you a full explanation of why, according to the opinion at present prevailing in Germany, thick slurry preparation is to be preferred to dry preparation, I should like to give you a short description of the working of a thick-slurry plant.

Such a plant is usually built in four stories, one above the other. The material comes from the pit to the top floor. The large pieces of limestone are here crushed to the size of a fist and fall directly onto the wet-kominutors placed below. The soft wet clay and marl are fed directly into this wet-kominutor, and roughly ground, with the addition of water. The rough slurry, which has 35 to 45% moisture, runs into the wet tube-mills, which are placed in the floor below under the wet-kominutors, and here it is ground quite fine. The factory has, according to its size, a number of large mixing basins, which lie below and in front of the wet tube-mills, and the slurry runs through pipes into these basins. A factory producing 1000 bbl. daily requires at least four mixing basins of 500 bbl. capacity each. As soon as a basin is three-quarters full, the mixture is made by testing the slurry every two hours and then grinding material either richer in clay or richer in lime and allowing it to run into the basin. The final adjustment can also be done by letting the slurry run from one basin into the other. The mixing basins are usually oval in shape; three stirrers run in each basin to keep the slurry in constant motion and mix it.

The slurry is then pumped by means of special pumps to small slurry bins over the kilns, and is burnt in the rotary kiln in exactly the same manner as dry material. The feed pipe to the kiln must be steep and wide, so that it does not choke. A difficulty with the burning is that the slurry is apt to roll together into large balls, which pass through the clinkering zone too quickly and do not get thoroughly burnt inside. These are called 'runaways.'

The kilns for the thick-slurry process have in Germany generally a length of 122 to 148 ft. and are 7 ft. 6 in. to 8 ft. 12 in. diameter. Only the kilns in the Dyckerhoff works are longer—150 ft. long and 9 ft. in diameter. Otherwise they are exactly the same as kilns for the dry process. The clinker is just as hard as the clinker made from dry material, and there is no difference in the further process of manufacture. Last year I often heard the view expressed in America that people in Germany were going over to the thick-slurry process quite generally. This is a mistake. As I have already told you, there are at the present time in Germany only seven such works, and in all of these special reasons led to the introduction of the thick-slurry process. Two of these works used the wet process from the beginning. At the moment only a single factory is altering its plant to the wet process, and from this you may see that the majority of the German cement makers still consider the dry process better, and in any case more economical. Only very special reasons, such as peculiarities of location or a naturally very wet raw material that could not be dried, have induced the German cement maker to introduce the thick-slurry process in a few places, although three engineering works are already making wet mills, and on this account are, of course, advocating the wet process.

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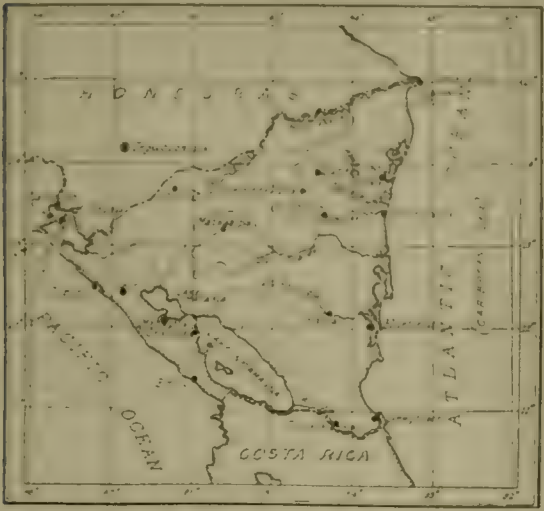
*A portion of a paper read before the Association of American Portland Cement Manufacturers, Kansas City, June 12 to 14, 1911.

Nicaragua and Its Gold Industry

By T. Lane Carter

We get enough of politics in the daily press, without introducing the subject into such a journal as this, but there is one political doctrine that mining engineers who lived in Nicaragua during the misrule of ex-President Zelaya thought of very often, the Monroe Doctrine. In writing of Nicaragua, this is the first point I wish to consider. My plea for bringing it in here is that mining depends to a great extent on sound political institutions, and that when you report on mining conditions in a country you must of necessity take note of the politics of the nation.

To the American at home the Monroe Doctrine is one of noble heritage. He joins in the cry, "America for the Americans. Let not Europe interfere or colonize in any part of Spanish America!" But the patriot is blind to the fact that the Monroe Doctrine carries solemn obligations, which we have failed in the past to recognize. Take the case of Venezuela, a country singularly blessed in mineral wealth. Who was responsible for such an anachronism as ex-President Castro? Indirectly, the United States. Under the Monroe Doctrine, Castro took liberties with Europe which should have brought fleets to his coast to chastise him. He realized that with the United States upholding this doctrine, he would be safe to disregard all international law. Because of men like Castro, the enormous wealth of Venezuela lies undeveloped, on account of the feeling of insecurity brought about by such lawless presidents.



MAP OF NICARAGUA.

Take the case of Nicaragua, equally as bad as that of Venezuela. Had it not been for the Monroe Doctrine, some European power would have protested to Mr. Zelaya so good and hard that the shock would have frightened him into being an honest man. But because of this doctrine, Zelaya carried on his rule of injustice for several years longer than he should, until the United States Government, at last stirred into action by the indignities shown her representative in that country by the dictator, as well as by other wrongs, moved to banish this man's evil influence from Central America.

The Monroe Doctrine is a good one, provided we realize the responsibilities it carries. If we will not allow Europe to call to order any tyrant in Central America who acts unjustly and hinders the expansion of the trade of the world, it is our obvious duty to keep order. What has been the fruit in the past of the doctrine of *laissez faire* on our part in Central America? Have the republics down there shown any more respect or consideration for our citizens than if we had pursued a firmer policy? It has been the experience of engineers that Americans abroad are not protected as are the citizens of Great Britain. I have known of cases where an American citizen has appealed to the British Consul in preference to the American representative, because he felt he would more readily get justice and protection by calling the British Consul to his aid. The foreign policy of the United States has been far too weak in looking after American citizens abroad.

With the advent of the Panama canal a new era seems to be dawning. The Panama canal has already justified itself, for it has awakened the United States to some realization of its duty in looking after the interests of its citizens engaged in the development of the mineral industry of Central America. Personally, I believe the future of mining in Nicaragua and the other republics was never brighter than at present. The history of Mexico will, no doubt, be repeated, and the five Central American republics will develop their great mineral wealth under more stable government, just as Mexico has, under stable government become one of the leading mining regions of the world. With the opening of the Panama canal the necessity for peace will become greater, and if our Government continues to show firmness, revolutions in Nicaragua and elsewhere will cease.

TRAVEL IN NICARAGUA.

The trouble in these countries is not with the people, but with a coterie of disreputable politicians and soldiers of fortune from the United States and elsewhere who, by a system of tyranny and oppression, exasperate the people beyond endurance and force them to rebel or starve. I was in the revolution against Zelaya in Nicaragua, and I know that for months the people of the country endured oppression as great as that imposed upon the peasants of Russia.

The political situation in Nicaragua is now promising for mining. Estrada, the new president, is a man who knows the importance of mining to his country, and he is anxious to give foreigners fair treatment and to welcome them and their enterprises. A large loan will be negotiated, and a program of railroad construction undertaken. It is most important to have railroad connections between the Atlantic and Pacific coasts. At the present time the only railroad in the country is in eastern Nicaragua from Corinto to Managua. To go across Nicaragua is a trying trip, for there are no roads, only paths through the forest, and the traveler must either walk or go on muleback.

Mining has not played as important a part in the history of Nicaragua as in some parts of Spanish America—Colombia and Mexico, for instance. Columbus sailed along the east coast of Nicaragua on his second voyage and landed at Cape Gracias a Dios. The Spanish adventurers found gold in the country, in western Nicaragua. The low, swampy coast-line of the Atlantic side of the country did not attract them, and this section of Nicaragua remained unknown until recent years. As a matter of fact, there are in the world few countries more sparsely settled than Nicaragua. A real 'boost' to mining in Nicaragua was given in the days of the gold excitement of California. Many of the fortune-seekers traveled to that Eldorado through Nicaragua. The chances of gold mining seemed so inviting that many miners stayed in Nicaragua and went to work. La Libertad district, in the State of Chontales, benefited by this invasion, and the production of gold started then has never entirely ceased.

There is very little literature bearing on the subject of the history of mining in Nicaragua. William Walker, that prince of soldiers of fortune, in his book, 'The War in Nicaragua', published in 1858, has very little to say about mining. His business was fighting, and he had no time to notice the gold industry. In a delightful book, now out of print, 'The Naturalist in Nicaragua', Thomas Belt not only describes the flora and fauna, but the mines as well. He was in charge of a mine owned by an English company in the La Libertad district, and complains of the difficulty he had in making a profit from ore running $7 per ton, with a milling capacity of 2000 tons per month. Mr. Belt states that the whole cost of treatment, including all charge for mining, carriage, reduction, amalgamation, and management was about $2 per ton, so that we see that as long ago as 1869, when this work was done, Nicaragua had remarkably low working costs. The cyanide process was unknown then. If it had been known, the manager of the mines would have made larger profit. As it is, he was evidently competent, for he mentions that after catching the gold with mercury, the sand and water then passed over inclined tables covered with blankets, the fibres of which intercept particles of gold and mercury that have escaped from the first process, and afterward into a concentrating-box, where the coarsest grains of sand and the sulphides of iron, copper, and silver were caught and, with the sand from the blankets, re-treated in arrastres.

Mining in eastern Nicaragua did not commence until 1888. There was an old German who lived for five years on the Principulca river trading with the natives, who had such influence with the Indians that they would bring him pieces of rock carrying free gold. Most of the mines found have been due to the clues given by the Indians, which later were followed up by the prospectors. Placer mining has never amounted to much in eastern Nicaragua, nor has a successful dredge ever been erected. Attention has been directed to vein mining, and it is this branch of the industry on which the future development of the country rests.

One of the first mines to commence operations was the Siempre Viva, on which Courtenay De Kalb made a report as long ago as 1892. This mine has produced steadily for years and still keeps at work. Later on, and also in the Pis Pis district, such mines as the Lone Star, Bonanza, Constantia, and Concordia, were opened on a small scale. Today the most important mine in the district is the Bonanza. A few years later La Luz y Los Angeles mine, in a district some 35 or 40 miles south of Pis Pis, was sold to an American company. This mine is still in active operation. The Topaz mine, in the Rama district, up the river from Bluefields, has been turning out gold for years. No attention was given to the tailing from the mills at first, simple amalgamation being the only method used. Cyanide plants were erected at the mines. One more step is necessary; the putting in of slime-plants.

Ask the average man and he will tell you that Nicaragua is one of the most unhealthy countries in the world, a land where one man out of two dies of yellow fever or malaria. It will take a long time to eradicate the impressions made by the high death rate during the digging of the Panama canal by the French. The assertion has been made that for every cross-tie laid on the railroad, a man died. People have thought for years that this high mortality was typical of all Central America.

Take it on the whole, Nicaragua is not an unhealthy country. After the experience of the United States Government at Panama, the world knows what can be done in making the tropics habitable. It is astonishing to find that the death rate in the Canal Zone is now as low as in many American cities. Most of the sickness in Nicaragua is found in the flat, marshy land along the coast and the rivers. When you get into the highlands and away from the mosquitoes, you escape from malarial fever. Much of the illness of the past has been due to hardships and neglect. Improper food and too much whiskey have had as much to do in wrecking health as the mosquitoes. No cases of yellow fever are on record as having occurred in eastern Nicaragua. The yellow fever mosquito (*Stegomyia*) is occasionally seen along the rivers, but as it has not been inoculated it is harmless.

The only enemy that the mining engineer going to the wilds of Nicaragua need fear is malaria. Fortunately, the type of malaria prevalent in Nicaragua is not as malignant as in other parts of the world, and the engineer gets rid of the malady when he goes to temperate climes. The sole cause of malaria is the mosquito. Remove it and the disease ceases. The engineer in Nicaragua should expose himself as little as possible to these insects. He should always sleep under a net. When he makes a permanent camp, the forest should be cleared away to let in the sunlight. Before going to the tropics, the engineer should read up on the subject of malaria. This knowledge will help him to prevent attacks, and to take care of himself if the disease lays him low. If he is in good health when he visits Nicaragua, the chances are that even in the swampy districts he will go for nearly a year without any attack. Many people escape, and if they live in the hills and mountains, may remain in Nicaragua for years without a day's sickness.

I wish the mining laws of the United States were as admirable as those of Nicaragua. The framers of the law had the poor man in view when they made it, for there are few codes which give the man without means a better chance than the mining laws of Nicaragua. Taxes are light, and the holder of a claim is not forced, as in the Western States, to do $100 of assessment work per claim each year. The size of a claim is 14,184 sq. yd., on which $2 per year in taxes must be paid. The law demands prompt payment of the taxes, which must be settled by the first of February. If not paid, the property is sold at auction.

The mining law is liberal in its granting of sites for establishing the plant where necessary for the treatment of ores, and also for water rights. For a mill-site of 100 hectares the law requires only 80c. per hectare per annum. As the dip of a vein varies, so does the shape of the claim. The width of the claim is determined by the dip, according to the following table:

From 30°	up to 45°	200 metres.
" 45°	" 50°	165 "
" 50°	" 60°	135 "
" 60°	" 65°	115 "
" 65°	" 90°	100 "

Every facility is granted in the acquiring of titles. The judge of the district appoints a competent man to measure the claims, the owner, of course, paying all the fees for surveying, stamps, and so forth. The owners are compelled to keep in order the monuments on their claims, and also to keep clean the boundary lines of the claims. There are one or two important reforms to be made in the Nicaraguan mining law. The most important is to make it possible for a large corporation to make sure of the 'deep level' claims of their property.

In the older sections of Nicaragua, around the capital, Managua, and the larger cities, the roads are passable, but in eastern Nicaragua there is not a road. To transport material overland is very expensive and difficult. Every effort is made to reduce to a minimum the distance on land, by working up the rivers and creeks with the freight to a point as close as possible to the mine. The freight is carried from the landing station, on the river to the mine, with mules or oxen. Through the vast, thick forest a trail is made by the natives with their long knives or *machetes*. The pack-animals follow this trail with their burdens. As the soil is soft and moist, it does not take long for the hoofs of the beasts to wear holes from 18 to 24 in. deep along the highway. This makes a difficult road to traverse, even in the dry season, but in the wet season the paths in the Nicaraguan forests are sloughs of despond. No wonder it costs from 5 to 8c. per pound to transport the freight from the river to the mine. Heavy pieces of machinery are dragged to the mines with oxen, use being made of block and tackle.

On the larger rivers, as the Escondido and the Wanks, steam paddle boats are used, but on the rivers where there are numerous waterfalls and rapids, all the freight is paddled up the streams to their destination in canoes or *pit pans* by the Indians. The difficulties of transportation have prevented the development of the mineral resources of the country as much as anything else. One of the first things that should be done is to open up the country with railroads.

There is a fine field in Nicaragua for geological investigations. This is not the place for a detailed dissertation on the structural geology of Central America. During the glacial period, it is maintained that the average sea level was 1000 ft. lower than it is today, and a variety of reasons have been urged for this difference in level. In early Pleistocene time it is probable that the coast of Nicaragua went far out into the sea. The islands of the West Indies, Porto Rico, the Virgins, the Anguilla group, Cuba, the Bahamas, and Hayti, once formed continuous dry land, and obtained its land molluscs from Central America and Mexico. The engineer is more concerned about the economic aspect of the geology of the country. He finds a great variety of vein structure and formation. Apparently the main mineral wealth of Nicaragua is gold. Up to the present, of the 500 mines registered in the republic, 490 are gold mines or prospects.

The majority of the formations are igneous. Occasionally small areas of crystalline limestone are found, as well as schists. Around Lake Nicaragua the signs of vulcanism are apparent, but in eastern Nicaragua and Honduras the formations are regular, and are seldom disturbed by faults or dikes. In the Pis Pis the well defined veins on which the Bonanza, Lone Star, Siempre Viva, etc., are located, extend for many miles without any large breaks. It is impressive to see the 50-ft. veins, worked by open-cut, on the Bonanza mine, and to notice that along the outcrop there are no faults or dikes. The country rock in the Pis Pis district is porphyry. As a rule, the veins are replacements in porphyry with a well defined foot-wall, and in many cases a well defined hanging wall. The vein filling is usually a quartz with sulphides of the common metals. There are many 'horses' in the veins. The water action has been intense, and as a rule the vadose zone does not extend more than 200 ft. The denudation of the veins has been enormous, and this has formed along the slopes of the hills a layer of soil from 3 to 20 ft. thick, locally called *manto*, which carries gold. At times this *manto* has been concentrated to such an extent that it is of high enough grade to mill. There are places in it here and there of great richness, but as a general thing the *manto* is very erratic.

The vital question, 'What will happen to the veins in depth?' has not yet been solved, as practically all the mines in eastern Nicaragua are worked through adit-levels. The indications are that when the permanent water-level is met the character of the veins will change rapidly. The possibility of this fact should be taken into account in the designing of any metallurgical plants. That the veins will extend to great depths is probable, but whether the gold content will persist remains to be proved. The width of the veins in the Pis Pis district is great, and up to the present no one has worried about what will happen at a depth of a few hundred feet, as there is sufficient ore above the water-level to keep the small mills running for many years.

Of course, there are veins in Nicaragua that are narrow and very rich, but I believe that the mainstay of the country will be the big medium-grade veins. I saw a curious gold vein in the Oconguas district, a tiny stringer with free gold in a limestone. One frequently finds veinlets in limestone in Nicaragua containing free gold, but they are more erratic. Fig. 1 is a sketch of a vein in limestone in the Oconguas district. An interesting geological formation is seen at the Santa Rita mine. This is illustrated in Fig. 2. The porphyry has been shattered and is full of veinlets running in all directions. The denudation has been so great that the oxidized zone does not extend far into the hill. The rock in the oxidized zone is of low specific gravity. Some of it will float in water like pumice stone. It is probable that many such formations as that at the Santa Rita mine will be found when the country is better prospected.

There are few countries in the world more difficult for the prospector than Nicaragua. The man who has looked for gold in open countries like Nevada and the Transvaal, finds, when he first goes into a tropical country like Nicaragua, the impenetrable forest, the thick covering of soil and sub-soil which hides the formation, and the difficulties of transportation, confronting him. But he soon learns by experience the methods to use in looking for gold. Fortunately, there are many streams in the country, and these cut the formations at frequent intervals, giving the prospector a good chance to study the rock. The keen eyes of the Indians and the Nicaraguans are far more likely to find gold than Europeans, and as a rule the white man takes one or two of the natives with him when he goes into the forest. The prospector who goes to Nicaragua should either be 'grubstaked' or have some money of his own. Being a new country, it is not a cheap one in which to prospect. One thing the new convert must beware of, and that is the fact that the gold is rather light and contains a large amount of silver. He is very liable to overestimate the gold in panning. As a great deal of the gold is 'bound', he should frequently have assays made of material which he considers gold-bearing.

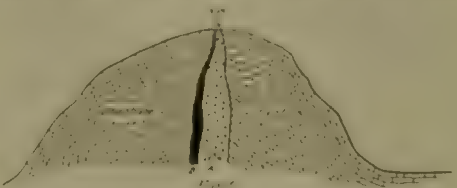


Fig 1

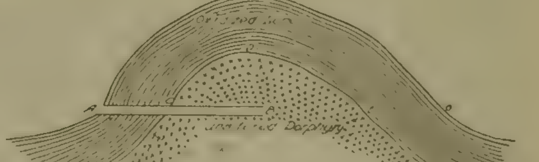


Fig 2

All of the mines that have been started have relied for awhile on wood for fuel, but they soon found that this is most expensive. While the land in Nicaragua is covered with forests, the number of trees used for timber and fuel is small. Most of the bushes are worthless. Fortunately, the country is blest with an abundance of water-power, and the mines soon get their power either direct from Pelton wheels or by hydro-electric methods. For a month in the dry season streams run low and there is frequently a scarcity of power, but in the wet season there is an abundance. A large company operating in Nicaragua would probably desire to provide for this one month of dry weather by putting in an auxiliary steam-plant. If this is done, and the mines are well served with railroad facilities from the coast, it will probably pay to bring in coal from Alabama.

Nicaragua is better off as regards labor than other countries, such as British Columbia and Alaska. Labor in Nicaragua can be divided into four classes. The Indian, the Spaniard or Nicaraguan, the Jamaican, and the European.

The Indians are expert in their canoes, and all the transportation on the rivers is in their hands. As hunters they also do very well. In opening up a new district it is possible to supply 25 to 30 men constantly with fresh meat if a hunter is employed to go out after the game. The Indians do not do well as miners or artisans. They receive from 40 to 80 cents per day and their board.

The Spaniards or Nicaraguans are the miners of the country. On the whole, they are better workers than the peons of Mexico and work best when put on contract. While on day's pay, they earn from 80c. to $1 per day, United States currency. When on contract they do surprisingly good work at times and earn from $3 to $4 per day. Most of the Spaniards come from the interior of the country and from Honduras. It is important for any large mining corporation that starts work to lay out a town for the employees, so that they can bring their families from the far more populous interior and settle permanently near the mine. The Jamaicans, or negroes, seldom work in the mine. They are employed as mechanics, carpenters, and the like. They are not popular in Nicaragua, being insolent and lazy. You will take them for British subjects, but if you ask the Jamaican in Nicaragua, he draws himself up with pride, and exclaims, "I'se a British object, sah." It is the best policy to divide the labor on the mines so as to have an equal number of Indians, Nicaraguans, and Jamaicans. The feeding of these people is expensive, on account of the excessive freight rate charged on imported foodstuffs. Most mines endeavor to raise fruit and vegetables with which to feed their men in order to reduce to a minimum the material brought to the mines. It costs from 60 to 90c. United States currency per day per man to feed this labor.

There is no more demand for Europeans as laborers in Nicaragua than in Mexico. The few that are found on the mines are in charge of the native laborers. You will seldom find a white man working as a miner. The best chance for the European in Nicaragua is to go to work on his own account, either prospecting or similar work. This, of course, requires a little capital. For the mechanic to go there with simply his muscles and no cash, the chance is distinctly a poor one.

The methods of mining employed on some of the properties have been distinctly primitive. On some of the small veins, from 3 to 6 ft. wide, there has been a great deal of gophering, not as much as one would find in the *antiguas* in Mexico, but sufficient to honeycomb the vein. In the narrow veins the ore is stoped out from the adit-level by back stoping or overhand stoping. The rather soft hanging wall is kept up by timbers. The dip of the veins is from 60° upward.

On the large veins the work is carried out on the open-cut system. At the Lone Star mine, however, during the rainy season, when it is almost impossible to mine in the open, the ore is drawn from underground stopes. The vein in the stope varies from 15 to 40 ft. The vein material is somewhat harder than the country rock. For this reason no attempt is made to support the hanging, but it is caved. An attempt is made in Fig. 3 to show the method employed in stoping underground at the Lone Star. Raises are put up every 50 ft., as at 1, 2, 3, 4. When the ore is blocked out in this manner, stoping commences at the top, as at *CD*. The ore is handled in wheelbarrows along *CD* and *EF* and dumped down the chute 1 or 2. Where the vein is stoped up to the hanging wall it is generally found that the pressure of the caved material above is sufficient to bring down the hanging. If not, a hole is placed in the hanging and it is caved. By this method it is possible on the Lone Star to extract all the ore from the stope without using much timbering.

The engineer is surprised to find such low working costs in a country like Nicaragua. The total cost at the mines with large veins, including mining and development, milling and cyaniding, etc., runs from $2.50 to $3 per ton, crushed. The reasons for these low working costs in spite of the high cost of transportation, are obvious. In the first place, power is cheap. On no mine in the world can one find a more ideal power scheme than the one on the Lone Star, where the mill and all the machinery is driven direct by water-power. The hydro-electric possibilities on a mine like the Siempre Viva, mean cheap power for all the properties in the district.

The veins, as a rule, are wide, the ore is easily stoped, labor, while not plentiful, is fairly efficient; so the labor costs are not high; and these points, of course, make for low working-costs.

The ore is rather soft, and the cost of milling, therefore, is moderate. The consumption of cyanide, per ton crushed, is normal. When it is realized that the present low working-cost in Nicaragua is obtained on plants with a daily capacity of 100 tons and less, one sees the great opportunity for very low costs in this county were the mines served with railroads and milling plants of a larger daily capacity. The use of rock-drills for stoping and development work will probably replace much of the hand work now done in the mines. This also will make for low costs.

The value of the ore in the different mines varies considerably. A conservative figure would be about $6 per ton for the large veins in the Pis Pis district. There is no reason why, with the proper equipment, there should not be an extraction of 85 to 90% of the gold content. This would give a recovery value of about $5 per ton, and a profit, with a modern plant, of about $2.50 per ton.

The metallurgy of gold in Nicaragua has been decidedly unsatisfactory. It is not a 'free-milling' country, and for years on some properties the extraction of the gold by plate amalgamation was from 33 to 45%. The introduction of the cyanide process was a great advance, but, unfortunately, only the sand has been successfully treated and not the slime. At one property, the Bonanza mine, the slime is treated by an entirely unsatisfactory method, the decantation process. It is questionable whether this process should be used anywhere. It is certainly a most unsightly misfit in Nicaragua.

While the slime problem presents some difficulties, on account of the large amount of alumina present, I am sure that the slime problem in Nicaragua can be solved. Laboratory experiments gave me an extraction as high as 90%. The only serious trouble was in clarifying the gold-bearing solution. The value of the slime is about equal to that of the sand, running about $2 per ton, and amounting in quantity to 50% of the tonnage crushed.

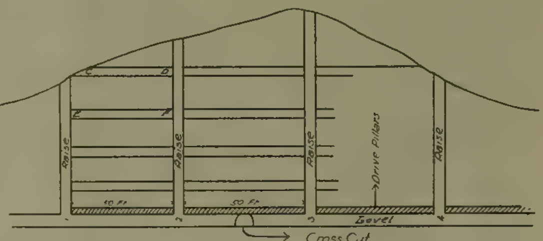


FIG. 3.

On the whole, it will be found that such machinery as the Huntington mills will be more suitable at the present time in eastern Nicaragua than gravity stamps. Where these muddy ores are crushed with stamps the efficiency is low, as the material sticks to the shoes and dies, increasing the weight of the stamps, simply augmenting the trouble. To my mind the best method of crushing the typical Nicaraguan ore is to pass it through crushers, then rolls, and then through the Huntington mills. As the ore is rather porous, there is no necessity for fine grinding, so that tube-mills will not be required in Nicaragua. I have obtained an excellent extraction by crushing with a 20-mesh screen.

The scheme of crushing in a cyanide solution and doing away with all amalgamation should be carefully considered, especially in the Pis Pis district, where the ores are amenable to the cyanide process. The fact that the amount of gold recovered in the Pis Pis district never equaled more than 50%, and is often as low as 15% of the gold in the ore, goes to show the importance of direct cyanidation in the treatment of these ores. The consumption of cyanide varies from ½ to 1 lb when treating the ores in the oxidized zone. Occasionally bunches of sulphides of lead and zinc are found, and if these pieces get into the mill the consumption of cyanide is increased. As these sulphides are not, as a rule, high in gold, it is profitable to sort these out before the ore goes to the mill.

Ordinary cone separators are used to divide the sand from the slime. It is of great importance to make a complete separation if a satisfactory extraction of the gold is desired. In one case that came to my knowledge, the people ran the whole product from the mill into the sand tanks. The amount of gold obtained from treating the mill pulp by this method was, of course, insignificant. A man who knew his business came along, made a careful separation of the sand from the slime, and had no trouble in obtaining an extraction of 88% of the sand.

The question of treatment tanks is a very important one. As a rule, they are built of wood imported from Louisiana or California. At the La Luz mine they have erected steel tanks at a great expense. Provided the property will last for a number of years, steel has the advantage of durability. With such splendid woods as are obtained in Nicaragua, one would think that the tanks would have been constructed from the native wood. This has not been done in the past on account of the absence of sawmills, but in the future, especially in new districts, it is probable that the tanks will be built from the wood of the country.

On account of the high cost of transportation, it is impracticable to use lime as a neutralizer. The vast coral reefs along the coast will give a cheap and abundant supply of lime in the future when railroads are constructed. At present caustic soda is used in the cyanide plants. The strength of the solution varies from 0.2 to 0.3%. Occasionally a little trouble is experienced with arsenic, but T. W. Bouchelle, the chemist at the Lone Star mine, overcame this difficulty, when he noticed a deposition of arsenic on the zinc shaving, by heating up the solution in the boxes with live steam. The heat caused the arsenic to scale off of the zinc and settle at the bottom of the boxes. Now and then bunches of copper are found, and these are likely to cause trouble if the cyanider does not understand how to treat the problem. By the use of bichloride of mercury in the boxes, the trouble from copper can be averted.

Sulphuric acid is used in the clean-up. The transportation of acid in a tropical country like Nicaragua is a difficult and expensive feat. The gold-bearing material from the clean-up, however, is so base, that to get the gold out without the use of sulphuric acid is a serious problem. The assay offices of Nicaragua are equipped to take care of the routine work. The gasoline furnaces, such as the Braun, have been a boon to the country, and it is possible to make a gold assay in these furnaces in the wilderness for 10 cents an assay and less. On account of the heavy rainfall, which varies from 125 in. per annum in the Pis Pis district to 300 in. at Greytown on the coast, the damage done to balances and survey instruments by excessive moisture is considerable. Assay textbooks, etc., rapidly deteriorate through mildew and must be kept wrapped in cloth if they are to be preserved for a number of years.

To give an adequate description of Nicaragua and its gold industry would take far more space than I have at my command. I have tried to give briefly some of the salient facts in the mining industry of this republic, which is so old that it can be considered new. Better days seem to be in store for this country. Not only American engineers, but the American people wish the country well. We all hope that under the guidance of the new president, Estrada, the night of tyranny which has for so many years hung over this beautiful land like a pall, will give way to the day of liberty and prosperity. In the past the indiscriminate granting of concessions has done a great deal to hold back the development of the country. The present Government has abrogated these concessions, and the country will now be thrown open to the prospector.

There are many difficulties in the way of the mineral industry of Nicaragua, and the development of the country will probably be slow. The owners of mines and prospects in the Republic do not fully realize these difficulties, and the prices frequently asked for half proved properties are absurd. They should remember that other countries besides Nicaragua are calling for funds, and that in this competition for capital the money will go to the industry offering the most attractive terms.

A NICARAGUAN MINE.

San Francisco Meeting of the American Institute of Mining Engineers

As already announced, the one-hundred and first meeting of the Institute will be held in San Francisco, California, beginning Thursday, October 19, 1911. The last meeting of the Institute in California, September, 1899, was so eminently successful, due to the careful arrangements made by the local committee for the comfort and enjoyment of the party, that it is regarded as having established a standard of highest merit. The description of the many interesting places visited, and the cordial hospitality showered on the party throughout the trip, are recorded in the *Transactions* (Vol. XXIX), and in a special volume on *California Mines and Minerals*, 450 pages, published by the California Miners' Association under the direction of E. H. Benjamin, secretary, who is the present chairman of the Committee on Excursions of the coming meeting.

The chairmen of the various local committees in San Francisco are: Executive, W. C. Ralston; Sessions, F. W. Bradley; Excursions, E. H. Benjamin; Reception, S. B. Christy; Finance, M. L. Requa; Press, H. F. Bain. The Institute headquarters will be established at the St. Francis Hotel. The local program, controlled by the Local Committee, provides for the opening session at the St. Francis Hotel, in San Francisco, Tuesday afternoon, October 10, to be followed by other sessions on Wednesday and Thursday mornings. On Thursday afternoon, October 12, a special train of Pullman and dining cars, in charge of the Local Committee on Excursions (E. H. Benjamin, chairman), will take the party to Bakersfield, arriving early Friday morning for a visit to the various oilfields. On Friday evening, October 13, the party will proceed by train to the heart of the gold-dredging district, near Folsom, spending Saturday morning, October 14, in visits to the gold dredges and the great rock-crushing plant of the Natomas Con. Company.

On Saturday afternoon, through the courtesy of Hiram Johnson, Governor of California, a public reception will be held in the State Capitol, Sacramento. Later in the evening, the train will transport the party through the

Napa and Sonoma valleys, arriving at the Bohemian Club Amphitheatre on Sunday morning, October 15, where a barbecue luncheon will be held. The day will be spent in this delightful grove and an orchestral concert will be given on the great natural stage, where the plays of this famous club are presented. On Sunday evening the party will return to San Francisco, and devote Monday, October 16, to rest and preparation for the departure of the Japanese delegation, and possibly to a few local excursions. On Tuesday morning, October 17, the return trip will start for Chicago.

Who Pays For It?

By Herbert C. Enos

While recently visiting a small mine in the State of Guerrero, Mexico, I noticed that the track from the mouth of the tunnel to the end of the dump, a distance of about 250 feet, was poorly laid, with a grade of about 2% in favor of the returning empty car, so that two men were required to tram the loaded car from the tunnel mouth to the dumping point. I inquired of the manager why he did not lower the dump end of the track enough so as to have a ½% grade in favor of the loaded car, and received this answer: "Well, it does not make much difference, since the trammers are on contract."

I have received that same answer many times in Mexico with reference to contract work about mines. Ignorant or shiftless superintendents expect Mexicans to make all sorts of break-neck efforts for the simple reason that they can get the job done comparatively cheaply on contract. Because you can get a Mexican contractor to hire boys to pack waste up ten flights of ladders with the stuff in baskets *(chiquihuites)* is no reason why you should not put in a windlass and pay the miner less money for his contract, thereby paying for the cost of the windlass and putting money in the company's treasury besides.

I have reduced the contract price on driving in limestone with machines from $28 to $26 per metre by simply giving the contractor an iron plate to shovel on and seeing that the track was kept close up to the working face. This particular drift to which I refer was to be driven a distance of 300 metres, so with a saving of $2 per metre, we have $600 saved against $20 invested in an iron plate.

I could cite a great many similar cases, and they all show that if a contractor has difficult conditions to work under, he is not the loser, as the company pays for it. The Mexican contractor generally expects to make about 25% more when working on contract than he does when working for daily wage; hence if conditions are made so that it is easy for him to work, he will accept the contract at a lower price than he would under poorer conditions.

Good chutes in which the ore does not block, track laid with a fixed grade using 16-lb. rails, and cars of a proper design, all help the contractor to deliver more cars to the station, and therefore he can afford to accept the contract at a lower price than if conditions were bad, thus reducing the working costs of the mine. With a piece of paper and pencil, and the use of a little simple arithmetic, these things can be figured out and the company saved much money.

Another point which seems to me to be an excellent one, but which I have never seen so rigorously enforced as is done at the El Oro mine, operated by the El Oro Mining & Railway Co., is the punishment of men by a fine or some other means, who do not remain in the stopes, or who sleep when they are supposed to be working, or do other things which take them from their work. This applies to men who have contracts as well as to those on day wages. A good many managers contend that when a man has a contract he has a right to work, loaf, sleep, or do as he pleases. In the United States that may be all right, but the Mexican miner is a great conversationalist and 'josher', and likes to sit around the mine in the morning in groups and talk it over. I have been in large mines in the Pachuca district, where men who went into the mine at 7 a.m. did not commence to hit the drill until 9 or 10 a.m. The result can best be shown by an example.

Take, for instance, a mine working 1000 men with 10-hour shifts, where the men are obliged to get to their respective working faces as soon as they enter the mine. It is a rule of the company, and applies to contractors as well as to men earning day wages. Generally a contract is let for the week or *quincena*, fifteen days, and the average contractor generally comes out with about 25% more money than he would earn working for day's wages; of course, sometimes a good deal better and at others considerably less, with about 25% for an average. In this mine the men get to work at once, and in the 10-hour shift they probably work nine hours.

Now suppose this company changes management and the miners are allowed to sit around for an hour in the morning discussing the political situation in Mexico, and are allowed to go wandering about the levels when they feel like it—and they get that feeling about three or four times a day—they average about six hours at work instead of eight or nine, with the following result. The contractors begin to come out poorly and in many cases do not make day wages. Then, of course, they object, and it becomes hard to let the old contracts at the same prices; perhaps the shift boss will think that they are not getting quite enough, and he will gradually raise the price of the contracts a little, and he may be forced to raise some of them until at the end of six months the price paid for contracts will have risen 20% or more and the men receive as much for working six hours a day as they formerly did for working eight or nine hours. In other words, the company again pays for it.

Along this same line is the question of working nights in Mexico. The El Oro company has stopped all night work where possible, with excellent results. I had the good luck to be at one of the company's mines in Chihuahua during the cutting down of the night work. I found that when working men on the contract system, by adding five men to the day force you could dispense with ten of the men on night shift. On the daily wage system, one man on the day shift will, on the average, do more work than three on the night shift. It may not be possible or advantageous to cut out night work on some properties, but there are many mines in Mexico where the night force could be cut down considerably, or dispensed with altogether, with profitable results.

The average Mexican miner will not sleep in the daytime. He visits around and spends the day in the *cantinas* or saloons. Animal instinct impels animals to seek their rest at dusk, and the Mexican miner has not, up to date, lost any of his atavism. Mexican contractors will accept contracts at lower prices when they do not have to put on a night shift. This is especially true of ore contracts, and companies should take advantage of the fact where possible, and get away from the idea that because it is a mine they have to work both day and night.

Copper Exports and Foreign Surplus

Exports of copper as compiled by the New York Metal Exchange and the foreign visible supply on the first of each month are noted below, all figures being in tons.

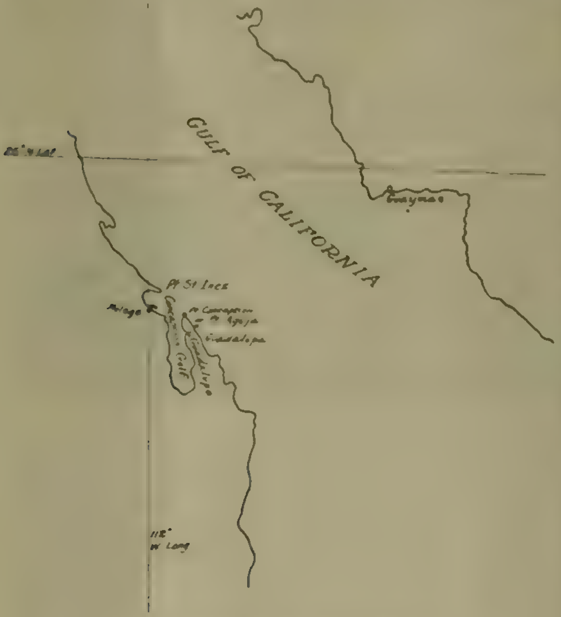
	Exports.		Visible surplus.	
	1911.	1910.	1911.	1910.
January	29,257	26,699	83,797	109,022
February	18,992	25,238	83,196	110,808
March	23,300	19,963	82,387	113,455
April	27,466	13,062	82,267	111,432
May	26,655	20,832	78,069	110,207
June	30,074	23,430	72,613	106,815
July	34,955	22,875	70,172	103,957
August	....	27,976	68,025	99,239
September	....	31,733	.....	97,507
October	....	27,917	.....	93,961
November	....	30,441	.....	88,422
December	....	31,526	.....	86,250
12 months	....	301,590		

Manganese in Lower California

By H. Vincent Wallace

The area embraced in the following description was visited during the month of December 1910, and lies in the municipality of Mulegé, South District, Baja California. The town of Mulegé has a population of about 1200 people, and is situated in Long. 111° 58′ W., Lat. 26° 53′ N., and about 95 miles W.S.W. from the port of Guaymas, in Sonora. Mulegé is beautifully situated on a river of the same name, about three miles from its mouth. The river rises about a mile to a mile and a half above the town, in a large *cienega*, or group of springs, which also serve to irrigate a large tract of very fertile land, devoted to market gardening, olive culture, and magnificent groves of date palms. Practically all this industry is in the hands of Chinese, who by their energy have developed a large export trade. Dried dates are consumed in large quantities by all the inhabitants of the locality, and it is almost a staple diet of the fishermen, sailors, pearl divers, and others.

Another industry of local importance is the salt refining, which is carried on at the mouth of the river, where, owing to the rise and fall of the tide, which amounts to eight feet, sea water is admitted as desired into a series of basins which have been dug in the lowest portion of a small peninsula or neck of land, just on the landward side of the harbor entrance, and back of the custom house. The collected salt water is allowed to evaporate slowly, and the impure salt crystals are collected and sacked. The resulting product consists of sodium chloride with a good deal of magnesium chloride. This is sold to outgoing ships, and, although bitter, is used along the coast for pickling fish. If scientifically conducted, a much purer salt could be produced at a very low cost by taking advantage of the different stages of crystallization of the various salts. The local method of pickling olives consists in merely placing the olives in a hot crude salt brine, which, owing to the magnesium content, gives a very bitter flavor. There appear to be no attempts at olive-oil manufacture, and as there are large numbers of sardines in the estuary and outer bay, at certain seasons, it would seem that there is a good opening for a cannery at this point.



MAP SHOWING MANGANESE DEPOSITS.

About a mile from the north of the river there is a large body of kaolin which is worthy of exploitation. It is of fair quality, even on the surface, and by systematic development would probably afford a substantial revenue. The exposure on the beach is impure, due to a slight iron content, but this is probably due to a local concentration and levigation tests could be made with a view to determining how good a product could be obtained by simple means. Samples of this material, both washed and unwashed, should be submitted to pottery and tile works in San Francisco, Seattle, Portland, and Los Angeles, as I understand that a few selected lots submitted to one firm in the last named city met with approval. Probably it is only a question of cheap mining and adequate loading facilities, with a maintenance of grade, to develop an important industry.

KAOLIN DEPOSIT NEAR MULEGÉ, BAJA CALIFORNIA.

Justice would hardly be done to this portion of the Gulf of California, if mention were not made of the pearl-fishing industry, as it is a well known fact that some of the finest black pearls in the world have been sent from Mulegé. Owing to the fact that this business has been largely monopolized by some companies which have obtained concessions from the Government, the pearl fishers are not as actively employed as formerly, and only a few divers are working on their own account, carrying on a more or less illicit traffic. Merchants complain that since the granting of the concessions the pearl-shell business has likewise dropped off to almost nothing.

The manganese deposits are all situated on the peninsula, Point Concepcion, which terminates at its northern extremity in Punta Aguja. This neck of land encloses the Gulf of Concepcion, which has a north-northwest direction, and the point of the headland is approximately 14 miles across the bay from Mulegé. One of the deposits, and the one of least importance except from the point of view of the probable genesis of the mineral, is that known as the Guadalupe, which lies inland about one mile from the shore of Guadalupe bay, which is some 12 or 14 miles south from the Punta Aguja, and on the east shore of Concepcion gulf. The other deposit, known locally as the Gabilan, is on the east side of the peninsula, and about 14 miles across country from Guadalupe. Concepcion gulf and Guadalupe bay are well protected from storms, but on the eastern shore, which is exposed to the violent storms of the Gulf of California, great fear is expressed

MANGANESE IN JOINTS AND CRACKS, GABILAN.

by the mariners, and danger of the *Nord Oeste* is constantly dinned in the visitors' ears—partly with a view to getting more pay for conveying passengers, but principally from the fact that the coast is rough and forbidding, with hardly any inlets or coves and no harbors.

The entire peninsula in which the manganese is found consists of igneous rocks, from extremely basic basalts on the east, overlain by agglomerates and conglomerates, with later intrusive sheets or sills of trachytes and andesites, and in certain localities pyroxenites. There appear to have been several distinct periods of intrusion and uplift, which, in addition to tilting the superincumbent conglomerates, have cracked the earlier basaltic and trachytic rocks. The direction of the intrusion is about north-northwest, and very probably is the cause of the peninsula. In the Guadalupe there are a series of deposits or layers, which at first appear to be regular veins, but I am inclined to believe they are local deposits where manganese-bearing solutions have found ready channels, or have precipitated as deep-sea deposits, the currents or flow being slow, and the adjacent rocks favorable to such deposition, and in this way the manganese oxide, accompanied by more or less silica, iron, and lime as sulphate (gypsum) has formed the layers referred to. The Guadalupe deposit, to my mind, has no commercial importance at this time, as, although at first sight it appears to be an exposure of over 100 ft. wide, subsequent investigation proves it to consist of several layers or beds, separated by layers of barren rock, composed largely of impure iron-stained gypsum. Erosion and weathering have caused the removal of the softer barren material, with the result that a large area is covered with black float, the average tenor of many samplings of the material 'in place' being as follows:

17.54% Mn (metallic);
1.63% Fe;
3.61% CaO (as sulphate);
28.22% SiO_2.

Across the peninsula at the point called Gabilan, the occurrence of the magnanese is entirely different. There is a cementing or filling in the brecciation cracks of the surrounding and enclosing pyroxenite. My impression is that these deposits are the result of metasomatic processes, or in other words the replacement of some of the original constituents of the basic rock, and a filling of the cracks by the material leached out from some of the component minerals of the rock. For example, augites or monoclinic pyroxenes are highly developed, and it is known that schefferite in its original form carries manganese, combined with lime, magnesia, and iron as a silicate. The remarkable purity of the manganese oxide in the Gabilan section compels me to believe that practically the manganese only was extracted from its original crystal home, and redeposited in the fissures and cracks which exist, completely filled, from knife-blade thickness up to as much as 11 inches. This material, on analysis, proved to contain from 59.9% to 60.34% of metallic manganese, with not more than 0.25% Fe, no lime, and 1.5% siilca.

This brecciated manganiferous area extends along the coast for over a mile, and is exposed inland in several places for 500 ft. from the shore-line, and at the time of my visit to the place the entire coast for this distance was strewn with pebbles, boulders, and fragments of sea-washed pure ore, samples of which equaled the analysis just referred to. It is difficult to estimate the tonnage of the ore on the beach, but it will probably exceed 2000 tons, and might be double that amount.

In reference to the probable genesis of the manganese in this locality, which hardly comes within the province of this paper, I would refer to 'Geological Distribution of the Useful Metals', by S. F. Emmons, *Trans.* Amer. Inst. of Min. Eng., 1893, Vol. XXII, pp. 53 *et seq.* As the Gabilan is absolutely undeveloped, it is impossible to say with any degree of accuracy what the ratio of pure manganese-filled cracks to rock-mass is, but I estimate that it occupies from 2.5 to 4%, allowing a length of 5000 ft. along the shore line, by 30 ft. in height of cliffs above tide, by a width of 500 ft. back from the shore, this would indicate a workable tonnage of 5,750,000 tons, which should produce 144,000 tons of clean ore, if the average tenor of this block only runs 2.5 per cent.

Probable water issuing from a contact of a trachite and agglomerate exists in a good spring at a point on the coast known as Trinidad. This is about 4 miles from the Gabilan deposit and indicates a permanent water-supply, as there are several large date palms growing around the spring, within a few feet of the beach. The locality lends itself to easy transportation, but before any extensive work is done, the tract should be carefully prospected, and several hundred tons of the cliff shot down, and for the purpose of preliminary estimates, hand-picked, to determine the average manganese content. If this should prove satisfactory, larger operations can be undertaken, a fair-sized supply-ship could be bought or chartered, and this could be used for the transportation of the water, men, supplies, and ore as mined and sorted. A further equipment of dugout canoes, such as are used along the Pacific and gulf coasts by fishermen and pearl divers, should be bought, as these are the only craft that are suitable for landing on this rocky coast.

In large operations the waste rock could be used for the building of breakwaters and small harbors, and in this way make a series of refuges, not only for the operatives on this work, but for the many small coasters and sailing craft that are now in constant dread of the northwesterly gales. It has been remarked that if you are looking for a rare mineral, go to Lower California: and certainly, for exceptional purity of manganese in considerable quantity, I would commend the peninsula of Concepcion.

Thorium Syndicate Suspended

For a considerable time past negotiations have been proceeding among the principal European manufacturers of thorium with the view to coming to an agreement by which production and prices could be regulated, but these have at length been abandoned, as unanimity was found to be unattainable under existing circumstances. The supply of thorium was at one time a virtual monopoly under the control of a powerful Continental syndicate, but the 'corner' has at length been broken, and the industry has fallen on evil days from the producer's point of view. Prices have steadily declined for two or three years, and are not unlikely to go considerably lower. This declining tendency is directly attributable to the glutting of the market with monazite sand, the principal raw material from which thorium is produced. The supplies of this sand were entirely controlled by the syndicate, whose exorbitant prices forced the leading makers of incandescent mantles, including the incandescent-light companies, to exert themselves to obtain independent supplies at all costs. In this they were successful, and prices fell rapidly. Practically the whole of the supply of monazite sand comes from Brazil, and thorium nitrate is manufactured only in the United States and on the continent of Europe. The yearly consumption of monazite sand for the manufacture of thorium is placed at between 2000 and 2500 tons, but for some years the supplies have been equal to double the consumption. The contract between the Brazilian Government and the thorium syndicate has now expired and a new lease of the fields is about to be arranged. There are numerous offers, and as the Brazilian Government is not likely to allow any monopoly to acquire control of the supply, a further flooding of the market and consequent decline in prices is feared.—*London Financial Times.*

CHROMITE is used extensively in the manufacture of ferrochromium, employed for making special steels, alone or in combination with tungsten, manganese, nickel, or other steel-hardening metals. It is also used for lining copper, lead, steel, and other furnaces, where the corrosive action is very great. For this purpose it is used either in the crude form or as chrome brick.

One Use for Tailing

Representatives of four railway systems entering the new Union station at Joplin, Mo., joined with the Joplin Commercial Club and the city council recently in celebrating the opening of the station, which is built of reinforced concrete made from tailing from the zinc mines. The gravel from the jigs and the sand from the concentrating tables, the two forming 15 parts in a mixture of 22 parts, were mixed with river gravel and sand, 3 parts, and portland cement, 4 parts. This formed a concrete which, when poured into moulds containing reinforcement, formed the solid walls, floors, and roof of the station, shown in the accompanying illustration. The demand for tailing as a building product is increasing rapidly, and thousands of tons are shipped out of the district each month. The tailing is used in concrete for constructing buildings, viaducts, telephone poles, railway ties, fence posts, burial vaults, and numerous other structures. As more than 95% of the material passing through the concentrating plants of the Missouri-Kansas-Oklahoma district consists of flint or limestone, and as an even greater percentage is waste, when the vast amount of boulders, that are discarded before they reach the mill, is taken into consideration, it can be realized that the production of so-called waste each year is very great indeed. A conservative estimate would place a single year's production of tailing at 6,750,000 tons. Not only is this being employed as a building material, but vast quantities of boulders are utilized in the construction of dwellings, garages, electric-line stations, etc. At present Harvey Nash, the city collector of Joplin, is erecting a $3600 bungalow built of huge boulders secured from a mine dump.

UNION STATION, JOPLIN, MO., BUILT OF ZINC-MILL TAILING.

Copper Deposits of the Nizina District

The most valuable copper deposits known in this region are situated near or at the contact between the Nikolai greenstone and Chitistone limestone. The copper is not, however, restricted to that horizon, but is found in many parts of the greenstone and even extends into the limestone to a distance of at least 1000 ft. above its base. The Kennicott or Bonanza copper mine, which made a first shipment of 1100 tons of ore to the Tacoma smelter early in April, is described in a report on the Nizina district, by F. H. Moffitt and S. R. Capps, of the United States Geological Survey, as well as other near-by copper properties, including those on the northward extension of the Bonanza fault, the Nikolai mine and the Westover claim, on Dan creek. An important fact concerning the copper ores is that they are connected with faults and shear zones, many of which, though difficult to recognize, give opportunity for the circulation of copper-bearing waters and the deposition of their copper. The Bonanza mine is on a large deposit of chalcocite located in such a shear zone. This shear zone has not given rise to any important displacement of the rocks on either side and was traced north-northeast for a distance of more than a mile from the Bonanza mine.

Peace in the German Potash Industry

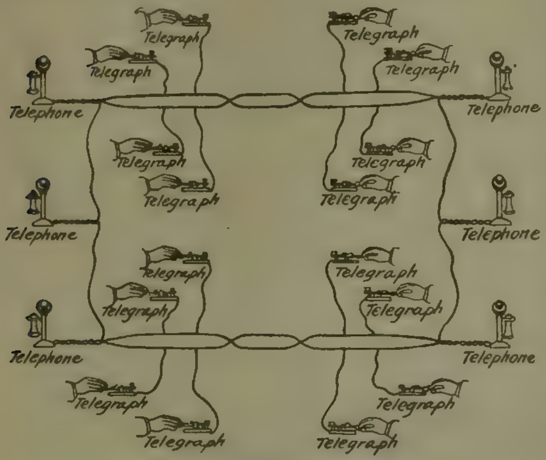
At the conference held recently at Hamburg between the conflicting interests, German and American, in the potassium industry, an agreement was reached as to prices and rebates. The agreement has a duration of five and one-half years. During this period the American purchasers of potash, that is to say, the North Trust, the South Trust, and the independents, obligate themselves to make all purchases from the potassium syndicate. The probability of the market being disturbed by outside mines is thought to be remote, as such outsiders would have to organize a sales agency in the United States similar to the German Kali Works owned by the syndicate, which delivers potash salts directly to the buyer. Such an organization would be expensive and difficult to effect.

The basis of prices is practically the same for concentrated salts as that provided in the potassium law, and the same as prevailed in America in 1909 before the syndicate was renewed and before the Schmidtmann contracts went into force. The prices, aside from 40% manure salts, which are sold to the German agriculturists at low prices, are the same as the maximum prices laid down in the law for the domestic consumption. On the other hand the prices proposed for raw salts, especially kainit, are higher than the prices formerly paid by Americans to the syndicate. Rebates for most sorts of salts are increased. Formerly a rebate of 9% on the average was granted the American companies. Now it will be from 11 to 12%. In reference to certain expenses which may be incurred by the syndicate, the right is granted it, during the duration of the agreement, five and one-half years, to increase prices 3%. The agreement is incomplete, inasmuch as the Aschersleben and Sollstedt works, belonging to the Schmidtmann interests and the Schmidtmann International Trust have not united in it. An effort will be made by amicable means to bring the remaining parties into the agreement. If it is not successful, it is thought that their sales contract will be attacked, as they are regarded as in some respects legally indefensible.

At a recent general meeting of stockholders of an important mining company held previous to the aforementioned conference at Hamburg, the president stated that the favorable result of the business year, namely, the distribution of the dividend of 15%, had been attained in spite of the potassium law. The chief purposes of the law, the prevention of the precipitate founding of new works and the rendering ineffective of the alleged ruinous American contracts, have not been accomplished. In both of these directions the law has proved abortive. Directly contrary to the law, a much more active founding of new companies has taken place and the American (Schmidtmann) contracts are in full force. This opinion seems to be shared by persons in Brunswick acquainted with the condition of the potassium industry; it is said that the industry has been sustained by the steady increase of sales in old markets and the introduction of the salts into new markets.—*U. S. Consular Report.*

Multiple Telegraphy

Many engineers will be interested in the following description of the method of using a circuit for both telephone and telegraph messages. It is taken from the annual report of the American Telephone & Telegraph Co. A telephone 'circuit' consists of two copper wires of superior construction, arranged in a particular relation to each other, forming a metallic circuit equipped with auxiliary apparatus, loading coils, etc., connected with a switchboard—all very complicated and elaborate. A telegraph 'circuit' consists of one wire at most—a grounded circuit. This wire can be divided into several distinct circuits. A telephone 'circuit' can not be used for telephone purposes by any but the two persons in communication, during the time of such communication, but the same telephone circuit can, at the same time it is being used for telephone service, be divided into two, four, or even eight telegraph circuits, each of which can be used for the transmission of telegraph messages. While existing telephone toll and long-distance lines can be used for telegraph purposes, the existing telegraph lines can not be used for telephone toll and long-distance purposes until reconstructed and arranged as described above.



WIRING FOR MULTIPLE TELEGRAPHY.

Use and Care of Mine-Rescue Apparatus

By James W. Paul

*Miners 22 to 45 years old, in good physical condition, who are temperate in their habits and naturally calm and deliberate are best suited for mine-rescue work. Before a man undergoes training in the use of breathing apparatus he should be examined by a physician to ascertain his physical condition, especially the action of his heart and lungs, and any defects of the nose or throat. Unless a man has a physician's certificate stating that his physical condition is good, he should not be permitted to take rescue training, nor to attempt rescue work in a mine.

A rescue party should have not less than five, and better not less than six members. Only such persons should be allowed to join the party as have already been trained in the use of the apparatus and are equipped with rescue apparatus in good order and have agreed to follow the directions of the leader, who must have full charge. While working in unbreathable gases within a mine the men should keep close to one another, and not separate under any condition. To be efficient and successful a party must take every precaution for its own safety. If one person in a party faints or receives an injury he becomes a burden instead of a help, for the entire party must at once conduct him to the surface or to fresh air. One or two stretchers should always be at hand.

A relief station, or base of operations, should be established at the end of the good air, and a relief crew with knapsacks should be stationed there ready to put on their apparatus and start at a moment's notice. A patrol of all brattice and doors leading up to the relief station should be maintained to protect the relief crew from harm. At each large mine there should be at least four crews, two outside and two inside crews, each of six men, including a captain and a lieutenant, and these crews should have practice once a week. While working in dense smoke the members of a crew should hold a rope which leads to fresh air. In case of total failure of an apparatus to supply breathable air, the wearer of the apparatus can throw away all the parts but the oxygen cylinder, and breathe from the cylinder through his mouth while endeavoring to reach fresh air with the rest of the crew. Apparatus for giving oxygen to one who has been overcome with gases is an essential part of the equipment of a rescue party. A telephone helmet is a convenience for shaft work, and its presence lends much confidence to a rescue party. Electric lamps, safty lamps, gas-analysis apparatus, thermometers, a pocket compass, and a map of the mine are necessary parts of the equipment. At each training station a record should be kept showing the work done by the men and the difficulties encountered. A record of each apparatus should be kept also. If an apparatus fails to give proper service it should be subjected to the regular tests, unless some injury is seen by inspection.

The United States Bureau of Mines has established a regular course of training in the use of mine-rescue breathing apparatus. This training is designed to give miners or other persons connected with mining a knowledge of breathing apparatus in general, and a confident familiarity with those types of apparatus that are most apt to be used in this country. The purpose of the Bureau of Mines in establishing this system of training is to facilitate investigation work within mines in which disasters have occurred, and to make mine-owners and miners acquainted with the value of breathing apparatus for rescue operations after mine disasters. It is hoped that, as a result of this work by the Federal Government in the near future, men familiar with such apparatus will be scattered throughout the coal-mining centres of the country, and be available on short notice to assist in rescue operations. After a disaster, valuable time is often lost in training men at the mine before rescue parties can be organized. Furthermore, a man can not work efficiently unless he has thorough confidence in the apparatus. To give a man this confidence, the course of training has been planned in such a way that he must do work in poisonous or unbreathable gases for periods of one and two hours at a time.

Copper Producers' Association Report

The Copper Producers' Association reports stocks on August 1 as 137,738,858 lb., a decrease of 19,695,306 lb., as compared with 157,434,164 lb. on July 1. The domestic deliveries in July were 56,982,582 lb., compared with 61,655,561 lb. for the previous month and 56,708,175 lb. last year. Exports, 74,880,658 lb., compared with 71,460,519 and 59,407,167 lb. Total consumption, 131,863,240 lb., compared with 133,116,080 and 116,115,342 lb. The total production in July was 112,167,934 lb., compared with 124,554,312 lb. in June and 118,370,003 lb. last year.

The Grand Trunk Pacific is spending $17,000,000 this year in constructing some thousand miles of new track. It is stated that 10,000 men and 4000 teams have been engaged. There is keen competition between the Grand Trunk Pacific and the Canadian Northern as to which will first reach the Pacific coast. Up to the present the grade on the main line has been carried almost to Tete Jaune Cache, a point about 1100 miles west of Winnipeg, while steel has actually been laid as far as Fiddle creek, about 80 miles east of Tete Jaune Cache.

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*Abstract from Mines Circular No. 4, Bureau of Mines.

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

The Liberty Bell Mill

The Editor:

Sir—With reference to the description of the Liberty Bell mill, appearing in your issue of June 24, certain statements have received wrong interpretation, so wrong, as to demand correction and explanation.

In saying that the apparent loss was 2.5c. per ton of dry ore, I referred to dissolved metals only, and had no thought that this would be taken as applying to the undissolved value in the ore. In the text reference is made to page 742 where a table showing the tailing value is given, and, had this been referred to, there would have been no ambiguity.

In the tabulation of mill costs the word 'Supplies' was omitted in the lower part. This has led to wrong statements as to the costs of a certain step in the process.

CHARLES A. CHASE.

Telluride, Colorado, July 26.

Overvaluation of Prospects

The Editor:

Sir:—It would seem clearly apparent that generalization as to what is truly a mine and what only a prospect can be of little value to anyone. Usage creates and tends to conserve the words of a language, and their meaning and application, and is apt to make 'mine' mean 'Mine', regardless of attempts at restriction. It may, perhaps, be safely stated that the complained-of confusion in the public mind as to mines and prospects and their valuation, results quite as much from noted mines suddenly becoming scarcely prospects, as from the oft-happening raw prospect suddenly becoming, at the grass roots, so to speak, the million-dollar mine. Certainly, in any attempt at rules for the classification and differentiation, there must always be taken into consideration the elements of time, place, occurrence, and *metallurgical environment*.

The old concept associated with the meaning of mine—of working or producing—will probably survive, regardless of attempts at technical limitation; at the same time any effort to classify investors into classes differently possessed of the common human attributes will probably fail. That the big investors of London and the money centres are just as much afflicted with the human trait of speculative hope as are the much-berated owners of prospects, is abundantly demonstrated; nor is this changed by the many negative blunders made by their highly paid experts in missing mines, to their regret.

A 'Goat Ranch' prospect, of black-looking limestone, known for years to carry some little gold along with some manganese and iron, suddenly becomes a quarry mine without either shaft or drift and produces a fortune because the new smelter pays the cost for mining and transportation for the flux, and returns as profit the low silver and gold content otherwise valueless. In plain sight on another mountain, a fortune is paid by a foreign syndicate for a property, after the most extensive expert examination of measured ore according to the rules, and after a few months' extraction the property becomes, due to an unforeseen condition, in exactly the same 'prospect' state of hunting the ore, by miles of drifts, as the adjoining property that has as yet never shipped. How would the 100-ft. depth rule work, where the contact body between the lime above and the andesite below goes up and not down? At Joplin, or in the porphyry coppers, a few drill-holes means a mine in the commercial sense of the word, without the three-sided ore. In Santa Eulalia, near the productive mines, fortunes are paid for ground with but scarcely a sign on the surface, although it may mean another fortune to prove the ore. Such prospective property, regardless of rules, is much sought after by syndicates of wealthy and world-wide experienced owners, and their engineers, and the failures seem not to deter the speculative hope created by the plums.

As it is stated that at least 80% of the big mines of the world have produced 'from the grass roots', prospects of this type may be considered as at least not unworthy of examination, especially if in proved districts. The price placed upon prospects that express either the capitalization of the owner's hopes or his overconfidence in his superior and exclusive prophetic vision, are certainly human traities that are apt to beset all alike, and one can easily allow for and excuse this, especially in the ones that have nursed the fever for years. Against this common overvaluation of prospects, let us set the wide literature of the London millionaire's years of dividends against the locator's years of search rewarded only by his 'mess of pottage'. Again, no doubt, market overvaluation of stocked mines helps as much as anything the exaggerated ideas on the part of the owner of prospects. Whether mine or prospect, one, two, or three-sided ore, or no ore exposed at all, the time, place, occurrence, and metallurgical environment are necessary determining factors of valuation.

Chihuahua, Mexico, July 27. L. L.

Dredging Costs and Methods

The Editor:

Sir—In reply to your correspondent who is interested in dredging costs and methods, I can give a brief description of the harbor work in the Key Route basin now being done for the city of Oakland.

The project involves the construction of a water-front street along the line of the levee now being built, and the reclaiming of the area on the landward side of the street by filling with spoil from the dredging required in order to deepen the harbor and its approach. The dredging of the harbor is to be done by suction dredges, as stated by your correspondent, and a levee was required to prevent the spoil of the suction dredge running back into the harbor. In firm material and still water such a levee could be, and often is, built by a clam-shell dredge; but with soft material on the site, and the strong tidal currents existent, this simple plan was impracticable. Therefore the city is forming and protecting the water face of the levee by a wall of loose rock, behind which the mud is placed. The rock of this wall has been criticized as being too small, and undoubtedly larger pieces would make a more stable wall. But as this wall will never be exposed to wave-action of any serious violence, and as it must retain a fill which is in part nearly liquid, the material used is efficient and cheap, if not ornamental. The rock wall is built under city supervision, and the contractor paid by the ton of rock placed.

A separate contract was let for the building of the earth levee, the contractor to use any method he chose, subject to the approval of the City Engineer. Material was to be taken from the harbor, leaving a berm on the waterside of the levee, and the amount of work done by the contractor ascertained by measurement of the excavation made. This is a common method in civil engineering work, and the only feasible one in the present case. Counting the number of buckets of material handled would result in a very rough approximation of the amount, as they are sometimes piled to nearly twice their level-full capacity, and in hard material may not be more than a quarter full. The temptation to use partly filled buckets is obvious. Measurement of the levee is impracticable, because it is too soft to walk on, and it is easier to cross-section the excavation than to wait for tides high enough to get a decent cross-section of the levee by sounding. The excavation of material for the levee naturally results in a channel parallel to it, and the city has just so much of its harbor work done. Cross-sections are taken every 50 ft., as close in front and behind the dredge as possible, so that the contractor may not suffer from short measurement, owing to the inevitable rising of the bottom adjacent to the levee, as its weight increases. This rising of the bottom adjacent to a fill is a familiar phenomenon, and will continue until the material under the levee is firmly compacted. The rate of rising is already decreasing, as shown by the cross-sections taken.

The question of costs is too complicated to be dealt with in a letter, and "a little knowledge is a dangerous thing." It is obvious that the character of material to be handled and the length of haul or discharge are two of the principal factors influencing cost; in the case of a suction dredge the height of discharge also affects the power required. The fixed charges of moving plant, etc., raise the unit cost in small jobs. Impounding levees for the spoil forms another variable item. The weather and water conditions affect the cost largely—in some localities it is impossible to count on more than fifteen days a month. The only way to get an approximate idea of the cost of any particular work is to have an estimate made by an experienced dredge-man or engineer.

Dredges similar to those commonly used for gold dredging are sometimes used in harbor work; they are called 'ladder dredges' in civil engineering works. They are more common in English and European practice than in American. So far as I have been able to discover, no tests for gold have ever been made in the Key Route basin, or near by. M. H. P.

Oakland, August 2.

Mine Valuation

The Editor:

Sir—Many phases of this important subject have been lately discussed in the *Mining and Scientific Press* by able writers, so that perchance but little can be added, except in so far as a few instances of personal experience may be of interest to those who specialize in this branch of the mining business. One engineer asserts that sampling is a purely mechanical performance, calling for but little experience; but the interpretation of the sampling results, he says, calls for a large fund of experience. This does not look rational to me. Should the sampling be faulty, due to inexperience, the sampling results will be equally so, and so, quite naturally, will be the final interpretation by the man of experience. I venture to say that no results can be depended upon as absolutely reliable unless the sampling was performed under the personal supervision of men of experience.

In estimating the ore in a mine, the term 'ore in sight' or 'positive ore' is sometimes used rather loosely. Taken literally a block of ore exposed on three or more sides is not ore in sight, as meaning the whole volume of ore in the block, because only a very small percentage of this is under actual observation. In most mines high-grade patches and low-grade spots alternate with barren zones of irregular dimensions within the ore-shoot. Fortunately nature has left certain indications in the exposed parts of the mines where these conditions obtain, which can be interpreted by the experienced valuator. To give an illustration, I once sampled a mine in the Bendigo district, Australia, in which the vein occurred as a blanket or saddle outcropping entirely around a low hill. The mine had been extensively worked, but was idle at the time. I found a block of ore estimated at 30,000 tons exposed on four sides by drifts, while the stoped-out area entirely surrounded this block. The vein, after being sampled in 3-ft. cross-sections, was found to be of a profitable grade. Not being satisfied, I started an intermediate drift into the orebody, and after advancing 20 ft. through pay-ore, found the vein barren, though as strong as ever. This was repeated on the other three sides, with the result that the whole of the interior, with the exception of an exterior shell of pay-ore about 30 ft. in width, consisted of barren quartz. Instances of this kind are by no means rare, but can usually be guarded against by careful and accurate observation.

In the sampling of precious metal mines where a large percentage of the metal is in the native state, which generally presupposes a patchy character, hand sampling will, as a rule, give negative results. An ore dump, if measured relative to the amount of vein matter extracted from the workings, will give far more reliable data, as in this case the dump material can be worked down in large quantities. Mill tests on a large scale cannot always be had, but where such tests can be secured even on small representative parcels, the results will be more accurate than those that can be got from hand sampling. A prominent gold mine in Colorado gave subnormal results when sampled in 3-ft. cross-sections on blocks exposed 50 ft. square, according to T. A. Rickard. At the Bunker Hill & Sullivan mine I was told that systematic hand sampling, long since discontinued, gave negative results in proportion to the area stoped.

Some time ago I sampled a gold property where 80% of the metal is free and the gangue is ideal for cutting grooves, that is, neither too hard nor too soft. Results from hand sampling were extremely low compared to the value of the dump. A small mill in the vicinity happening to be idle, sampling began in earnest. Drifts and raises were driven through the blocks and all of the ore milled, with results more than satisfactory and closely tallying with the assays on the dump. The unaccounted difference between sampling and mill results might possibly be accounted for in a few instances. In one of the largest camps on the Mother Lode I have only recently observed men rocking the tailing on the creek bank below the mills. On panning the sand my wonder turned to surprise. In Mysore, India, 12 years ago, the sand below the mills also had an unaccountably high content. No doubt in many large low-grade mines it is good practice to consider the tonnage crushed at the expense of a percentage of the metal content. Whether sampling for the purchaser or the vendor, the valuer should in no wise be influenced by personal considerations; to introduce one factor of safety in the first case and use a different one in the second can hardly be conducive to an unbiased judgment.

R. L. Mann.

Cazadero, California, August 4.

Oxy-Acetylene Welding

The wide possibilities of use in connection with field repairs at mines lends especial interest to the description below of tests of the oxy-acetylene welding process.

A demonstration of the oxy-acetylene blowpipe was given at the Sydney Technical College recently by George Kennedy, formerly leading blowpipe operator with the British Oxygen Co., Ltd., of London. A number of representative engineers being present, several welds were successfully made, and afterward stood all tests to which they were subjected. The cutting powers of the blowpipe were also conclusively demonstrated.

One of the principal advantages of the blowpipe system of joining metals by simple fusion is that as the heat can be locally applied, the parts of complicated structures can be fitted together and welded in position. In many cases electric welding has hitherto been the only possible substitute for mechanical joints, the blowpipe can be more profitably employed, and in a large variety of work the blowpipe can be used where electric welding is impracticable.

Autogenous welds can be effected by means of the oxy-acetylene blowpipe without any deleterious effects upon the metal. The heat, in addition to being greater than that obtainable from any other blowpipe system, is also more concentrated, the temperature of the flame in a good oxy-acetylene blowpipe being approximately 6000° Fahrenheit.

During the last few years oxygen has come prominently into use for the purpose of cutting wrought iron and steel plates and structures of all sorts. The process is based on the well known fact that a jet of oxygen directed upon a previously heated spot on metal ignites it, with the result that the metal, acting as its own fuel, burns away rapidly in the form of oxide of iron.—*The Mining and Engineering Review.*

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

A GOOD FILLER for woodwork is composed of corn starch, $^1/_2$ lb.; fine pumice-stone dust, $^1/_2$ lb.; white polish or liquid shellac, $^1/_4$ gill, boiled oil, $^1/_4$ pint. Thin for use with turpentine.

A GENERAL RULE for the diameter of the base of a brick chimney standing free is that the side of a square chimney or the diameter of a round one should be one-tenth of the height.

SALT is obtained from three principal sources: (1) from rock salt, in which case it is mined, and crushed; (2) from brines pumped from wells; (3) from the evaporation of sea-water. The salt supply of Utah and the adjoining States is obtained by evaporating the waters of Salt Lake.

BROMINE and bromine salts are produced as a by-product of salt manufacture in the United States, the Michigan wells being the most notable producers. Although only a small quantity of bromine salts can be obtained per ton of salt, the difference in the consumption is so great that the supply of bromine and its salts is ample to meet the demand. If the demand were greater the selling price would probably be lower.

A STRAP WRENCH suitable for unscrewing lubricator bodies, glass oil-cups, and other polished articles, can be made from a piece of hardwood one inch square and a foot or more long, a metal dog, and a piece of sheet brass, which acts as a bearing for the dog and as a clamp to hold the strap against the wood. To use the device, pass the strap around the object to be turned and pull the end through the dog as far as it will go, then turn.

AN ACT of 1907 (35 Stat. L. 1243) provides "that during each year and until patent has been issued therefor, at least one hundred dollars' worth of labor shall be performed or improvements made on, or for the benefit or development of, in accordance with existing law, each mining claim in the district of Alaska heretofore or hereafter located." There is no warrant for the belief that six claims can be held by the performance of $100 worth of work yearly.

HIGH-CARBON STEEL should not be used for reinforcing concrete, as from its greater brittleness it is liable to sudden failure under stress, and is frequently found to be cracked or broken when sent to the work, making careful inspection necessary to prevent bad material getting into the structure. High-carbon steel is supposed to permit much higher working stresses, but much of the material sold as such, when tested, will not come up to specification.

BUILDING STONES have to meet various requirements; for example, such a stone should be durable, of pleasing appearance, comparatively easily cut, cheap, and available in large amounts of uniform quality. It might be expected that a stone which could be easily cut would not be durable, but fortunately many building stones have 'quarry sap' in them; that is, they are easily cut when first quarried, but on standing and drying out become much harder.

AN OIL-CUP attached to a lathe centre will prove a great convenience and will prevent the centre becoming hot. A $^1/_{16}$-in. hole is drilled in the point of the centre and carried back about 1¼ in., or far enough to meet the vertical hole, which is tapped to receive the oil-cup. It is obvious that the point of the centre will have to be removed before drilling the $^1/_{16}$-in. hole, but this will not decrease the bearing surface of the centre, as the extreme point never touches the work if the centre hole has been properly made.

A VERY useful spacing instrument is made from an ordinary thread gauge with the teeth blackened by rubbing over a lead pencil. By moving the blade sidewise about $^1/_{16}$ in. a fine hair line is made by each tooth, thus dividing the line into equal parts, which may be made fine or coarse by using different blades of the thread gauge. If the teeth are rubbed on a pencil each time after being applied to the paper, the resulting divisions will be very distinct. Every draughtsman who has frequent occasion to draw threads or other work requiring spacing, would find the purchase of a thread-gauge a good investment.

ORES may be smelted in reverberatory-furnaces fired by gas, but under ordinary conditions it is not practicable to do so. Gas furnaces, to derive the full benefit of gas firing, must be regenerative, which is equivalent to saying that they must be large and of expensive construction. Such furnaces are widely used in the manufacture of open-hearth steel, and the tendency toward their application in reverberatory copper-smelting is shown by the growing use of oil and coal-dust fired furnaces for that purpose. It is not unlikely that the small-sized gas producer may soon be successfully applied, in which case the use of gas for reverberatory smelting is likely to become widespread.

PATENT OFFICE drawings differ in many ways from an ordinary working drawing, and before attempting to prepare them, the draughtsman should study the 'Rules of Practice', of which a copy can be obtained on application to the Commissioner of the Patent Office. Among the peculiar features of patent drawings are the non-use of centre lines, the absence of scale in the ordinary sense, and the incorrect way of drawing certain parts. Two points which should be kept in mind are: (1) that the drawings are intended for the use of persons who are not accustomed to reading workings, and (2) that poorly prepared drawings may be the cause of losing a patent suit.

METHODS of mine and smelter bookkeeping are as varied as the methods followed in mining work, and it is impossible to settle on any one system as the best, except for a given set of conditions. When the scale of operations is small, all the records can be easily kept in a few books. Where operations are extensive it often happens that a large force is engaged in keeping a large number of books, without making much information available, simply because the information needed is not readily obtained from the records. An accountant who has had experience in mining work is more competent than an engineer to decide upon the necessary system. A large part of the difficulty experienced is often due to the fact that the system adopted at the beginning when the scale of work was small, proves inadequate in later years, and the introduction of an entirely new system is attended with difficulty.

IN leaching ores with cyanide solution, the solution may either be allowed to flow from the top downward, or forced to flow from the bottom upward, overflowing at the top of the vat. Any ordinary force-pump will serve to force the leaching solution into the space beneath the filter-bottom of the leaching vat, whence it passes upward through the ore. In either case care must be taken to get an even distribution of the ore in the leaching-vat, otherwise channels will be formed, and the leaching will be imperfect. Channeling may be more easily avoided when downward leaching is used, as the solution automatically finds its way by gravity through the ore at the proper rate. Where pumping is employed the solution may be forced in faster than it can pass, and the excessive pressure will cause channels to form. It is believed in some quarters that the use of upward leaching gives a more thorough contact of solution and ore, but this is a matter of opinion.

Special Correspondence

BUTTE, MONTANA

Increasing Use of Electric Power.—New Mill for Butte & Superior.—George Mine Scandal.—Prospects for Copper.—Work of Smelter Fume Commission.

The Anaconda Copper Mining Co., owner of the Butte, Anaconda & Pacific railway, has decided to electrify that road, which, with main line and main spurs is about 80 miles long. The plans have been approved and the change will call for an expenditure of about $1,000,000. The work of installing an electric haulage system in the mines of the Anaconda company is also progressing, and electricity is being put in all the properties, gradually taking the place of steam everywhere. The compressed-air hoisting plants at the Mountain View and Diamond mines are in operation and the new system is being installed at the High Ore mine. Nearly two months was consumed in making the change at the Diamond. It is also announced that the Chicago, Milwaukee & Puget Sound railway, from eastern Montana to the Pacific Coast, will be operated by electricity, and the railroad company has for some time been negotiating for electric power. It is likely that the Amalgamated Copper interests, which own the big power plant at Great Falls, will supply the Milwaukee with electric power, although they have not yet been able to agree on rates. The Milwaukee also contemplates making electric lines of several proposed branch lines in Montana.

It is announced as official that the Butte & Superior Copper Co. will build a concentrator of its own near the Black Rock mine, although it is yet uncertain when work will be started. The company has for several months been experimenting with flotation methods of concentration, known as the 'gas bubble' method, at the Basin concentrator, and it is announced that the system works well on Butte & Superior ore, the claim being that it saves 90% of the valuable minerals in the ore, against a saving of only 65%, and consequently a net loss in operation, under the old system. The initial capacity of the new concentrator is to be 500 tons per day. D. C. Jackling has passed on the new concentration and says it is successful. However, there have been so many and repeated claims in behalf of Butte & Superior in the past that did not 'pan out' that everybody in Butte is a Thomas and registers from Missouri when anything is given out about Butte & Superior.

The George mine, near Anaconda, which was reputed to have fabulous wealth in silver, has been closed and the plant dismantled by the men who had a lease and bond on it. Apparently there is a remarkable case of 'salting' or jobbery in connection with the George, and a great scandal in connection with one of the big smelters is being hushed. When the men who took the bond on the George were negotiating for the property they were furnished with smelter figures showing very high returns, but the best ore they have been able to find in the property since has netted about $4 per ton, which did not pay operating costs. The men who held the bond paid only $25,000 on it, however. They sold considerable stock in a company they had organized in anticipation of the big mine they expected to develop. Ex-Mayor Nevin, Pat Wall, formerly of the East Butte, and several other Butte men are among those who have lost money in the deal.

Before leaving for the East, J. D. Ryan, president of the Amalgamated company, reiterated his faith in the future of the copper industry. With the rapidly improving domestic demand the copper situation of the near future looks very good indeed. L. D. Ricketts, general manager for the Greene-Cananea Copper Co., and J. A. Holmes, Director of the Bureau of Mines, have completed their investigations of smelting conditions at Anaconda, and J. H. Hammond, the chairman of the commission, will make an independent inspection during August. The three men will then formulate a report and may be able to make suggestions that will result in improving the situation, although the Anaconda company has done everything possible to lessen the damage from the smelter fume.

JOPLIN, MISSOURI

Mining Beneath the Bedrock. — Noticeable Discrepancy in Prices of Spelter and Blende.

Numerous rich finds of zincblende in the Thoms Station district, north of Joplin, have done much toward exploding the theory that the pay-dirt of the district is underlain by a bedrock of limestone, beneath which it is useless to prospect. Because of this antiquated theory, Thoms Station, which is now producing more than half a million pounds of zincblende each week, remained dormant for years, after an early boom when rich ores were found near the surface and above the bedrock. Crossman, O'Donnell, and others have taken a lease on land in this area, and in the first drill-hole, sunk within 20 ft. of an abandoned shaft, ore was found at 110 ft. and continued for about 12 ft. A deeper and equally rich run also was found. In other drill-holes the formation was consistently blocked out. Had the pioneer prospector pushed his shaft 20 or 30 ft. deeper, he would have found the bonanza. Throughout the entire Thoms Station district, in which scores of shafts are being sunk, and in which dozens of drill rigs are at work, evidence is found on every hand of suspended operations after the 'grass-root' deposits had been gouged out. The 'bedrock' of the early days, which first was found at 30 ft., then at 50, then at 75, and finally at 100, has ceased to terrify, and the fact is becoming generally recognized that the chances for finding pay-dirt beneath limestone bars are as good as they are in open ground.

Under ordinary conditions the price of spelter at East St. Louis has had some effect on the price of blende, but conditions at present are extraordinary. An 8 to 1 ratio has been considered as fair. That is, when East St. Louis spelter is quoted at $5.65, the present quotation per 100 lb., blende per ton should be eight times as much, or $45.20 per ton, on the assay basis of 60% metallic zinc. Instead of this, the price is now $38 to $42.50 per ton, and little is sold at the latter figure. At times the ratio has been much higher than 8 to 1; at times it has been slightly below this, but conditions have never been so unfavorable from the ore producer's standpoint as now. The average ratio for 12 years has been greater than 8 to 1; 8.13 to 1. At this ratio, blende should now be bringing $45.935, assay basis of 60% metallic zinc, while high-grade lots should be commanding $49. Contrary to precedent, high-grade lots are now in lightest demand, and producers of this class of ore, who customarily find it an easy matter to dispose of their output, are surprised to find offerings few. Absence of co-operation among the producers is one cause for the smelters' advantage. The surplus supply of blende in the district is about 6500 tons, of calamine 700 tons, of lead 800 to 1000 tons, widely scattered.

Tebbets & Co., operating on the Brinkerhoff land, north of Joplin, have sunk nine drill-holes and claim that blanket ore has been found. A shaft has been put down on the main lease, and several sub-lessees are at work. A concentrating-plant is to be erected. The extreme depth of the ore, as indicated in drilling, is 206 ft. The first 'shines' were found at a depth of 90 ft. These operations are in virgin territory, some distance from the nearest producers in Thoms Station. To the north of the Tebbets lease, the Kansas City Southern railway, in blasting a 30-ft. cut in a hillside, found a rich pocket of galena, from which turn-ins have been made. The pocket was soon exhausted, but the find drew a great many operators to adjoining tracts, and any number of gouges are now being sunk for shallow lead deposits. Several have already discovered rich 'chunk' lead, and the ore is being cleaned on hand-jigs. That operators are returning more and more to the soft ground mining is indicated by the remarkable growth of the Joplin camp, in which virtually all of the ore produced comes from open formations. A corresponding decrease is noted in the Webb City-Carterville camp, where virtually all of the mining is in deep 'sheet' ground, where the ore deposits are extensive, although the [illegible] and [illegible] is small, barely 2 or 3% as a rule. [illegible] or 6 [illegible] Joplin, for many years, produced [illegible] of the blende of the entire district. It is now producing [illegible] than 40%, and this in face of the fact that the aggregate production of the entire district is increasing.

Barry county, some distance removed from the zinc and lead mines of the district, is to be the scene of extensive development, the Springfield [illegible] Mining & Milling Co. having filed articles of association at Springfield, Mo. The capital stock is $200,000. The company owns large tracts in Barry county. Prospecting is to be begun immediately. At the Mosley mines, in Newton county, where lead was mined by the Confederates during the Civil War, a 100-ton concentrating plant, one of the finest in the district, is being erected. The company has developed a deep run of zinc ore in drill-holes. Virtually all of the shallow lead was mined out years ago, although occasional pockets are still found.

Rigid mine inspection in Missouri is resulting in decreased catastrophes. A striking contrast is noted between the mines of Missouri, in which State the inspection is thorough, and in Kansas, where little or no effort is made to enforce the mining laws in the metal-mining districts. Twelve big producing mines of the Joplin district are now closed down, by order of the inspector. Various reasons are given for shutting down the plants. The most common reason is that only one shaft is used, while a recent law requires all operators to have two shafts, and these must be connected with drifts. Improper cutting of ground, and removal of pillars also result in speedy action on the part of the inspector.

UTAH COPPER MAGNA MILL, GARFIELD.

SALT LAKE, UTAH

Utah Copper Report Revives Mill Controversy.—Nevada Con. Shows Decrease.—Montana-Bingham Makes New Arrangement with Bingham Amalgamated.

A notable statement in the quarterly report of the Utah Copper Co. is that the stamp-mill sections of the Arthur mill have been permanently closed. This statement comes almost simultaneously with the death of A. J. Bettles, who designed the Boston Consolidated mill (now Arthur plant of the Utah Copper). Before the Utah Copper acquired the Boston, millmen familiar with both plants declared that the use of stamp-mills—an innovation of Mr. Bettles for crushing this kind of ore—had been demonstrated to be far superior to the other system, and that a better saving was being made at a lower cost in the Boston Con. The controversy over this point has been prolonged, and the Utah Copper officials have taken occasion at various times in their official and other reports since the consolidation, to proclaim that the Magna (old Utah Copper) mill was producing better results than the other, and to defend the original mill policy of the Utah Copper management. While the present management presents many figures in support of its contentions, there are high-class millmen who still believe that the Bettles system of crushing the porphyry ore by stamps is the proper method. On the other hand, this is what C. M. MacNeill, president, and D. C. Jackling, general manager for the company, have to say officially on the subject: "The Magna plant was operated for the entire quarter. The Arthur plant was not operated to full capacity, but only to such an extent as necessary to take care of the excess of ore production above the capacity of the Magna plant. The remodeling of the fourth section of the Arthur plant was completed by the end of the quarter, and as the operation of the remodeled sections shows that the capacity of the four now in commission is about the same as the original thirteen sections of that plant, the stamp-mill sections have been permanently closed down. Other sections of the Arthur mill will be remodeled to keep pace with ore production."

Nevada Con. shows a decrease in production and earnings for the quarter ended June 30. Production was 15,677,065 lb., as compared with 18,173,676 lb. for the quarter previous. The ore averaged only 1.59% copper, which is the lowest since the operations began.

The tunnel of the Utah Metal M. Co., which is to connect underground Bingham with the International Smelting Co.'s plant at Tooele, is now about half completed. The tunnel will be about 10,000 ft. long, and it is expected that it will be finished within another year. The work is going ahead from the Tooele side of the range at the rate of about 300 ft. per month. Preparations are being made to start work from the Bingham side, the mouth of the tunnel to be near the Highland Boy mine of the Utah Con. When completed, the tunnel will tap a number of orebodies and will furnish a direct route for the transportation of ores from the camp to the smelter. The cars will be run by electricity, the power being furnished in part, at least, by the flow of water from the bore. This flow is steadily increasing.

An arrangement has been made between the Bingham Amalgamated and the Montana-Bingham whereby the latter will extend for about 4000 ft. into the latter's ground, taking its pay in treasury stock. The tunnel will be continued on through to some ground of the Montana-Bingham which cannot well be reached in any other way. The Alta Con. Co. has been formed by Tony Jacobson and associates to open a group of 11 claims between the City Rocks and the old Emma. A force of men has been put at work. The first act of the new directors of the Columbus Extension was to levy an assessment of 5c. per share, or $15,000. Part will go for debts and part for development. Tintic people are making some comparisons of Cobalt shipments with the regular output of this old camp. Shipments from Cobalt for the week ended July 21 were 15 cars, of which 12 were high grade. Tintic shipments for the week ended August 4 (about the average) were 157 cars, and it cannot be said this was all low-grade ore. Four mines—Centennial Eureka, 38 cars, Iron Blossom and Dragon, 24 each, and Grand Central, 14—each shipped more than the entire Cobalt district. The Chief Con., one of the new Tintic producers, is opening up encouragingly. It has shipped about $300,000 worth of ore, most of it from the 1400-ft. level, recent shipments averaging $50 per ton. The ore has been found in a raise from the 1600-ft. level.

A revival of interest in the Indian Queen property in Beaver county has been caused by the discovery recently made by lessees. They have taken out 750 sacks of high-grade, and are steadily opening up more ore. Favorable reports continue to come from the Harrington-Hickory mine of the Majestic company. The water is decreasing and the silver-lead ore in sight is increasing steadily.

The operations of the Sevier-Miller Mines Coalition Co. are giving encouragement to the believers in the Piute county gold veins. The property, formerly the Sevier Con., has gone through the hands of a receiver, and was acquired by the present owners about two years ago. They have been developing the ore, remodeling the mill, and installing a filter-press, making many other improvements, and will soon be ready to start up the 100-ton concentrating and cyanide mill.

KALGOORLIE, WESTERN AUSTRALIA

Progress Notes.—May Production.—Recent Accidents.—Ivanhoe Reserve.—Continuous Sluicing at the Oroya Brownhill.—Arsenical Concentrate at the Assciated Northern.

After eleven months dry weather all over the goldfields of this State, some very welcome rain has fallen, and the total to date is 3½ in. Such centres as Menzies, Norseman, Ora Banda, those out from Southern Cross, and up in the northwest, have been suffering for the want of rain for a good while, and many mines were shut down for the time. Now that the ponds are well filled, work is in full swing; and prospecting should be stimulated. Sulphide ore has been cut in the Gimlet South at Ora Banda, some forty miles from Kalgoorlie. The Associated Northern and Oroya Exploration companies have promising properties under option there. In appearance the sulphide resembles that of this centre, but not much has been opend up yet.

ASSOCIATED NORTHERN MINE.

The main shaft at the Lancefield is down 908 ft., and at the No. 7 level, the main drift is in 35 ft., with ore 90 in. assaying $6.96 per ton, while the south drift is in 29 ft., showing 70 in. worth $8.16 per ton. At the Youanme, worked by the Oroya Exploration Co., the lode at 300 ft. at various points is showing from 50 to 72 in., averaging $10 to $14 per ton. This is a good property and a 20-stamp battery is being erected. At Southern Cross, the Mountain Queen and Prince are showing well. At the former the mill is nearly completed. This consists of two Holman pneumatic stamps, and is the first instance of this type of mill in Western Australia. The East Pool & Agar mine in Cornwall has them at work, showing a marked increase in economy over the old Cornish battery it had working. If satisfactory at the Mountain Queen, the government may erect others at several small centres needing crushing facilities.

OROYA LINKS DUMP.

During May the gold yield from the State totaled $2,390,000, and $88,000 paid in dividends. Below are the yields from the chief producers.

Name.	Tonnage.	Yield.	Profit.	Dividend.
Associated	9,274	$68,900	$1,600	.....
Associated Northern..	2,034	20,800	.....	.....
Burbanks Main Lode..	1,640	26,000	.....	.....
Chaffers	3,435	24,200	590†	.....
Golden Ridge	2,781	32,500	13,000	.....
Golden Horse Shoe...	23,609	191,500	28,000	.....
Gt. B'ld'r Perseverence	19,952	127,400	17,400	.....
Gt. B'ld'r Proprietary.	17,890	240,400	122,200	.....
Great Fingall	10,555	82,400	15,100	.....
Hainault	4,839	30,400	160	.....
Ivanhoe	20,528	204,500	90,000	.....
Kalgurli	10,920	119,300	53,500	.....
Lake View Consols...	9,190*	9,200	3,000	.....
Lake View & Star...	13,416	82,700	8,900†	.....
Oroya Black Range...	4,250	42,500	11,100	.....
Oroya Exploration ...	21,192*	17,400	5,000	.....
Oroya Links	7,456	41,100	12,500†	.....
Sons of Gwalia	13,950	122,000	50,300	.....
Sons of Gwalia South.	2,515	18,100	4,500	.....
South Kalgurli	9,460	60,100	11,100	50,000

*From old residue. †Loss.

There have been a number of accidents of late on the mines. At the Sons of Gwalia a skip, loaded with 9 men, rushed away down the 2500-ft. incline to the bottom of the main shaft. Three were killed, but as the rope was attached and the brake hard down on the drum, the result was not as bad as it might have been. The drum being out of gear was the cause. In the Boulder, a man was practically engulfed in the collapse of some filling. Also, in the same mine, a trammer fell to the 1800-ft. from the 1300-ft. Two were killed in the Eclipse mine of the Oroya Links, in knocking down some dangerous-looking roof. In the Ivanhoe mill, a shift foreman was electrocuted by catching hold of an electric-light wire.

It may be remembered that the Western Australian Government demanded extra payment on dividend duties from the mines, amounting to some $200,000, including past years. The companies pay income tax out of another fund, the shareholder getting his full dividend; but the Government argued that it should be paid out of the dividend only. After argument in the Supreme and Full Courts in Perth, the test case against the Horse Shoe for $26,000 went to the Privy Council, which decided in favor of the company, remarking that the act was very vague.

The Ivanhoe management publishes its reserves at 980,046 tons worth $10.68 per ton, and the consulting engineers, Bewick, Moreing & Co., place them at 1,008,464 tons at $10.80, distributed as follows:

East Lode, 690,243 tons at $10.46 per ton; Middle Lode, 211,801 tons at $11.10; New Lode, 87,271 tons at $10.90, and Boulder Lode 25,220 tons at $10.22 per ton. The total value is $11,040,000, taking the lowest estimate.

The water used during the month by the Mines' Water Trust amounted to 36,516,000 gal., or 1,178,722 gal. daily. The use of wood pipe is extending, as water rapidly corrodes iron and steel pipe, especially when hot. The power company here has just laid down a 6-in. main, and in the alterations to the main conduit of the water scheme, large wood bends are being fitted in. In the May number of the *Chamber of Mines Journal*, B. L. Gardner has a paper on 'Slime Settlement', dealing with the rate of flow and settlement in spitzkasten, and a method of accelerating the settling as at the Sons of Gwalia. The heap of old residue on the Oroya Brownhill, some 500,000 tons, has been all re-treated in the vacuum-plant of the Oroya Exploration Co. The plant will now be used in treating the fresh slime from the Oroya Links mill, which consists of 50 stamps, pans, Wilfley tables, tube-mills, bromo-cyaniding the slime, and roasting the concentrate. This is the first instance on the 'Golden Mile' of treating the current mill-slime in a vacuum-plant continuously. A good wash is expected, probably better than from the old material.

A lot of 200 tons of arsenical concentrate, with a 21% As. from the Transvaal mine, near Southern Cross, is to be treated at the Associated Northern mill this week. The whole plant will work on this ore and good opportunities will be afforded of watching any ill effect on solutions.

NEW YORK

The Copper Situation.—Doubt as to Actual Consumption.—Futility of Curtailment.—Progress at the Boulder.—Production at the Ray Con.—Eastern Share Market.

The figures of the Copper Producers' Association covering July output are serving to direct some attention to the copper situation. There are some interesting analyses of the figures covering the first six months of the year, and some intersting comments concerning the improvement of which so much was made when June figures showed a small decrease in accumulated stocks. One London analyst, writing of the gratifying increase in export demand from America, says: "The natural satisfaction is chastened by doubts as to whether the whole of the increased exports can be on account of legitimate consumers. Monthly exports of 31,900 tons are so much in excess of last year's monthly average of 26,870 tons, and the shipments of late months have been so substantial that even when Europe's record consumption is taken into account, one cannot altogether avoid the suspicion that invisible stocks are being piled up somewhere on this side." Shipments for the month of July are expected to show exports of 36,000 tons, which will possibly show a decrease in surplus of between 10,000,000 and 15,000,000 lb. If indeed it is true that copper shipped abroad is not going to consumers, but into storage, it is simply an effort of the controlling factors of the copper market to lift themselves over the fence by their own boot-straps that cannot be seriously defended except as a measure of rather desperate necessity which is likely to prove a boomerang. While it may be said that this thought has not been absent on this side of the water, the desire for improvement has been so strong and so universal, that none has seen fit to give it voice.

In all of the crusading against the trusts, the assaults upon combinations, none of the defenders of the corporations has thought to point to the huge economic waste entailed in the present status of the copper producers. If it is to be admitted that there is a valid argument in favor of the Steel Trust, for instance, it is to be found in the plight of the present copper producers, who are powerless to conserve their resources or protect their market. The recent quarterly reports of the Utah Copper and the Nevada Consolidated demonstrate the futility of any attempts at curtailment. Utah's output for the half-year is 15,766,523 lb., as against 15,583,640 lb. for the latter half of 1910 and 13,645,871 lb. for the first half of 1910. Copper costs were 8.02c. for the quarter. Calumet & Arizona, is another producer that is keeping output up to full capacity. The output for July was 4,394,000 lb., as against 3,656,000 lb. in June and 4,929,000 in July. The new smelter planned for the Calumet & Arizona is to cost about $1,500,000, and is expected to reduce costs materially below the present figure of 8c. On the present output and at the prevailing price, Calumet & Arizona is earning its dividend of $4 per share.

Pope Yeatman has just returned from Chile, where he has been superintending the construction work on the Braden Copper property. The first unit of the concentrator is just going into commission, and the entire concentrating-plant will consist of three units each of 1000 tons capacity. The hydro-electric power-plant is all completed save final touches; transmission lines are up and generators in position. Mr. Yeatman says that the most important feature of the Fortuna mine is the fact that the orebodies are unquestionably of primary origin, and may consequently be expected to persist in depth.

Progress is being made on the Ray Consolidated plant. The fourth unit of the concentrator has just gone into commission. This additional capacity will put Ray Consolidated on a basis of 4,400,000 lb. output per month. When the eight sections of the concentrator are completed and running up to the full capacity hoped for of 1250 tons per unit per day, the copper output will be 100,000,000 lb. per annum. Butte & Superior shareholders have had a long, hard pull, and by far the greater part have either actual or paper losses piled up against the investment at the present time. However, there are said to be some early betterments contemplated. A new process is to be used at the Basin Reduction works, which is said to be effecting a saving of 90%, as against 68% saved heretofore. In addition, the company plans to erect a new concentrator of a capacity of 500 tons daily on its own property. The management has been in consultation with D. C. Jackling and C. M. MacNeill of the Utah Copper Co., regarding the equipment necessary to make the new plant as complete and perfect as possible.

While the Eastern financial centres are undoubtedly learning to study specific properties and are beginning to realize that "the tape does not always tell the whole story", still the interest centres in markets and quotations. The prevailing stagnation has been the chief subject of comment for some months. Markets have been held remarkably firm in the face of the dullness, but there are signs of a break at hand. The latter part of the current week saw some remarkable liquidation, both on the floor of the New York Stock Exchange and in the mining shares on the outside market. The Porcupine issues especially came in for some heavy selling, and it would appear that the forced realizations following the fire are just beginning really to come into the market. The strain of the situation is beginning to tell, nerves are beginning to jangle, and, as one member was heard to say recently: "If the turn does not come soon there will be some Stock Exchange seats for sale at reduced prices." Porcupine is rebuilding, and in most instances the equipment destroyed is being replaced by larger and better plants, but so far as market interest is concerned, it appears plainly now that any general interest or any boom is to be postponed for a year, until some of the properties now developing begin to produce and pay dividends. The Mexican situation, the disturbed conditions, the unrest, and the frequent outbreaks have definitely postponed any contemplated new developments in that country, and, very naturally, have also limited market activities to selling on the part of the frightened holders.

General Mining News

ALASKA

The high-grade coalfields and copper and gold deposits in the region tributary to the Pacific seaboard of Alaska, which are being tapped by railroads, are being energetically explored by parties of the Geological Survey. D. C. Witherspoon's party is making topographic surveys, and another under F. H. Moffitt, assisted by Theodore Chapin, is making geologic surveys and studying the mineral resources of the Hanagita valley and Bremner river basin in the Copper river region. J. W. Bagley has completed a topographic base-map of the Valdez inlet mining district, and after surveying the Moose Pass district will map the Sunrise placer region. R. H. Sargent, with a party of five, is mapping the western part of Kenai peninsula.

In all, 14 parties, including about 50 men, are mapping and studying Alaska. One party under P. S. Smith, geologist, and C. E. Griffith, topographer, is exploring unsurveyed and almost unknown land along the Noatak river, northwestern Alaska. It will go up Alatna river in canoes in the hope of finding at the head a pass to the head of the Noatak, so as to descend the latter to the Arctic ocean at Kotzebue sound. A. C. Maddren, working in conjunction with a party of the International Boundary Commission, is studying the geology and mineral resources of northeastern Alaska, north of Porcupine river. C. E. Ellsworth in the Fairbanks and Birch creek districts, and E. A. Porter in the Forty-Mile district are investigating water-supply for placer mining in the Yukon-Tanana region. L. M. Prindle and H. M. Eakin are leading parties in the same region for reconnaissance mapping and studying the mineral resources. G. C. Martin is studying the coal resources of Kenai peninsula and later will visit the Katalla oilfield. B. L. Johnson is studying the lode and placer deposits of the northern part of Kenai peninsula, where important developments have been made. The Yentna placer district is about 150 miles north of the head of Cook inlet. S. R. Capps is conducting a study of its geology and minerals.

MAP OF ALASKA.

A. H. Brooks, geologist in charge of the Alaska surveys and investigations, will sail from Seattle, August 15, for Prince William Sound. He will visit the lower Copper river region, the Valdez inlet mining district, and the Kenai peninsula.

Eleven men were caught in a cave-in in the Chitina tunnel of the Copper River & Northwestern railroad. W. A. O'Neil, foreman, and John Sethers were killed. A third is missing. The ten were promptly dug out.

JUNEAU

J. E. Clark has discovered a vein rich in free gold on the east fork of the Skagway river, near Whistler's gulch. A claim has been recorded.

THE TANANA

In the fiscal year commenced in July 1910, over 240 quartz claims have been recorded at Fairbanks, say Alaskan papers dated last June. The entire Fairbanks district and some adjoining territory are represented.

A 4-stamp mill of 25 tons capacity has been shipped to the Chandlar district for the company headed by S. J. Marsh, United States Commissioner in the Chandlar district. It is to be in operation by January 1. The company has 13,000 tons of $40 ore blocked out, according to press reports. The vein averages 6 ft. wide.

ARIZONA

GILA COUNTY

The Burch rolls, used in No. 4 unit of the Miami Copper Co.'s concentrator at Miami, have proved unsatisfactory for that kind of ore, and Chilean mills will be used in No. 5 and 6 units, which will be started as soon as possible. The Burch rolls in No. 4 will be retained for further experiments. Chilean mills are used in No. 1, 2, and 3 units. Before the end of the year, it is reported, the Miami mill should be running with all six units in operation. The capacity of the mill is to be 3000 tons per day. The concentrate is being shipped under contract to the Greene-Cananea smelter, and the product is again taken over the Mexican boundary to the Raritan refinery of the International Smelting & Refining Co. Sales, according to report, are being handled by the United Metals Co., a subsidiary of the Amalgamated Copper Co. Production has been under way only a short time, and only a small amount of copper has reached the market.

The Black Warrior Development Co., promoted by Smith & Hovland, has shut down the Warrior mine. It is rumored that the mine will be abandoned and will revert to its former owners. Reports state that its production was sufficient to more than pay expenses during the two years ownership by the present company.

GREENLEE COUNTY

At the Twin Peaks mine a rich vein of sulphides has been found at the 100-ft. level.

MARICOPA COUNTY

The Big Blue M. Co. will start active development work early this fall. A Bryant mill with tables, and a pump for unwatering have been ordered. J. A. Caskey is superintendent for the company.

YAVAPAI COUNTY

Eastern capitalists, headed by W. E. Sharps, of Philadelphia, have acquired the Yarnell gold mine, six miles from Congress Junction. Press reports state that over 200,000 tons of $6 ore is blocked out. A 100-stamp mill is to be built and a cyanide plant will be added later. The ore is a white quartz. The mine is five miles from the old Congress mine.

CALIFORNIA

AMADOR COUNTY

(Special Correspondence.)—It is reported that the July clean-up of the Kennedy mine amounted to $100,000. The increase was due to the milling of the rich ore deposit recently opened on the 2800-ft. level. One hundred stamps are constantly in action. At the Bunker Hill during the past six months the ore treated averaged slightly less than $5 per ton, as special attention was paid to milling low-grade quartz. The company continued to disburse its regular monthly dividends of 5c. per share, and it is possible that this rate will be increased before the close of 1911. On the 1950-ft. level the vein is reported 90 ft. wide in places.

Arrangements for the vigorous operation of the Valparaiso are under way. The new 500-hp. electric hoist has been placed in position at the Argonaut, and operation at full capacity is about to be resumed. A rumor is in circulation that the celebrated Eureka mine, owned by Mrs. Hetty Green, has passed into the hands of a strong company. The Eureka was formerly the premier producer of the Mother Lode.

Jackson, August 4.

BUTTE COUNTY

(Special Correspondence.)—Lava Beds dredge No. 3 of the Oro Water, Light & Power Co. was put out of commission while working near Oroville, August 6, by a strange accident. The [illegible] point of a [illegible] caused by pinching [illegible] down on the dredge when the [illegible] gave way and [illegible] the working [illegible] back [illegible] the end of the dredge. The machinery was not injured. The dredge, which has been [illegible] to have been [illegible], in any case.

Oroville, August 8.

Nevada County

(Special Correspondence.)—The Gaston Mining Co. has been crippled temporarily during the repair of the flume and ditch of the Northern Water & Power Co. The heavy snows and slides of last winter damaged the flume to the extent that an order was placed with the Gaston sawmill for 80,000 ft. of lumber, which is now being cut. The mine is running with a slightly reduced force, and the 40-stamp mill is dropping 30 stamps. It is expected that both the mine and mill will be shut down for about two weeks while the flume is out. About 75 men are employed at the property, which is one of the largest in northern California. Claude Ferguson is superintendent.

Gaston, August 1.

Shasta County

The Monarch mine, on the west side of Clear creek, and Paige's mine, on the east side, were menaced this week by forest fires. The flames came within 50 ft. of the Mt. Shasta mine, which was saved only after hours of work by every employee. Several prospectors' cabins were burned.

Sierra County

(Special Correspondence.)—A. B. Call, of Pasadena, has bonded the Grizzly ridge claims owned by Mark Alling, a mining engineer of Downieville. The property consists of four 160-acre claims covering $2\frac{1}{2}$ miles of ancient lava-capped channel, of the Neocene age, never yet bottomed. The channel contains a white and blue quartz wash carrying gold along its course, and where tributaries have been followed into the ridge. Rich ore is expected when the bottom is tapped. The channel is covered with a deep flow of pipe-clay, over which lies an ancient andesite capping. The property is on the same ridge as the Delhi mine, Nevada county, and as the nature of the wash is similar to that of the Bald Mountain mine, eight miles northeast, across the river, it is thought it may be the same channel, although it formerly has been thought that the Bald Mountain had crossed from Moore's Flat to North Bloomfield. The ridge is heavily timbered, and a wagon-road lies along the property.

Downieville, August 7.

(Special Correspondence.)—A large bed of rich gravel has been uncovered at the Haskell Peak mine, in which August Johnson states that a second channel was found under a stratum of pipe-clay. The first channel, which the company has been developing for the past two seasons, is known to have yielded big dividends. The work of hauling the timber necessary for the sluice-boxes soon will be started. The company expects to be in full blast this summer.

Haskell Peak, July 25.

The first deep mining in the Alleghany district soon will be started as the result of the sale of the Red Star and Tightner mines to San Francisco investors. The Red Star vein is considered to be a continuation of the Tightner vein. The construction of a 10-stamp mill has been commenced at the Tightner and should be done in 45 days. H. L. Johnson formerly owned the properties.

George Scarfe, Jr., superintendent of the Middle Yuba Hydro-Electric Co., is in San Francisco to purchase motors to operate a new air-compressor and other machinery soon to be put in at the Omega mine. The Middle Yuba company will furnish power for the mine. Much interest is being shown in the Red Star mine's electric equipment.

Tuolumne County

(Special Correspondence.)—The company which has been exploiting the gravel deposits near Columbia with a Keystone drill has incorporated under the name of Columbia Basin Development Co., the incorporators being J. B. Watson, F. S. Duncan, and James Sam, all of San Francisco. Gold-bearing gravel was recently penetrated with the drill, and a three-compartment shaft has been started. It is planned to drive a long adit from the Stanislaus river to drain the basin in which the property is situated. The company expects the arrival soon of two large boilers and two Cornish pumps.

The Star King mine has been sold to A. H. Wagner and R. C. Kennedy, of San Francisco. A mill will be erected to replace the one destroyed by fire several years ago and a hoist and other machinery will be built at once. Mr. Wagner will personally direct all work. The machinery for the Gold Ship gravel mines, near Groveland, has begun to arrive and active mining operations will be commenced soon. Porterville capitalists have begun development of the If I Can gravel mines, one mile above O'Byrnes ferry, on the Stanislaus river, and it is said that at least 30 men will soon be employed. The property comprises several hundred acres and is developed by two adits which have reached gold-bearing gravel. The Empire mine, owned and operated by L. H. Jansen, is being extensively developed. The property is opened by a shaft 200 ft. deep, from which several drifts have been driven, exposing a vein of good ore 4 to 5 ft. wide.

A power-drill has been purchased for the Hardtack and Hunter mines, operated by Messrs. Redding and Gledhill, and other machinery will soon be ordered. The Uncle Sam mine, at Arastraville, is being reopened for inspection by prospective purchasers. A mill test of 10 tons of ore taken out in the development of the Gem mine, near Confidence, returned 24 oz. gold. Assays show the sulphide to be of a high grade. The unwatering of the Juniper mine is almost finished and development work will soon be in progress. Only a few men are employed at the Soulsby and the announcement of the complete suspension of operations is daily expected. The resumption of operations at the Manganate mine, near Jamestown, is contemplated for an early date.

Tuolumne, August 6.

Yuba County

Dredge No. 13, the largest gold dredge in the world, has been formally put in operation on the Yuba river, near Hammonton, by the Yuba Con. Gold Fields. W. P. Hammon, president, and other officers of the company and a number of their friends were present when the electric current was turned on. The dredge was started on Friday, August 4.

COLORADO

Gilpin County

The Rexall G. M. Co. has bought most of the principal producing lode and placer mines in the northern part of this county, including the well known Perigo and Gold Dirt placer properties. It is reported that the former owners, Hal Sayre, E. W. Williams, James E. Lightborne, and Thomas H. Potter, will become stockholders in the Rexall company and that Mr. Williams will be elected to the board of directors. These men gradually had acquired these properties through advancing money to prospectors, but comparatively little development work has been done. The Rexall company will place dredges and do extensive development work. Charles Knight is general manager for the company. The property consists of 2500 acres of placer ground and 700 acres of lode claims, including the Rollins and Pactolus placer mines, water-rights on South Boulder creek, and the townsite of Rollinsville.

Saguache County

(Special Correspondence.)—A new Colorado record for the first month's use of machine drills was established in June at the Rawley M. Co.'s mine near Bonanza. The distance was 380 ft., against the former record of 302 ft., made by J. A. McIlwer on the Laramie-Poudre adit in January 1910. W. C. Russell is manager for the Rawley M. Co. In July the Rawley company's 6250 by 7 by 8-ft. drainage and development adit was advanced 414.23

ft. The adit on August 1 had been driven 905.23 ft. Two shifts worked 29½ days in July. The No. 8 Leyner Water drill is being used.

Bonanza, August 6.

San Juan County

Press reports state the Little Maud mine, Maggie gulch, has been taken over under lease and option by the Danforth Investment Co. E. J. C. Riley, of Cripple Creek, representing the Danforth company, made the deal.

San Miguel County

The Ophir Gold Mines, Milling & Power Co., which last year acquired the old Suffolk properties at Ophir is planning to mill all of the ore from the workings, which for years were tied up in litigation. A tram will be built from the mill to the No. 5 Suffolk level and to the Lilly, a new opening, from which all of the levels will be worked. New buildings have been erected at No. 5 level and a large force of underground workers can be cared for. With the tramway, aside from the expense of removing the ore, the treatment cost will be but 80c. per ton, a saving of about $3 over the days when lessees operated the property. The company has valuable water-rights which make 250 hp. available throughout the year. The whole hill where the property is situated is said to be a network of gold-bearing fissure veins, some low grade and some high grade, running $40 to $50 per ton. George B. Pickett is general manager.

PERIGO MILL.

The Alta mill, recently enlarged by 10 stamps, will be increased 10 more stamps shortly. The increased output will be about 45 cars per month.

Teller County

The Index shaft at Cripple Creek, on the south point of Gold hill, will be sunk to 1000 ft. The hoist has been overhauled.

IDAHO

The production of gold in Idaho this year will be 25% heavier than the production of last year, says Joseph Pinkham, who is in charge of the United States assay office at Boise. An abundant supply of water has lengthened the placer season, many new claims have been developed, and several old mines have been reopened and placed on a paying basis. The Gold Hill mine at Quartzburg, closed for 30 years, has been opened by Mrs. M. Hall, of Boston. The Boise basin placer mines will produce more gold this season than in many years.

Idaho County

Humboldt Quartz & Placer M. & M. Co. has been organized in Spokane by F. E. Garman and his associates to develop thirteen 20-acre placer claims near Marshall lake. Fifty thousand dollars is to be expended, if necessary, in equipping the property and buying 10 other claims in the district, which is between the famous Florence and Warren camps. J. J. Moak, superintendent and general manager, announces that two giants and 1000 ft. of steel pipe will be used, which will give a 200-ft. head of water from Grouse and California creeks. The prospect assays show average values of $2.75 per yard, according to report.

Shoshone County

The Granite-Allie M. Co., near Murray, will erect a 100-ton mill, in a building large enough for a 300-ton mill. A sawmill will be built to furnish lumber for a flume. The shaft is down 220 ft. in good ore, according to report.

The Four Ledge M. Co.'s silver-lead properties, comprising 15 claims, four miles west of Wallace, have been acquired by the Burlington M. Co., of Spokane, headed by Ben. E. Hewey. A water-power plant will be constructed.

MONTANA

Lincoln County

(Special Correspondence.)—The Cornet Placer M. Co., operating on Libby creek, has closed to allow a clean-up of the sluice-boxes. The Libby Placer M. Co. is constructing a large hydraulic plant. The latter company also has closed for a clean-up of the sluice-boxes.

J. M. Roberts and Louis Hale believe they have found the district in which Lincoln county's lost gold mine is situated. A 15-ft. vein of coal was reported in the northern part of the county by three gold prospectors in the early sixties.

Libby, August 2.

(Special Correspondence.)—The Snowshoe mine, which has been in operation for the past three months, since its purchase by the Pacific Coast Smelting, Refining & Mining Co., is to begin shipping ore to the smelter at once. Although the concentrator has been running for over two months, no ore as yet has been shipped. There is now about 2000 tons of concentrate on hand. The ore will be hauled by teams for eight miles, to the Libby Lumber Co.'s logging railroad, where it will be loaded on Great Northern cars. E. H. Wilson, consulting engineer for the company that is operating the mine, is planning an adit to the vein on the opposite side of the mountain from the present workings to obtain a depth of 1000 ft. This step is possible through the purchase of claims adjoining the mine. Another air-compressor will be added. The company is employing about 100 men.

Libby, August 3.

(Special Correspondence.)—The steam-drill which was taken to the placer ground south of Libby recently is now in operation and holes are being sunk on the land for testing the ground. It will take several months to prospect all the ground, as the machine can only drill about 10 ft. per day. C. B. Campbell, of Colorado Springs, Colorado, is back of the enterprise, and has been on hand this week to watch the operations. There is about 1000 acres of land on Libby creek that is thought to be suitable for dredging. Mr. Campbell has an option on about half of this. G. F. Hinton, a placer mining expert, is in charge.

Libby, July 30.

NEVADA

Clark County

The Yellow Pine mill will soon be in operation. The fourteen-mile narrow-gauge railroad from Jean, on the Salt Lake route, to the mine is nearly completed. An electro-gasoline engine will be used. The ore-shoot has been followed down to the 400-ft. level and appears to be larger in the lower levels. A power-plant will be constructed at the mine. J. F. Kent is manager.

Esmeralda County

The Goldfield Con. M. Co. on July 31 mailed checks for a dividend of 50c. per share on all outstanding shares. The approximate figures for July show a net profit of $650,000, against $679,537.16 for June and $796,151.64 for May.

Humboldt County

Press reports state that slabs of almost pure gold are being taken out of the Adamson-Turner mine at Rexall, the Winnemucca mountain camp. The reported ore comes from about the 100-ft. level. Some of the ore has been screened and sacked, and it is believed will assay about $1000 per ton.

Lander County

(Special Correspondence.)—The Austin Manhattan Con. M. Co. announces that the developments at its mines, and the operation of its mill have been so satisfactory that additional capital will be raised to conduct operations on a larger scale. The plans include the erection of a 150-ton mill, with cyanide departments. The manager recently stated that only bullion will be shipped, and that the concentrate will be treated on the ground. The holdings comprise the greater part of the Reese river mining district. At present a small plant is treating ore, employing the Huff Electrostatic process. Maricopa Mines Co. is erecting a 100-ton mill on the Patriot, which has been leased from the Austin Manhattan for an extended period. The Kingston mine and mill has been taken under lease and bond by John C. Charles of San Francisco and F. C. Hazzard of Los Angeles. The purchase price is understood to be $200,000. The property is 25 miles south of Austin.

Austin, Aug. 3.

Lyon County

The Rea, Baruch and Erickson property, consisting of 50 acres near Dayton, a mile and a half above the Logan & Hully mines, has been bonded by H. C. Cutler for Eastern capitalists. The shaft will be unwatered to the 500-ft. level. A 300-ton mill is on the place. Mr. Cutler, who formerly was consulting engineer to Nixon & Wingfield, will be manager.

The new 800-ton smelter in Mason valley is expected to blow in some time in November. The 200-ft. stack is completed and the dust chamber is being constructed. All structural steel for the sampling mill is on hand and much of the blast-furnace building steel has been received. The equipment for the 6600-ft. tramway to the Copper Belt railroad is ready. It will have a capacity of 100 tons per hour. From the 400-ft. level raises are being driven to the surface to obtain the limestone needed for fluxing.

Nye County

The Manhattan Big Four M. Co. has declared its second dividend of 2c. on 762,000 shares outstanding. The payment will be made August 15. The first dividend, also 2c., was paid May 5. Of the three leases, the Poak-Steen-Cicola has produced $225,000 in the last eight months.

At the War Eagle claims preparations are being made for sinking a permanent working shaft. J. McCummon is superintendent for Malcolm L. Macdonald, who has a lease from the Humphrey brothers.

J. C. Charles, of San Francisco, and F. C. Hazzard, of Los Angeles, have bought the old Kingston mine, in Kingston canyon, Smoky valley. Harry Green and A. D. Sly have leased the Union No. 2 property and will install a whim shortly. It is reported that some Philadelphia capitalists, headed by John Whilldin, are planning to buy the Priest mill. R. H. Toll, a Denver mining engineer, is to make a report on the property. The Happy Day claim, near Central, formerly owned by the Goldfield & Bald Mountain Con. M. Co., was bought at a sheriff's sale by Martin Bartholino. Work shortly will be resumed on the Hoosier claims, at East Manhattan, near Mineral hill. The shaft, 300 ft. deep, has passed through encouraging ore and will be continued to water-level. J. B. Houppert, vice-president, is at Manhattan.

Storey County

The Mexican M. Co., after nearly 50 years of existence, has declared its first dividend, which is the first dividend since the Ophir's in 1908, on the Comstock. The disbursement on the 201,600 shares will call for $20,160, and will leave on hand about $30,000 for August expenses. With the mill, now under construction, it is believed that dividends can be maintained next year. The Mexican M. Co. has received a report from the smelter showing a net yield for July of $44,860.30.

The official weekly reports of the superintendents at the north end show a large ore extraction in July. There was a substantial increase in the output of the Ophir and a decrease at the Mexican. The former reports show a total of 1466 mine-cars hoisted, giving a gross assay value of $51,429.17, more than $12,000 in excess of June's output. At the Mexican, 1810 cars was hoisted, giving a gross assay value of $71,776.08. The Mexican was shut down for more than a week. Other producers in the Comstock district include the Union Con., Con. Virginia, Comstock Phoenix, Monte Cristo, Cosmopolitan, Chollar, Potosi, Gould & Curry, Justice, and Crown Point.

White Pine County

The Nevada Con. Copper Co., in its second quarterly report for 1911, announces a deficit of $1130, incurred after payment of dividends amounting to $749,389 and charging off $136,991 for depreciation. Net earnings were $886,266. The production was 15,677,065 lb., against 15,893,743 for the first quarter, and 15,698,595 for the last quarter of 1910. The ore treated averaged 1.59%, the lowest grade yet milled. The average was lowered through the treatment of a large amount of ore of low grade, yet too valuable to be thrown away. The deficit was caused through reducing the figure at which stocks were carried, and $23,826 was deducted from the former metal price reserve, $46,629. The first basic-lined converter was scheduled to go into operation August 1. The undivided profits are $2,159,310, and the surplus $9,056,153.

OREGON

Baker County

The Virtue M. Dev. Co., eight miles east of Baker, is changing to electric power, and is remodeling the mill. A cyanide plant will be added. At present the mill is not operating. Power will be delivered in a few months by the Eagle River Electric Power Co., whose plant is now under construction. The Virtue M. Dev. Co. property includes eight former holdings. J. K. Romig is manager.

Press reports state that work will be commenced immediately on the big Keystone company's dredge near Sumpter. The dredge will be a Bucyrus and is to have a capacity of 7000 cu. yd. of gravel per day. Electric power will be used, furnished by the Oregon Light & Power Co. from its substation at Bourne. R. W. Derby has charge for the Keystone company.

W. H. Turner, of Spokane, has been elected president of the Humboldt Con. G. M. Co., which has taken over the holdings of the Humboldt G. M. Co. in the Mormon basin near Baker. The vein has been traced for more than 5000 ft. within the company's ground, and 600 ft. of drifts shows ore for nearly the entire distance, ranging from 2 to 45 ft. in width. A large quantity of ore has been taken from the property by Colt Brothers, the former owners, but there still remains more than $250,000 worth of ore in sight. The shaft will be extended 100 feet.

UTAH

Salt Lake County

The Utah Copper Co., in its report for the second quarter of 1911, April, May, and June, gives its gross production for that period as 24,469,812 lb. copper. May's production was the highest, 8,391,879 lb. The average monthly production was 8,156,604 lb., against an average of 7,098,903 for the first quarter of 1911, and an average of 7,563,940 lb. for the last two quarters of 1910. The average cost per pound during the quarter, after allowance for smelter deductions and without crediting miscellaneous income, was 8.02c., against 8.434c. for the first quarter. The ore treated amounted to 1,060,414 tons, against 981,104 tons for the first quarter. The copper content was 1.6332% against 1.5509% for the first quarter. The net with Nevada Con. dividend, was $1,366,944.17 for the quarter, of which $1,177,011.75 was paid in dividends, leaving a surplus for the quarter of $189,932.42, computed on a basis of 12¼c. per pound of copper. Average extraction was 70.64%. From Utah and Boston groups 1,395,504 cu. yd. of capping was removed, as compared with 957,149 during the first quarter. The mine will be put in shape for winter work without stripping under poor weather conditions. Track has been laid across Dry Fork bridge on the Bingham & Garfield railroad, and track is to be laid to the Garfield smelter early in August. Equipment is expected to arrive in time for operation in August.

WASHINGTON

Okanogan County

The Granby Consolidated Mining, Smelting & Power Co. bonded seven claims on Copper mountain, Myers Creek district, last February, and has been prospecting them with a diamond-drill. One hole cut 86 ft. of rich ore, a second one 56 ft., and another ran 40 ft. through iron sulphide. Since then the company has sent in experts who have examined other claims nearby and are negotiating for them. Among them is the Battle Axe, from which ore assaying $60 to $80 per ton has been shipped. These properties are six miles northeast from Chesaw.

Pend Oreille County

Metaline Oriole M. Co., headed by Fred N. Davis, has just shipped its first consignment of two cars of high-grade ore from Metaline Falls to the United States Zinc Co.'s smelter at Blende, Colorado. Six cars of ore is blocked out. Plans have been approved for sinking a 250-ft. shaft during the coming fall and winter. The adit, now in 586 ft., was driven in 72 days at a cost of $6.43 per foot. In addition, there is some open-cut work and a short adit on the vein, where several tons of good ore has been taken out. No. 2 adit is in 225 ft. and has reached a depth of 100 feet.

CANADA

British Columbia

(Special Correspondence.)—The Inland Empire M. & M. Co., Ltd., at Paulson, is putting in a 10-stamp gold-mill. D. G. Daires, mining engineer, is in charge of the work.

Paulson, July 21.

Work at the Portland Canal M. Co.'s concentrator has been resumed. The plant has been enlarged to treat 80 tons of ore per day. The mill equipment consists of 7 Wilfley tables, an Overstrom table, 2 Frue vanners, 2 four-compartment 5-mm. jigs, and 2 four-compartment 3-mm. jigs. The whole plant is driven by water power.

Ore from the latest discovery on the Simpson claim, Salmon-Bear river, brought to Stewart by O. B. Bush, assayed $53.60 in gold and $510.64 in silver.

E. A. Bradley and associates are making extensive tests on Big Bend, French creek, preparatory to developing the placer district there on a large scale.

Ontario

(Special Correspondence.)—The Porcupine boom has resulted in a considerable revival of interest in gold mining in other parts of the province, more particularly in the Lake of the Woods district, where several mines which had for many years been closed down are now being worked. The Ophir, now principally owned by Charles Fishback, Chicago, is being operated with good prospects of success by a force under James Morton as superintendent. The shaft has been put down to the 100-ft. level, and some driving undertaken. The vein was found to widen to 9 ft. at depth and good ore is being taken out. At the Mikado, formerly a producer to the extent of about $500,000, where operations were resumed last fall, large orebodies have been found and 15,000 tons blocked out. Operations have been slackened latterly because of the refractory character of the ore, owing to its bismuth content, which will necessitate the building of a cyanide plant to prevent heavy loss in extraction.

A copper property near Kenora is being worked by Mr. Scovil and Frank Moore. A shaft is being put down to 100 ft. It is claimed that samples of ore taken from the 40-ft. level assay 27 lb. of copper per ton. Active work is being done at the St. Anthony gold mine in the Sturgeon Lake district, of which J. C. Houston is in charge. A new vein has been discovered running about 20 ft. in width, which has been traced for 300 ft. A winze put down 75 ft. from the 100-ft. level shows good ore all the way. The manager estimates the ore in sight at $500,000.

In order to avert the danger of a coal famine in the West this winter, owing to the protracted strike of the coal miners in British Columbia, the Canadian Government has by order-in-council remitted the duty on coal imported into Canada at points west of Sault Ste. Marie for consumption in British Columbia, Alberta, Saskatchewan, and Manitoba. This goes into effect August 7, unless the parties to the strike effect a settlement and resume operations before that date. The railways are also reducing freight rates on coal from Port Arthur and Fort William to western points, and it is anticipated that large supplies will be brought in from the United States.

Toronto, August 4.

Three bars of bullion recently were shipped from the Cobalt Lake mine to the Toronto office. The bars in the aggregate weighed 149.5 oz.

Yukon

The McKinnon brothers and Messrs. Clark and Fotheringill have leased the stamp-mill formerly belonging to Mr. Bennett and associates of Dawson, and have commenced crushing ore from the Indian river conglomerate deposit, which they believe will become another Rand.

MEXICO

Chihuahua

A rich discovery of silver ore was made recently at the Esmeralda mine, owned by the Esmeralda-Parral M. Co. A large quantity of ore running from 5 to 10 kg. silver per ton is being sacked. The ore was found on the fifth level south. Wade Armstrong is manager.

Confidence is growing in the Parral district, according to press reports. All of the old properties have resumed, and the district is remarkably free from strikes. To avoid any possible trouble, however, several new properties will not open before the elections in October.

The La Republica mine during June crushed 1051 tons of ore. The proudction was ₱78,656.76; operating charges, ₱52,393.10; and construction and equipment charges, ₱7188.74. J. Gordon Hardy, of El Paso, is consulting engineer.

Sonora

The electric hoist at the Calumet & Sonora mine at Cananea has just been completed. Electricity is obtained from the Cananea Con. Copper Company.

Bostwick and Dickson, owners of the Washington mine, near Huepac, are planning to organize a company to develop this copper mine. About 250,000 tons of ore is blocked out, which it is believed will run from 3 to 5% copper.

The Transvaal Copper Co. will build a concentrator at Cumpas and a narrow-gauge railroad from its mines to Cumpas, a distance of 200 miles. The work will be done within a year. O. C. Rasch is now at the property. The company owns 1966 acres of mining land, a 50-acre smelter site at Cumpas, and an interest in the San Nicolas-Tolentino ranch of 26,000 acres. The property includes the Cobre Rico, Transvaal, Buckeye, San Nicolas, Ultima Chanza, Virginia, and Guadalupe claims.

The El Tajo M. Co. is planning to develop other silver properties in the vicinity of the San Geronimo mine, which it operates.

The Mexican Metals Co. has allowed its properties in the Magdalena district to revert to the former owners, its parent company, the Dominion Syndicate. The Mexican Metals Co. now owns only the Arizpe Mining Co., later reorganized as the Arizpe Mines Co., and still later merged with the Mexican Metals, whose properties consist of 27,000 pertenencias, including the Alacran, Reydel Cobre, Palo Seco, Manhattan, and other holdings.

The Zambona M. Co. has added 10 more stamps and a tube-mill to its plant at Minas Nuevas. The Mauchacho Grande M. Co. is developing claims aggregating a mile long and a half-mile wide at Matopaco. Several veins of silver ore varying greatly in value traverse the property, which is in the Alamos district.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS

COAL MINING CORPORATION—DUTY TO SHOW INCORPORATION

The statute of Kentucky requires every corporation to place on its principal place of business its name and under it the word 'Incorporated.' Under this statute a coal mining corporation operating a mine in one county and maintaining a business office in another county maintains two places of business, within the meaning of the statute, and must place its name with the word 'Incorporated' at both places where its business is so carried on.

Commonwealth v. Nebo Consolidated Coal & Coke Co., (Kentucky) 134 Southwestern, 221. January 1911.

LOCATION OF MINING CLAIM—TRUST AGREEMENT AND STATUTE OF FRAUDS

It was orally agreed between several persons that one should explore the public domain and discover and locate mining claims for their joint benefit. Pursuant to such agreement, any claims located by one, either in his own name, or in the name of another, inures to the benefit of all, and the one in whom the legal title vests holds it in trust for all interested in the joint enterprise. And such an agreement based on a valuable consideration is not within the statute of frauds.

Hardin v. Hardin, (South Dakota) 129 Northwestern, 108. December 1910.

LIABILITY FOR INJURY TO BOY IN COAL MINE

The violation of the statute prohibiting the employment of a boy under 14 years of age in a coal mine may be rightly considered as the proximate cause of any injury which is the natural, probable, and anticipated consequence of such violation; but the employer is only liable for injuries against which the statute is intended to guard. Where the employment is thus unlawful, the boy under 14 years of age cannot be held to have assumed the risks incident thereto, including the risk of injury by a fellow-servant. But any contributory negligence on the part of such a boy injured in the unlawful employment is available to the employer as a defense, unless it be such that must reasonably be anticipated as a probable consequence of the violation of the statute. The fact that the boy misrepresented his age will not alone preclude him from recovering in an action for damages caused by violation of the statute.

Norman v. Virginia-Pocahontas Coal Co., (West Virginia) 69 Southeastern, 857. December 1910.

Burke v. Big Sandy Coal & Coke Co., (West Virginia) 69 Southeastern, 992. January 1911.

LIABILITY FOR DEATH OF MINER—EVIDENCE

In an action for the death of a coal miner, alleged to have been caused by rock falling from the roof of the mine, where the mine-owner was charged with having negligently failed to have the room, wherein the deceased was working, examined by the mine examiner and marked with chalk as of the date, there was a conversation between two mine inspectors about two hours after the accident, in which one asked the other if he had examined the room the night before and where he placed his mark, and being told where said it was not there then, to which the other replied "No." This was held to be a mere narrative of a completed transaction and not admissible as part of the *res gestae*. In such a case any error in permitting a witness to answer questions as to the proper practice in coal mining, as to whether it was possible to tell when a large untimbered rock was going to fall, is regarded as harmless, where the jury could not have understood that it was the duty of the mine examiner to remove the rock, and where it was self-evident that the precise time when such a rock would fall could not be determined.

Belskis v. Dering Coal Co., (Illinois) 92 Northeastern, 575.

Book Reviews

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

A STUDY OF THE BLAST FURNACE. By the Harbison-Walker Refractories Co., Pittsburg, Pa., 1911. 105 pp., ill. For sale by the *Mining and Scientific Press*. Price $1.25.

This little volume is a companion volume to 'A Study of the Open Hearth Furnace' and is an equally striking example of the art of book making. In recent years we have learned the fallacy of the pioneer idea that fine dress is an evidence of worthlessness, and these handbooks, bound in leather, with gilt edges, and beautifully printed on double-calendered paper, are a treat to the lover of good workmanship. The care with which the plates have been executed makes them particularly valuable. The book is not intended for a steel metallurgist, but its brief and comprehensive outline of blast furnace practice will be interesting, valuable, and useful to the many who desire only a brief discussion of this large subject.

METALLURGY OF TIN. By Henry Louis. Pp. 136; ill. McGraw Hill Book Co., New York, 1911. For sale by the *Mining and Scientific Press*. Price $2.

This little book is a revised and enlarged reprint of the article contributed by Mr. Louis to Vol. V of the *Mineral Industry*, 1896. A feature of the work is the large amount of space devoted to the description of native methods practised in the Straits Settlements and neighboring districts. It is only within comparatively recent years that descriptions of such methods of work have appeared in the journals of technical societies, and Mr. Louis has done good service in gathering together and amplifying them from his own experience. The volume concludes with a chapter on the utilization of tin waste and scrap. The metallurgy of tin is of interest to but rather a narrow circle, but its members will welcome this concise and lucid description of the subject.

STRAIGHT-LINE ENGINEERING DIAGRAMS. By Manifold & Poole. Cloth. Pocket size. Technical Pub. Co., San Francisco, 1911. For sale by the *Mining and Scientific Press*. Price $3.

This little book contains diagrams by which it is possible easily and quickly to solve a large number of engineering problems that constantly arise in the field. No calculations or drawings are necessary, and it is but the work of a moment to compute approximate solutions. Among the problems solvable by its use are, bearing power of piles; depth of keystone in masonry arches; strength of concrete of different porportions; economical percentage of steel in reinforced concrete; strength of beams; voltage losses; deflection for copper and aluminum wire with various spans and temperatures; relations of kw., hp., voltage, amperage, etc.; size of wire for power transmission; comparative cost of power; hoisting and haulage problems; flow of water in pipes and canals; water measurements; stadia measurements; gearing and shafting problems. The book will prove a great convenience to field men everywhere.

Recent Publications

ENGINEER MOUNTAIN FOLIO. By Whitman Cross and assistants. U. S. Geol. Surv., Geologic Atlas, Folio 171, Field Edition, 1910. The engineer mountain quadrangle lies south of the Telluride and east of the Rico in Colorado. The district is an interesting one from the point of view of general geology, but ore deposits of large value have not yet been found within its limits. The 'Field Edition' of the folio is published in pamphlet form, 9½ by 6 inches, with flexible back, and maps folded in pocket. The library edition is in the old style of flat folios, 17 by 21 inches.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

J. C. Pickering is in London.

H. E. Bush was in San Francisco.

J. Power Hutchins is in London.

Hennen Jennings is in San Francisco.

R. A. F. Penrose, Jr., is at Los Angeles.

J. Morgan Clements is in San Francisco.

Louis J. Mayreis has returned from London.

Norman C. Stines is at Vladivostok, Siberia.

J. F. Brandes is now living in San Francisco.

Gelasio Caetani has gone to Telluride, Colorado.

Edmund Juessen will go to Pittsburg next week.

Percy E. Barbour was in San Francisco Thursday.

Courtenay De Kalb was in San Francisco this week.

A. H. Keller is leaving for Colombia, South America.

Carl F. Dietz is in Maryland on professional business.

F. G. Clapp has left Pittsburg for field work in West Virginia.

Charles P. Richmond is at San Miguel, Salvador, Central America.

Fred L. Lowell has returned from a wedding trip to Sitka, Alaska.

Alden H. Brown has been in San Francisco and has gone to Nevada.

A. A. Hassan is at Cobalt, from which point he will make exploration trips.

Arthur J. Hoskin is returning from a short business trip to the East.

C. T. Durell is making a tour through Australia before returning to the United States.

Dyke V. Keedy is in Maine, examining some mining property for New York people.

Joseph H. Playter has returned from Mexico to the management of Nevada Crown Mines, Golconda, Nevada.

Howland Bancroft has left Lima, Peru, for La Paz, Bolivia, which will be his headquarters for the next six months.

C. Frederick Sherwood has been in San Francisco and has gone to New York *en route* to Buena Ventura, Colombia, South America.

Carl L. Allen, of Allen & Colburn, Denver, has returned from the examination of mining properties near Breckenridge, Colorado.

Obituary

W. C. Greene, who died at Cananea, August 5, of acute pneumonia, the secondary result of being thrown from a carriage by a runaway team, is mainly known for his connection with the Greene-Cananea Copper Co. He was one of the picturesque pioneers of the Southwest who turned promoter and did much to attract attention to the region in which he made his home. Beginning as a Government contractor in Colorado and Kansas, he was successively prospector, miner, and company organizer. He acquired the title of Colonel while leading volunteer forces against the Apaches in the early eighties. He nearly lost it when, after breathing dire threats of extermination, he met a certain other Colonel from Boston. It is said that the conversation between the two Colonels closely followed the lines of the historic *pour parler* between the Governor of North Carolina and the Governor of South Carolina. After the reorganization of the Cananea company, Mr. Greene devoted the major part of his attention to his immense cattle and farming interests in Sonora. He was one of a type that is fast disappearing from the Southwest.

Market Reports

LOCAL METAL PRICES.

San Francisco, August 10.

Antimony	12—12¾c	Quicksilver (flask)	50
Electrolytic Copper	14—15¼c	Tin	47—48½c
Pig Lead	4.75—5.70c	Spelter	7—7¾c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50—9.75; large $7.50—8.50

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Aug. 3	12.43	4.50	5.85	52¼
" 4	12.43	4.50	5.88	52⅜
" 5	12.43	4.50	5.88	52⅜
" 6	Sunday		No market.	
" 7	12.43	4.50	5.90	52⅜
" 8	12.43	4.50	5.93	52⅛
" 9	12.43	4.50	5.95	52⅛

ANGLO-AMERICAN SHARES.

Cabled from London.

	Aug. 2. £ s. d.	Aug. 10. £ s. d.
Camp Bird	1 9 3	1 9 0
El Oro	1 2 9	1 3 0
Esperanza	1 15 0	1 16 10½
Dolores	1 5 0	1 5 0
Oroville Dredging	0 5 9	0 5 9
Mexico Mines	7 2 6	7 1 3
Tomboy	0 19 4½	0 19 4½

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing prices, Aug. 10.		Closing prices, Aug. 10.
Amalgamated Copper	$ 62⅛	La Rose	$ 4
A. S. & R. Co.	71½	Mason Valley	8½
Braden Copper	5	Miami Copper	20¼
B. C. Copper Co.	4⅛	Mines Co. of America	4¾
Butte Coalition	16½	Nevada Con	17⅛
Chino	20	Nevada Utah	⅝
Davis Daly	⅞	Nipissing	8¼
Doble	1	Ohio Copper	1⅛
Dolores	4¾	Ray Central	1⅜
First National	1	Ray Con	15
Foley O'Brien	1	South Utah	¾
Giroux	5½	Superior & Pittsburg	16
Goldfield Con	5⅛	Tenn. Copper	35⅜
Greene-Cananea	6⅞	Trinity	4
Guanajuato Con	⅛	Tuolumne Copper	4
Hollinger	10⅜	United Copper	2¼
Inspiration	7⅜	Utah Copper	46⅝
Kerr Lake	5	Yukon Gold	3⅞

COPPER SHARES—BOSTON.

	Closing prices, Aug. 10.		Closing prices, Aug. 10
Adventure	$ 6	Mohawk	$ 43
Allouez	28	North Butte	29⅛
Calumet & Arizona	53	Old Dominion	40½
Calumet & Hecla	410	Osceola	95
Centennial	9	Parrot	11¼
Copper Range	57	Santa Fe	1⅛
Daly West	5¼	Shannon	10⅛
Franklin	10	Tamarack	30
Granby	31½	Trinity	3¾
Greene Cananea, ctf.	6¾	Utah Con	15½
Isle Royale	14½	Victoria	1⅜
La Salle	3	Winona	7
Mass Copper	7½	Wolverine	107

(By courtesy of J. C. Wilson, Mills Building.)

NEVADA STOCKS.

San Francisco, August 10.

Atlanta	$ .19	Mayflower	$ .05
Belcher	.47	Mexican	4.00
Belmont	6.65	Midway	.17
B. & B.	.18	Montana Tonopah	.70
Booth	.09	Nevada Hills	3.65
Chollar	.13	Ophir	1.87
Combination Fraction	.10	Pittsburg Silver Peak	.71
Con. Virginia	.79	Round Mountain	.70
Florence	1.40	Sandstorm Kendall	.05
Goldfield Con	5.70	Savage	.11
Gould & Curry	.11	Tonopah Extension	.85
Jim Butler	.28	Tonopah of Nevada	5.80
Jumbo Extension	.22	Union	1.45
MacNamara	.18	West End	.53

(By courtesy of San Francisco Stock Exchange.)

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EDITORIAL

DENMARK will hold an International Marine Motor Exhibition at Copenhagen in July and August next year. Applications for space should be made through any of the Royal Danish Consulates.

AIR-COMPRESSORS are widely used, but there is a surprising lack of exact data regarding them and indeed many features of the use of compressed air. We are glad to present this week the first of a series of short practical articles written by Mr. R. L. Webb and based upon his experience in running tests, particularly an elaborate series but recently concluded at Cobalt, Ontario.

TO THOSE who have time to stop to reflect, amid the hurry of modern life, the changes which the last few decades have wrought in our national life and the national habit of mind are astonishing. A short while since ten thousand citizens gathered to see the first spadeful of earth removed in the construction, by the municipality of New York, of a subway which is to cost three hundred millions of dollars. Probably the larger number of those present were scarcely as much interested as they would have been in the passing of a circus parade, yet the magnitude of the work and the fact of its being undertaken by the municipal authorities strikingly exhibits the sweeping changes which have come as a result of enormous development of city and nation.

MINNESOTA is strengthening its State University, and we are especially pleased that the geological department is among those to receive help. Mr. W. H. Emmons has been called to the chair of geology and will serve as state geologist, the Geological and Natural History Survey of Minnesota being under the direction of the regents of the University. Mr. Emmons will be recalled by our readers as the author of an interesting series of articles on 'Outcrops of Orebodies,' and by engineers generally as having written an illuminating discussion of the rôle of manganese in secondary enrichment of gold ores. He is one of the most brilliant of the younger American workers in economic geology and will undoubtedly serve with distinction in the position to which he has been called.

'STIRRING the passions of the vulgar horde' is an easy way to obtain notoriety, but when coldly considered is usually seen to be an immoral use of the baser elements of human nature. The recent action of Mr. J. K. Vardaman, newly elected United States Senator from Mississippi, in appearing upon the streets of Meridian dressed in white, sitting in a white chariot drawn by 160 white oxen in order to advertise his candidacy by emphasizing the color line between the two races, was a theatrical display which deserves the condemnation of all right-minded men. The race problem is a pressing one in many places, including our Southern States, but no good purpose can be served by such appeals to unreason as have characterized Mr. Vardaman's whole public career. It is a strange commentary on Mississippi that he is to be sent to Washington as the associate of the scholarly and able Mr. John Sharp Williams, who is now serving his first term in the Senate.

CONCRETE is used widely in battery foundations and heavy blocks are now common. At the Headwaters mill, Baguio, Philippine Islands, a block containing 80 cubic yards was used to support ten stamps. This large amount was made necessary by reason of a tube-mill instead of plates being used below the stamps. The excavation being carried down twelve and a half feet to the tube-mill level, concrete was the most available material for building the foundation block.

FOREIGNERS in Mexico are complaining that conditions have changed greatly since the revolution. In many places, particularly in the remoter towns, they have been called on to face much annoyance and occasional real danger. This, while unfortunate, is to be expected. After a successful war any people is likely temporarily to become overly self-satisfied. Germany has never recovered from her easy victory over France, and in that fact lies the chief menace to the peace of Europe today. The Japanese, after defeating Russia, were for a while considered to hold an exaggerated opinion of their own importance, and, after our own little skirmish with Spain it was the universal opinion of others that Americans had a better opinion of their own prowess than was altogether warranted by the facts. These things are generally temporary, and while they endure call for good-humored forbearance among friends. If the Mexican peon in the first flush of victory considers the scheme of things from a wrong angle, it is well to remember that the past has given him little opportunity for forming sound judgments in matters political and economic. Patience and tact are called for to an unusual degree among engineers in Mexico just now. It is hard to suffer injustice, but that is at times the way of life. The best thing any friend of Mexico can do now is to keep as many Mexicans as possible exceedingly busy. Idle hands make repeated revolutions easy.

ONE striking and interesting feature in the foundation of Michigan College of Mines was the fact that the initiative came from a young man, a graduate of a technical school, and that his main concern was the benefiting of the practical men already in the mines. Mr. J. Parke Channing, to whom more than anyone else the school is due, in his letter to the Marquette *Mining Journal*, January 7, 1885, emphasized the need of broadening the outlook of the mining captains and under-bosses. Despite the excellent work done at Houghton and elsewhere since 1885, that need is still acute. There are enough schools for engineers, but even now there are not enough opportunities for the men in the ranks. At Houghton itself emphasis appears now to be placed mainly on training engineers, and this seems to be the universal drift in technical schools; they work away from the men instead of drawing the latter to them. This may be in the line of evolution. We are glad to note, however, the fidelity with which the school at Houghton has followed the main principles laid down at the time of its founding, as Mr. Channing enumerates them on another page. It is instructive to note also the large results that have followed from relatively small effort on the part of one man. Mr. Channing, when he took up the matter of founding the school, was but a recent graduate, a subordinate in a minor State office, and a stranger to most of the people in Michigan. Yet he had the foresight to sense the need and the means of meeting it and the initiative to undertake the matter. This called out coöperation, as it always has and always will, and the greatest benefit has ensued. The whole matter carries a lesson of individual responsibility and of personal opportunity. In the face of the results of Mr. Channing's work no engineer should despair over the possibility of benefiting his profession.

ARIZONA statehood seems likely to be still further deferred since the President has refused to sign the joint resolution admitting Arizona and New Mexico. The merits of the original question, whether judges should be subject to recall, have disappeared in the larger one whether the people of Arizona shall have the form of government they want without resorting to trickery. It is everywhere conceded that once in the Union, Arizona could enact any law on this subject that pleased its people. This, we think, completely nullifies any force which might lie in the President's objections to the new constitution. Whether we like or dislike the notion of recalling judges, to adopt the recall system does not destroy republican government, and so long as that is true it is a matter for decision by the people of Arizona rather than the Nation. We sincerely hope the resolution will be passed over the President's veto.

Taking Things for Granted

There is a well known story of the youthful lawyer who was called upon to argue his first case, an ordinary trespass suit, before an old and learned judge. Fired with the enthusiasm of youth, he began with a sketch of Roman law, followed with a summary of Blackstone, and was about to recite the United States Civil Code, when the judge interposed: "Young man, in the Supreme Court of Massachusetts you may take some things for granted." Everyone has some time felt the embarrassment of being subjected by a chance acquaintance to a long and frequently faulty exposition of some subject with which the listener is perfectly familiar. But, on the other hand, everyone has at times been equally embarrassed by the omission of essential information in a statement, letter, or report. The emphasis therefore shifts to the essential point; the taking of things for granted only when it is safe to do so. It is safe to say that the average business man has in his daily life, more conversations to listen to, more pages to read, more letters to write, and more things to do than he can well afford the time for. The elimination of the unnecessary is a constant problem. The waiter's shout of "ham and" is a frequent source of amusement, yet if he occupied the time and attention of the cook with "please prepare two fried eggs together with fried ham," he would probably, and properly, get his deserts with a dish-mop.

Much of the slang current in America finds its origin in this effort to be concise and definite, substituting for words that have several meanings another applying only to something definite. Such an uncouth word as 'muck' is derived thus. That term is widely used for the material broken down in driving underground; this is usually waste, at times hard rock, at others clay, but it may be ore, and is frequently a mixture. A 'mucker' is the man who loads it into cars and trams it to the loading station. This unattractive slang is almost typical. Muck already had four well known meanings, two of them colloquial, before its use in this connection, so that instead of attaining the aim of brevity and conciseness, increased confusion results from the use of a word which has unpleasant associations. Another characteristic of slang is that it frequently takes so strong a hold upon the fancy of the unthinking public that instead of being restricted to a definite usage it is applied in the loosest possible fashion and degenerates into the patois of the uneducated, and, having thus burst the bubble of its temporary utility, soon drops from sight. A small percentage of words survive and, fighting their way into good society, finally attain a place in the Who's Who of philology without even the tell-tale [colloq] to mark their humble origin. Abbreviations are a legitimate and common method of securing conciseness, and stenography and the typewriter are among the many aids to brevity and speech that [illegible] be devised. There always springs up in each circle of men of similar interests a special vocabulary, so that a lawyer would be at a loss to understand a conversation between two physicians, while both would be puzzled by the phraseology of a stockbroker. But an intelligent physician would not use the same phrases to a layman as to another physician, nor should engineers attempt in writing to use the colloquialisms of the mine and mill.

A Public-Lands Convention

Denver is to entertain a public-lands convention September 28, 29, and 30, this year, the call having been issued by the Governor pursuant to a joint resolution by the legislature. Only those States containing 1,000,000 or more acres of public land are invited to send delegates. The purpose of the convention is stated as follows:

"The real issue is whether the public domain, other than the little remaining farming lands, shall be held in perpetuity by the National Government free from taxation by the States, to be administered by leasehold for revenue for the Federal treasury, and under bureaus at Washington."

The problem of the public lands is one of the most important before the people today, and in it those of the Western States has a peculiar interest. At the same time it is a National problem, and, rightly or wrongly, it will be settled by representatives of all the people. Assuming that there is a distinctly Western viewpoint, and that it differs markedly from that of the East, the practical problem is whether we are most apt to reach a fair consensus of opinion by Western men holding a separate convention, or by inviting as many Easterners as are willing to come and see conditions as they actually exist. As a general rule, there can be no question that unity is promoted by getting together and threshing things out. Also, it is easier to convince your opponent when you have him in your territory and surrounded by your friends than when you invade his domain, backed by resolutions never so resounding. As a matter of fact, we doubt whether the call reflects fairly the viewpoint of the West, though it does undoubtedly voice the sentiments of a large element, possibly the majority. Once before, a public-lands convention met at Denver, but, greatly to the surprise of its proponents, it endorsed fully the Roosevelt policies. The ex-President is exceedingly popular in the West, and while there is still much complaint, National Forests and land withdrawals are much less unpopular than two years ago. In practice it is found that better roads and trails are built by the Forest Service without a local levy of taxes than most communities enjoy as a result of taxation, and more than one mining district has been revived as a result of a road built by the Forest Service, as readers of our news columns will have noted. The allotment of revenue from the forests to the local counties does much, too, to destroy the point of criticism relative to removing vast areas from local taxation. The forests, our only example of National administration, are not run 'for revenue for the Federal treasury', and anyone who will re-read Mr. Roosevelt's proposals regarding leasing coal lands must recognize that he at least never proposed that plan as a means of raising revenue. Indeed, we are not aware that any Federal officer has proposed a royalty on coal higher than that exacted by Colorado from State leases. The leasing system has been proposed, not as a revenue measure, but to prevent monopoly and secure better and more systematic development. It is capable of plain demonstration that these results have followed in other countries where the system has been adopted; and that, too, where the conditions and the people are not dissimilar to those of our Western States. There is room for much difference of opinion regarding the utilization of the public lands, and need for much discussion to effect an enlightened public opinion, but we are doubtful as to the finality of any conclusions likely to be reached by the Denver convention.

Investment and Speculation in Mining

Yukon dispatches announced lately that Mr. A. N. C. Treadgold had secured the cooperation of Mr. John Hays Hammond and the Consolidated Gold Fields of South Africa, in the formation of a new corporation rivaling Yukon Gold in importance. This is now denied by Mr. Hammond, so far as concerns his own participation in the negotiations and the enterprise, though he states that the Gold Fields company has taken a small interest in the new Yukon enterprise. Mr. Treadgold has been known to have been quietly buying ground at Dawson, and, whether now or later, will undoubtedly form a corporation for work on a large scale. Among properties mentioned as going into the new corporation are the Boyle concession and the Northern Light, Power & Coal Company. There is abundant room for a second big company at Dawson, and ground from which profit can be won only by large-scale dredging. The new enterprise will have the good wishes of mining men. Denial of the report that the Consolidated Gold Fields of South Africa is largely interested in the Yukon calls attention to the fact that so far that active group of investors has been unable to do much business in America. Both the deals for the Golden Cycle at Cripple Creek and the Rea Consolidated at Porcupine, as well as reported heavy purchases at Guanajuato, fell through after they had been announced as completed. We are not informed as to the details in any of these cases, but the truth seems to be that buying mines is conducted differently in England and America. Investment is emphasized there and speculation here. It is all too common in the United States to consider mining as entirely speculative, anyway, and therefore to capitalize from the first the maximum possible profits. It is very generally true that shares in an American mining company sell for higher prices than is shown to be warranted on any careful analysis of data supplied by the company itself. As a broad general statement, purchase of shares in America, and particularly of mining shares, is determined more by who are in the company than by what is known to be in the mine. We do not deprecate speculation. Buying shares with a view to selling them later at a higher price is a common and innocent form of making money—and also of losing it. It is not, however, for the best interest of mining and of mining men, at least as we see it, that attention be centred too exclusively upon that phase of the business. Mines may be and should be run so that strictly on the investment basis purchase of shares is as well warranted as is the purchase of shares in industrial enterprises. For the younger men of the profession particularly, it is important that attention be centred first on this phase of the business of mining. Many a promising career has been ruined by too early participation in speculation in mining shares. One of the most successful, financially, among American mining engineers confined his activities absolutely to operation and examination for over twenty years after leaving the mining school. Then, with seasoned judgment and a masterly grasp on the technical operations of mining, he participated in financing and promoting properties, with eminent success. His own point of view is somewhat fatalistic, since he holds that if an engineer has 'financial sense' the opportunity to use it will come to him by the time he is ready. This whole subject has been discussed here before, and has recently been well put in *The Mining Magazine*, but its importance warrants repetition.

Buying Air-Compressors

By R. L. Webb

In mines and quarries the air-compressor is often the most important part of the mechanical equipment, as upon it depends the operation of the drills, and, in many cases, the pumps and hoists. Any accident to the compressor would mean an expensive shut-down and possible flooding of the mine. This being true, all that is usually considered when purchasing a compressor is continuity of service, cost, and delivery. In few instances are any guarantees asked of efficiency, output, and steam-consumption. When questions of efficiency are raised, the answers given are misleading in that they are often only in part correct. This is possibly because of the dearth of reliable data. It often happens that selection of a compressor of high efficiency, well adapted to the work, and of low steam-consumption, though at a somewhat higher cost, will save enough in the cost of fuel annually to amount to a high dividend on this additional investment.

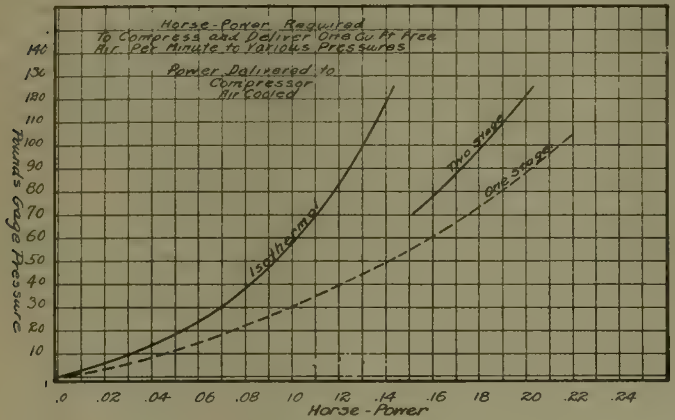


Fig. 1.

Air-compressors are usually rated by their displacement, which is the volume of the cylinder in cubic feet times the revolutions per minute. Generally no deduction is made for the rod. In multi-stage compressors the volume of the low-pressure air-cylinder alone is considered. The air-compressor is a machine for changing one kind of energy to another, taking in mechanical energy from a steam engine, electric motor, or other source, and delivering compressed air. In principle it is somewhat similar to an electric generator, which, driven mechanically, delivers power in the form of electricity. As such apparatus absorbs in friction and other internal losses some of the energy delivered to it, the true efficiency is the foot-pounds delivered as a percentage of that put into the machine; in other words, output divided by input. The difference between these is the loss in conversion, which includes all the losses, and not any one particular loss which is only a part. Many salesmen when asked for the efficiency of their compressor, will quote a figure that is the indicated horse-power of the air-cylinder stated as a percentage of the power delivered to the machine. This is misleading, since it only allows for friction and takes no account of the other inherent losses of compression. Another answer sometimes given is that the output is a certain per cent of the displacement. This, too, is only partly correct, and therefore misleading. The air-compressor has been given so many horse-power applied in the steam-cylinder, or on the pulley, as the case may be, and the per cent of this that is actually delivered in compressed air available, is the true efficiency. Manufacturers of electrical apparatus will unhesitatingly guarantee the efficiency of their apparatus, and they educate purchasers as to what is meant by it. Strange as it may seem, the question of true efficiency (output over input) is avoided by many compressor manufacturers and the purchaser does not have it explained as it should be.

To determine the energy delivered from a compressor, multiply the cubic feet per minute output by the horse-power required to isothermally compress one cubic foot of free air to the desired pressure in one minute. Figures of isothermal compression or compression without any increase in temperature, should be used because, although the air leaves the compressor hot, it loses this heat rapidly, and this should be considered as a part of the loss. Fig. 1 shows the horse-power required in the air-cylinder to compress one cubic foot of free air per minute to various pressures isothermally, in one and two-stage compression. These curves are taken from the standard authorities, and many points have been checked from actual tests. The one and two-stage curves are based on adiabatic compression plus 15 per cent.

To get the output of a compressor by actual test, the easiest method is by the use of standard orifices, using Fleigner's equation for the flow of air through an orifice; but when this cannot be done, a fairly good method is to consider that the machine compresses the air adiabatically and divide the indicated horse-power of the air-cylinder by that shown on Fig. 1 for one or two-stage compression, as the case may be. This will give a close approximation to the real output.

When purchasing an air-compressor, the first point to be considered is the capacity needed. This can be determined from Fig. 2, which takes into account only the actual working time of drills. If pumping is done by compressed air and the compressor has to be operated under light loads, Sundays, nights, and holidays, it will be well to consider an additional unit to take care of this light load, since the cost of operating any compressor increases rapidly as the demand for air decreases. This is a matter which should be considered separately for each plant in order to decide whether the saving in operating cost will pay for the additional investment. Aside, however, from the actual saving in operating cost, this arrangement gives a better chance to keep the main units in repair.

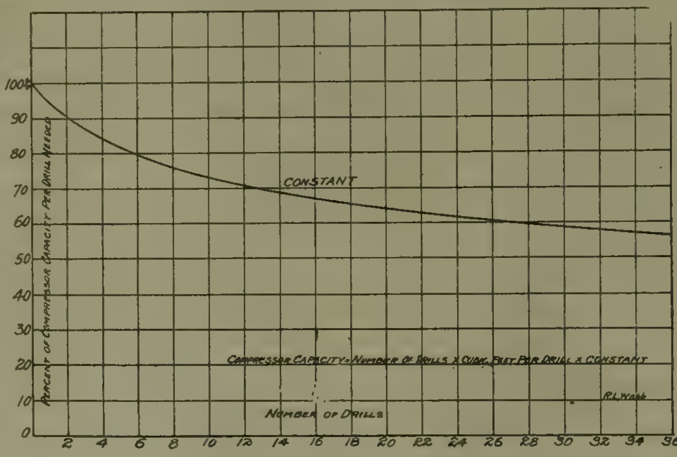


Fig. 2.

The question of whether to use one-stage or two-stage compressors depends on the pressure which will be needed, and is a matter of simple calculation which can be made from Fig. 2, but to obtain the full saving, it is absolutely necessary that the intercooler between the stages be of sufficient size so that the partly compressed air enters the high-pressure cylinder at its initial temperature. Multi-stage compression is frequently condemned because of this, as the compressor manufacturers are driven, by too close buying and unscrupulous competition, to cut down the cooling surface in the intercooler. In all cases the manufacturer should guarantee that with circulating water of a stated temperature the air will leave the intercooler at the initial temperature. It should also be required that the intercooler have hand-holes so placed and large enough to permit it to be kept clean. The cylinder walls and heads should be well jacketed and have good circulation, and with no dead spaces, so that these surfaces may be kept cool. It is true that jacketing does not cool the air during compression to any great extent, but it does have a great effect on the output of the compressor. *For each 5° F. increase in temperature, the volume of air increases 1%.* Thus, if the air entering the cylinder on the suction stroke meets hot surfaces, it at once increases in volume and the density is less than that of the atmosphere. This, when it occurs to any great extent, can be seen on indicator cards.

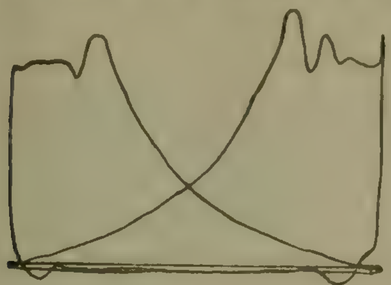


FIG. 3A.

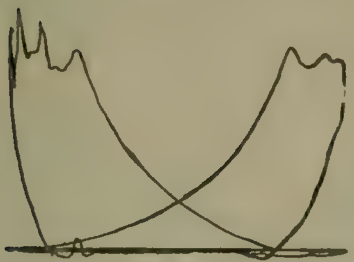


FIG. 3B.

The type of suction valves to be used is debatable, but it is important that if poppet valves are used they be so placed that the air drawn into the cylinder is as cold as possible. In all cases, it should be drawn through a duct from the outside and *not from the hot engine-room.* I have seen as high as 10% loss from this alone. When mechanically operated suction-valves are used, it is easy to connect the suction inlet with the outside air. The area of the suction valves should be ample, so the density of the air in the cylinder at the beginning of the compression stroke will not be less than that of the atmosphere. In most compressors the discharge valves are of the poppet type. They should be of sufficient area. In both suction and discharge valves the speed at which the compressor is operated affects the areas so that no rule can be given. It is extremely important that all valves should not be too tight or too loose and adjustable.

Every compressor should have all the cylinders tapped for an indicator, so that cards may be taken at regular intervals. These will indicate unsuspected troubles that cause waste of power. The clearance should be as small as is compatible with safety in operation. The clearance, or space between the piston when at the end of the compression stroke and the discharge valves, is at this period filled with compressed air which, as the piston moves back on its suction stroke, must expand until it is at or slightly below atmospheric pressure before a new supply of free air will enter the cylinder. The effect of this is to cut down the output, and in the card shown in Fig. 3A, the loss from this and possibly a discharge-valve leak, which latter could not be detected, was 20 per cent.

In most compressor plants the load or demand for air varies greatly. In direct-connected steam-driven compressors the pressure is kept constant or nearly so by an automatic throttling governor connected to the air discharge and controlling the speed by opening or closing the steam valve. This is called throttling. The Meyer valve, which is a slide-valve with an adjustable cut-off, is commonly used. The point of cut-off can be changed by hand and is not automatically regulated. This valve has been successfully applied quite generally where the speed varies and the compressor operates at low speeds most of the time with an occasional demand for full speed; for example, where there is an average of 35% of normal and operating mostly under 50%. For this condition, which is the one usually existing in the class of plants under consideration, I would give this valve the preference over the Corliss, but where the speed is over 50% the greater part of the time, the Corliss is more economical. The Corliss valve is intended to maintain a constant speed with varying load by automatically increasing or decreasing the point of cut-off. In the steam-driven air-compressor with its throttling governor in conjunction with Corliss valve gear, it was found that at below 50% of rated speed the Corliss release did not operate because of the throttling effect and that nothing was gained despite the increased cost of this gear.

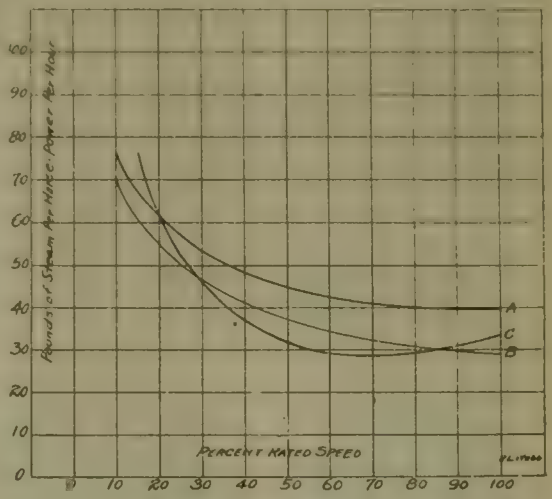


FIG. 4.

All of these types of gear may be compounded and also operated condensing, but the saving obtained by these refinements has to be considered in each case to determine whether it will pay for the increased investment. This is largely a matter of the cost of fuel and the class of labor available.

In all steam-engines the steam-consumption per horse-power increases with any decrease of load or speed. This applies to steam-driven air-compressors. This is shown on Fig. 4, which gives the steam-consumption per horse-power per hour as affected by speed of several types used.

With compressors operated by an electric motor, the varying demand for air is controlled by a weighted valve so arranged that when the pressure rises, the air churns from one end of the cylinder to the other, thus cutting down the consumption of electric current. This valve generally works on an exceedingly small difference in pressure; as low as a pound. The saving obtained by this method of regulation is much less than generally supposed, as there is considerable power used in churning the air, as well as in overcoming the friction of the compressor, so that in a number of cases tested it was found that it required from one-third to one-half as much power to operate the compressor with the unloader in use as when compressing against full pressure. The exact amount can easily be determined by a wattmeter and by timing the respective periods when the compressor is working and 'running light'. Under these conditions the use of an automatic pressure regulator to control the motor, such as is seen on the electric street-cars when air-brakes are used, is to be recommended. This device will automatically stop the motor and the use of electric current when the pressure reaches an adjustable predetermined point, and will also automatically start the motor when the pressure falls to another adjustable predetermined point. The starting and stopping points are separately adjustable. In most cases a ten-pound range can be allowed without any noticeable effect in the working of the machines, five pounds above normal as the stopping point, and five pounds below as the starting point. It can also be so equipped that an electrically controlled unloader will enable the compressor to start up light and not start compressing until full speed is attained. This latter device does away with an excessive starting load. By the use of this device I, in one case, saved a client 30% of his power bill without any noticeable effect in the operation. There are two of these devices on the market which have given satisfaction.

There is also a new type of control where the compressor is run at constant speed and the varying demand for air is taken care of by controlling the amount of air admitted. This is a step in advance, and is well worth considering in the larger-size units.

Grinding Wheels

At the third annual convention of the American Railway Tool Foremen's Association, at Chicago recently, H. E. Blackburn, of the Erie railroad, made the following pertinent suggestions, as reported in the *Railway Age Gazette*.

If Webster were to come back and make a trip through a modern shop, he would certainly have to revise a few things about "to grind." Instead of a slow, severe, continuous process of rubbing of material, his definition would read: "a rapid cutting process of reducing material to accurate size." The old method of reducing metal by machining it in the lathe and leaving it large enough to allow for filing and polishing to size, never did permit round or straight work. The next move was to machine the metal and allow enough to finish on the universal grinder. Now cast metal or drop forgings are made large enough to grind to size from the rough in some form of an automatic grinder, thus eliminating all machine work and allowing hardened surfaces to be finished to accurate sizes.

Just as much judgment is required in selecting wheels and speeds, as in selecting tools, speeds, and feeds for machine work. While no absolute rule holds good in ordering wheels, when you ask for soft wheels, most of your troubles are over (that is, if you can get them). The storekeeper may tell you that he notices that hard wheels last longer. Well, so does the work you are trying to get out. The management may say that the soft wheels wear away too fast, and that they do not keep their shape. Cobblestones, flour, or emery and glue, do not go far in making up a wheel in this progressive period. Still there are a few firms trying to convince you that it is a good combination. With such grits as alundum or carborundum you can pass over the question of material used, and study the grain and grade. If the grains, commonly called grit, are too fine, they soon clog up. If the grade is too hard, the grains, fine or coarse, cannot break away to expose a new set, and the work becomes burnt. There is only one place that you can use a hard wheel—put it on a bolt for a washer.

If you are allowed soft wheels of from 40 to 60 grains, you can grind or finish all the work that comes to a tool-room. Do not be deceived into believing that it takes a 90-grain wheel to do finished work. A good all-around grinding and finishing wheel is a 24 to 36-grain mixed soft wheel, speeded up to a mile per minute surface speed if it is allowed plenty of water; with a traverse feed of ¾ the face of the wheel to one turn of the work, you will have a fine finish. If you wish to take a roughing cut, use from 15 to 30 ft. per minute feed.

Keep the face of the wheel as narrow as possible. Wide faces on small work cause chattering, a fatal thing for both work and wheels; a ¼-in. face on 8-in. wheels is a good size, but if you value your good looks, use the elastic wheel instead of the vitrified when using these slim widths in deep gashes. A wheel that works well on large work does not, as a rule, cut well on small work, and it is always advisable to use the smallest wheel that the work will admit of, so as to get a good clearance. Cast iron or steel requires a soft coarse wheel. Rolled iron or steel requires a soft medium wheel. Cast or rolled brass requires a soft fine wheel. A good rule is, the harder the stock to be ground the coarser the grain of the wheel, and all wheels should be soft enough to be scratched with a scriber before you mount them for use.

While it is necessary now and then to violate tradition in order to do the work with what wheels you may have left over from your first order, avoid the slim, slick-looking hard one, for, like the aeroplane, it will do stunts in the air; and remember that the devil himself cannot make one wheel for 'all comers', if he can furnish the sparks. Teach the operator to have the wheel fit the arbor 'neat'. Be sure the arbor and washers run true, and that the drive-washer is keyed on the arbor, this washer to be one-third the diameter of the wheel. Use rubber pads between the washers and the wheel; don't allow the operator to jam the nut with a hammer. When everything runs dead true, you can feel safe for a good job, as a wheel out of true is only a one-eighth producer.

True the wheel with a diamond, and dress it frequently with a spur cutter. Instill into the operator's mind that dressing is not trueing. With rough diamonds at $12 mounted, there is no excuse for not having one. The operator should dress and true the wheel between heavy and finishing cuts.

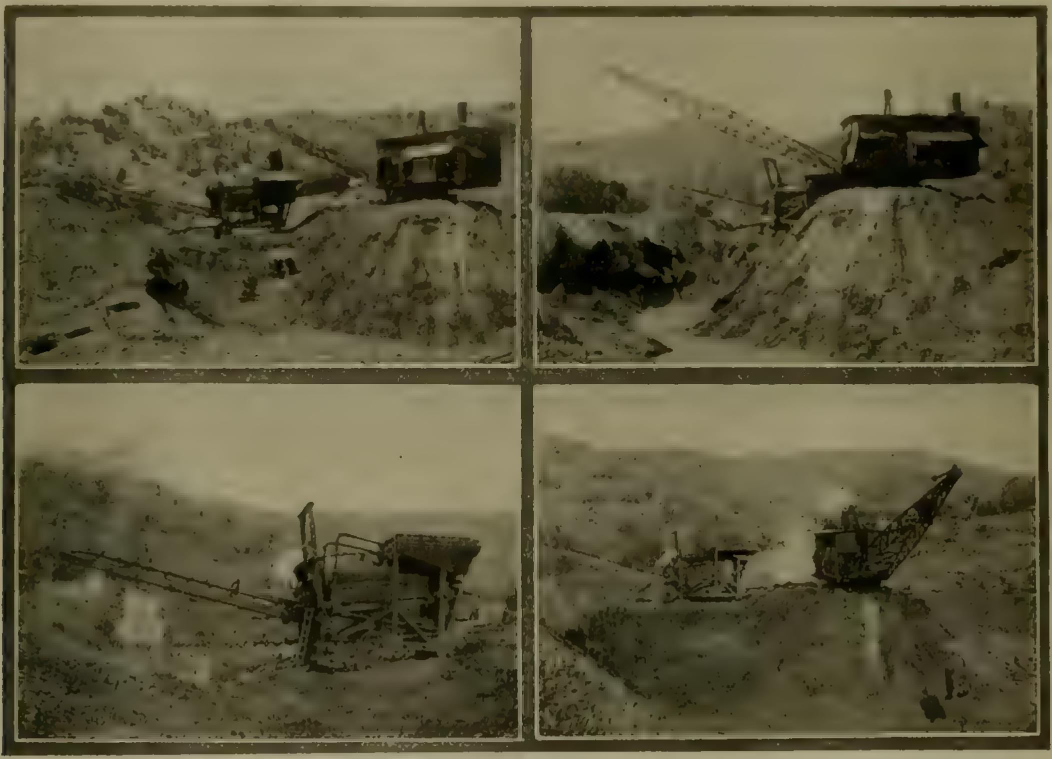
Remember that old machines and methods and slow operators soon start a graveyard in any shop. Keep clean and set the example for the operator to do likewise. If you wish to find out all the bad points about the wheels you are using, ask the wheel agent of a rival firm—you will be surprised at the outburst. Last of all, do not condemn any wheel until you have tried it on different metals with variable speeds and feeds.

SMALL HAMMER DRILLS are used with a chisel bit in the Hecla mine at Burke, Idaho, for cutting off the crushed ends of timbers. In the stopes the greatest pressure is from the squeeze of the walls, and as the ends of the stulls and caps become splintered and crushed, it is necessary to cut them off and put in new blocking. It is often difficult to get at the crushed timbers, and, even when accessible, it is not an easy job to chisel or saw the wet and twisted fibers by hand. The cutting of the wood is rendered quite easy with the drills, and by using sufficiently long bits, almost any desired place can be reached. The drills and chisels may also be used to great advantage for chiseling wall plates when an extra shaft compartment must be added, or in cutting off posts to ease up drift sets in heavy ground. In a number of mines, the blocking on drift caps is shot out when it is necessary to ease up on the sets; this work can much more safely and surely be accomplished with the drill.—*Ideal Power*.

SURPLUS COPPER STOCKS are lower now than at any time since February 1909, two and a half years ago. This fact can have but little effect in the present condition of business, but would form an excellent basis on which to work in the case of a business revival.

Bucket Scrapers in Dredging

Inquiries have been made for further particulars regarding the bucket scraper used by the Calaveras Engineering Co. in gold dredging and described in our issue of June 17. We therefore present below views showing details of both the bucket scraper and the washing apparatus. The scraper was originally developed for use in ordinary excavation. C. W. Purington, in 1909, saw the machine in operation in levee building at Muscatine, Iowa, and, recognizing the possibilities of the apparatus, purchased one for use at the Kolchan mines in Siberia. Views of this scraper in use handling accumulated tailing were published in the *Mining and Scientific Press* July 9, 1910, and in our issue of February 11, 1911, Mr. Purington presented full details of its operation. In Siberia the scraper was used to dig tailing from old placer workings, delivering to a sluice. It was erected in three weeks after arrival and made a cut 120 ft. wide and 27 to 30 ft. deep. Owing to insufficient water-supply, the machine was not operated continuously, but during the 59 days that it was in operation, 593 cu. yd. per day was handled; equivalent to full capacity $16\frac{2}{3}$ days of 24 hours each. Mr. Purington estimated that with sufficient water for steady sluicing, a capacity of 1750 yd. could be maintained with 20 hr. work per day. This year the scraper is delivering to a series of gold-saving tables similar to those on a dredge. These have been mounted on a scow floated in a pond following the scraper, which is now working in undisturbed gravel. The San Andreas bucket scraper illustrated in the accompanying figure, delivers to a set of similar trommels and riffles, in this case mounted on rails. The excavator rests upon rollers by which it is moved on a plank track. It has a 60-ft. boom upon which the scraper-bucket works, weighing $1\frac{1}{2}$ tons, and having the capacity of $1\frac{1}{2}$ cu. yd. The bucket is raised and lowered by means of a hoisting cable working over a sheave at the end of the boom; it is loaded by means of a drag-line running between a set of traveling sheaves in front of the floor plate. The loading and dumping is accomplished by means of an equalizer cable attached to the drag-line and front of bucket, and which passes over a sheave fastened to the bucket bail. The excavator has a bottom plate of steel, 14 ft. square, a 14 by 28 ft. floor plate of steel; between the two plates is a turn-table of 12 cast wheels resting on 80-lb. rails. The machine is turned by a single drum winding engine, having two cables attached, whereby a complete circle can be made and the buckets operated on all sides. The machine is operated by steam power, wood being used as fuel. Thus equipped, it has excavated to a depth of 45 ft., and can be worked to a depth of 50. The channel being dredged contains a considerable amount of barren clay, occurring in layers. By utilizing the equalizer cable on the bucket the operator is able to excavate in layers, and thus remove the clay. It requires two men on the excavator, one to operate, the other attending to firing, water supply, and oiling; one man is required on the washer. All bedrock material, except the limestone, can be excavated by the bucket.



BUCKET SCRAPER AND GOLD-SAVING PLANT, SAN ANDREAS, CALIFORNIA.

The material is dumped by the bucket into a 12 by 12-ft. hopper, from which it passes into an iron cylinder, $4\frac{1}{2}$ by 22 ft., which revolves at 12 to 15 r.p.m. The upper part of the cylinder has $\frac{3}{8}$-in. perforations, those in the lower 18 in. being $\frac{3}{4}$ in. The oversize discharges upon the stacker, by which it is carried to the dump; the undersize passes into an iron box lined with Hungarian riffles, in which 80% of the saving is made. The sand and gravel are then carried to a riffled sluice-box in which quicksilver is deposited, and finally to a 20-ft. sluiceway in which cocoa matting is used for recovering the fine gold. The cylinder and stacker are operated by a 15-hp. electric motor.

A somewhat similar bucket known often as an 'Oregon scraper' is frequently used in the West for shallow digging. It is handled by means of lines from a donkey engine and the bucket is so shaped that a pull on the main line forces it to dig into the ground till full. Such a bucket gave good service at Treadwell, Alaska, this summer while excavating in hard boulder clay, for storage-bin foundations. This device has been applied to placer mining near Oroville and was described by H. W. Turner in the *Mining and Scientific Press*, August 8, 1908.

Government Specifications for the Purchase of Fuel Oil

By Irving C. Allen

*Until within a few years fuels were generally bought solely on the statement of the seller. The consumer made little effort to find whether value was received for the price paid, but relied on the integrity of the dealer and the brand or trade name of the fuel. Recently, however, the plan of purchasing coal according to specifications of quality, especially heating value, has gained favor. In consequence of the success that has attended the use of heating-value specifications in buying and selling coal, there has arisen a demand for similar specifications, based on careful tests, to govern the purchase of fuel oils and the refined products of petroleum. These specifications, to be satisfactory, should establish not only the heating value of the oil, and thus show, like the specifications for coal, the number of heat units the purchaser obtains for a given price per unit quantity of fuel, but also the physical character of the oil, its flash point and burning point, and the quantity of extraneous matter it contains.

The Bureau of Mines has received many inquiries from Government bureaus and from private concerns regarding fuel-oil specifications and the sampling of purchases. In reply to these inquiries the bureau has issued a report, which, although intended primarily for the guidance of Government officials, may be of service to all persons who buy or sell fuel oil.

(1) In determining the award of a contract, consideration will be given to the quality of the fuel offered by the bidders, as well as the price, and should it appear to be to the best interest of the Government to award a contract at a higher price than that named in the lowest bid or bids received, the contract will be so awarded.

(2) Fuel oil should be either a natural homogeneous oil or a homogeneous residue from a natural oil; if the latter, all constituents having a low flash point should have been removed by distillation; it should not be composed of a light oil and a heavy residue mixed in such proportions as to give the density desired.

(3) It should not have been distilled at a temperature high enough to burn it, nor at a temperature so high that flecks of carbonaceous matter began to separate.

(4) It should not flash below 60° C. (140° F.) in a closed Abel-Pensky or Pensky-Martens tester.

(5) Its specific gravity should range from 0.85 to 0.96 at 15° C. (59° F.); the oil should be rejected if its specific gravity is above 0.97 at that temperature.

(6) It should be mobile, free from solid or semisolid bodies, and should flow readily, at ordinary atmospheric temperatures and under a head of 1 ft. of oil, through a 4-in. pipe 10 ft. in length.

(7) It should not congeal nor become too sluggish to flow at 0° C. (32° F.).

(8) It should have a calorific value of not less than 10,000 calories per gram (18,000 British thermal units per pound); 10,250 calories to be standard. A bonus is to be paid or a penalty deducted according to the method stated under section 21, as the fuel oil delivered is above or below this standard.

(9) It should be rejected if it contains more than 2% water.

(10) It should be rejected if it contains more than 1% sulphur.

(11) It should not contain more than a trace of sand, clay, or dirt.

(12) Each bidder must submit an accurate statement regarding the fuel oil he proposes to furnish. This statement should show: (*a*) the commercial name of the oil; (*b*) the name or designation of the field from which the oil is obtained; (*c*) whether the oil is a crude oil, a refinery residue, or a distillate; (*d*) the name and location of the refinery, if the oil has been refined at all.

(13) The fuel oil is to be delivered f. o. b. cars or vessel, according to the manner of shipment, at such places, at such times, and in such quantities as may be required.

(14) Should the contractor, for any reason, fail to comply with a written order to make delivery, the Government is to be at liberty to buy oil in the open market and charge against the contractor any excess of price, above the contract price, of the fuel oil so purchased.

(15) Deliveries of fuel oil will be sampled by a representative of the Government. Whenever such action is practicable, the oil will be sampled as it is being delivered. The final sample will be made from samples taken from as large a proportion of the delivery as practicable, in order that the final sample may truly represent the delivery.

(16) The final sample will be sealed and forwarded to the Federal Bureau of Mines, Pittsburg, Pa., for analysis.

(17) If the contractor so desires, permission will be given him, or his representative, to witness the sampling of the delivery and the preparation of the final sample.

(18) The final sample will be analyzed and tested immediately after its receipt at Pittsburg.

(19) A contract entered into under the terms of these specifications shall not be binding if, as the result of a practical service test of reasonable duration, the fuel oil fails to give satisfactory results.

(20) It is understood that the fuel oil delivered during the term of the contract shall be of the quality specified. The frequent or continued failure of the contractor to deliver oil of the specified quality will be considered sufficient cause for the cancellation of the contract.

(21) Payment for deliveries will be made on the basis of the price named in the proposal for the fuel oil corrected for variations in heating value, as shown by analysis, above or below the standard fixed by the contractor. This correction is a pro rata one and the price is to be determined by the following formula:

$$\frac{\text{Delivered calories per gram (or B. t. u. per lb.)} \cdot \text{contract price}}{\text{Standard calories per gram (or B. t. u. per lb.)}} = \text{price to be paid.}$$

Water that accumulates in the receiving tank will be drawn off and measured periodically. Proper deduction will be made by subtracting the weight of the water from the weight of the oil deliveries.

These specifications provide for the purchase of fuel oil by weight. As such oil is frequently delivered by volume, it is important to note the temperature of a delivery and to allow for the expansion due to this temperature when computing the weight of the delivery from volume. From the volume of the oil at the temperature of delivery, the volume at standard temperature (15° C.) should be computed in the manner given below.

The coefficient of expansion of ordinary fuel oil residues of asphaltic base is approximately 0.0006 per 1° Centigrade.

Hence if the temperature (N° C.) of the delivery is above 15° C., then (N° C. – 15° C.) × 0.0006 = correction. This correction is to be added to the specific gravity at N° C. to give the standard specific gravity, that at 15° Centigrade.

If the temperature (N° C.) of the oil delivered is below 15° C., the correction ([15° C. – N° C.] × 0.0006) is to be subtracted from the specific gravity at 15° Centigrade.

Since a gallon of water at a temperature of 15° C. weighs 8.3316 pounds, the weight in pounds of a gallon of oil at 15° C. is 8.3316 times the specific gravity of the oil at that temperature.

Similarly, since a cubic foot of water at 15° C. weighs 62.3425 pounds, the weight in pounds of a cubic foot of oil at 15° C. is 62.3425 times its specific gravity at that temperature.

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*Abstracted from Tec. Paper 3, U. S. Bureau of Mines.

Founding of the Michigan College of Mines

By J. Parke Channing

*In the autumn of 1884 I was asked by A. P. Swineford, ex-governor of Alaska, who was at that time Commissioner of Mineral Statistics for the State of Michigan, to examine and report upon the various copper mines of the State for the forthcoming annual report. Having graduated from the Columbia School of Mines only a little over a year before, and realizing as I do now that the possession of a diploma did not [illegible] knowledge of the mining [illegible], it was with considerable [illegible] that I entered upon this [illegible]. But a few days' work, however, convinced me that everyone was ready to help me, the particularly gracious people being the Cornish mine superintendents and captains, who made allowance for my inexperience, and with their vast fund of practical knowledge guided my steps aright. To such men as James **Dunstan, William Tonkin, Samuel B. Harris, John Daniell,** and Johnson Vivian I was particularly indebted. In talking with them and their various subordinates the question of technical education was frequently discussed, and its desirability for the rising generation was freely admitted. In particular there was a crying demand from the ambitious young and middle-aged men for some means of studying the science of mining outside of working hours.

Early imbued by my mother with the truth of the words of St. Simon that "All should labor for the development, material, moral, and intellectual of the class most numerous and the poorest," and knowing that talent and genius from all conditions rise, I was filled with the desire to found a school, which has now developed into the Michigan College of Mines. I had but lately come from Drifton, Pennsylvania, where Eckley B. Coxe had established a day and night school for the miners, and this seemed to appeal particularly to the men who were working in the mines and who wished to raise themselves from the positions of merely running a drill, to the large and more important places which were ever demanding their services. After finishing my examination and writing my report for Mr. Swineford, in January 1885, I wrote a letter to the Marquette *Mining Journal* stating thoroughly my views on this matter, and suggesting that something be done by the State toward the establishment of a mining school. As has always been the case in respect to meritorious suggestions, the Marquette *Mining Journal* published this letter in full, with favorable editorial comment, and a copy of this issue of the *Journal* found its way to J. A. Hubbell, who as Senator was then representing the Upper Peninsula at Lansing. The suggestion appealed to him, and I remember his writing me asking me to get him some extra copies of that particular issue of the *Mining Journal*, which I did, and sent them on to him. He soon after secured the passage of an act by the Legislature which was approved May 1, 1885, establishing the Michigan College of Mines, which, however, at that time was called the School of Mines, and with it an appropriation of $15,000, in support of the school.

From that time forth Mr. Hubbell devoted his best energies to the development and prosperity of the school, and its success has been principally due to his zealous efforts. I remember soon after the school was started, he told me that had I been older and more experienced, it would have greatly pleased him to put me in charge of the school. While recognizing the justice of his judgment, I could not but admire the wisdom of his choice of Albert Williams, Jr., a graduate of Princeton, to launch the adventure. Mr. Williams remained in charge for two years and then resigned. M. E. Wadsworth, a graduate of Bowdoin and of Harvard, was chosen president next and remained so for a number of years until he was succeeded by F. W. McNair. In the beginning there were no buildings for the School of Mines such as you now see, and the basement of the fire engine building at Houghton was used for class rooms. In September, 188[illegible], some rooms in the Odd Fellows' building were secured, but the continued growth of the school in the summer of 1888 obliged them to take rooms in the Roller Rink building, which afterward became the Armory Opera House. It was not until 1889 that the first building, known as Science Hall, was occupied. This building was erected upon land donated by Mr Hubbell, and this was the forerunner of the present college buildings. In 1890 the Ore Testing Works were constructed, and in 1892 a small building was erected containing some metallurgical furnaces. In 1895 the State erected another large building, which took in the department of Electrical Engineering, Mechanical Engineering, and Drawing, and the office and lecture rooms of the Civil and Mining Engineering courses. From that time on the growth of the school has been steady and its graduates have commanded ever increasing respect for their integrity and capacity in the mining world. From the first sum of $15,000 the annual appropriations have increased, so that the total for the quarter century is $1,182,420. The total number of students registered has been 1563, and the number of graduates 640.

The principles formulated at the time the school became thoroughly organized and its functions defined are given below, and it is hardly necessary to say that they have always been closely adhered to:

1. To keep the school a special one for giving instruction in all branches relating to the development of the mineral wealth of the State and Nation.
2. To give the very best, most practical, and highest education in this field that it was possible to reach with the means at command.
3. That the instruction should always be by laboratory and field methods, or a true union of theoretical and practical instruction.
4. That the school should in its earlier days, put every dollar obtainable into equipment and collections for teaching purposes, and spend nothing for show, until the departments themselves were in a condition to do their proper and designated work.
5. That special opportunities should be given to men of mature or advanced age who had been engaged in practical work, and who wished to obtain an education to aid them in their subsequent labors.
6. That the catalogues and other publications should state, so far as could be known in advance, the exact truth about the school and its instruction.
7. That no one should be appointed an officer in the schools, or be retained therein, for any other reason than his fitness for the place and his capabilities for doing his work.
8. That students in the school must work or leave; and that no distinction should be made among them on account of their wealth, social position, or birth place, the only criterion being their ability to perform their duties. Also that quality and thoroughness of work should be the aim, and not mere numbers of students.
9. That the institution should be managed on business principles, and the professors be allowed to conduct their departments according to their own individualities. They should be held responsible for producing the required results, but not for their methods of bringing about these results. They should have entire choice of, and control over, their subordinates, who were to be solely responsible to them. Further, that the professors should receive from the president every aid and assistance possible in developing their departments, and they should be supported in enforcing proper discipline.
10. That the school should be conducted for the benefit of the students and of the State and Nation, and not for the particular advantage of the town in which it happened to be located, or any special clique. This should be done

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*Address delivered at Houghton, Michigan, August 8, in celebration of the twenty-fifth anniversary of the founding of the college.

in the belief that in serving the State best the local town would in the end be more benefited than by any other policy.

The Board has always been composed of mining men, and it is greatly to their credit that they have always found time, without prejudice to their especial work, to give the school a full share of their attention.

Although a graduate of the Columbia School of Mines and thoroughly loyal to my *alma mater*, I am convinced that a mining school properly financed and officered, and situated in a mining district like Lake Superior, can not be excelled in the superiority of the instruction it can offer its pupils. I say properly financed, because when so conditioned it can in a great measure offset the advantage usually enjoyed by larger schools in large cities, of being able to offer temptingly large salaries, and thereby draw from smaller schools men who have demonstrated their efficiency as instructors. Hence the word 'success' when associated with a school, inadequately financed, is often but a prediction of its sooner or later failure, by reason of its inability to long retain a sufficiently large corps of able teachers. The State of Michigan derives much revenue from the mines, both directly and indirectly, and it should not be niggardly in its appropriations for the Michigan College of Mines. When men realize that the more numerous the prosperous and educated in the community the greater the guarantee of individual happiness and prosperity, then they will cheerfully endure any amount of taxation. The State must in self-defense educate the masses.

Germany recognized the necessity and advantage of having a mining school in a mining district, when it established a School of Mines at Freiberg and one at Clausthal. It is difficult to describe a mine to a student, and while a great deal of preliminary instruction is purely scientific, yet it is better that a student see a mine than attempt to evolve it out of his inner consciousness, as the German philosopher did the elephant. Schopenhauer in his 'Essay on Education' lays stress on the fact, that "the main endeavor in education must always be to let particular observations precede general ideas and not vice versa, as is usually and unfortunately the case." It has been truly said that objects may be segregated and studied through a tube; but their combinations require the naked eye. The inspection of instances is but preparatory to reflection upon principles. In the mining district the advantage of constant intercourse with the man who is doing things in mining, must be considered as exerting a greater influence in developing the understanding, than can be acquired in any of the technical schools, be they in New York, New Haven, Cambridge, or San Francisco.

I cannot do better in closing this address than to quote the following apt words from a lecture by Thomas Egleston, who established the Columbia School of Mines: "Sit at the foot of the practical man. When you know what he knows, with what you already know, you will know more than he knows."

THE tin-gravel industry of Northern Nigeria has been attracting attention. While some of the properties are doing exceedingly well, others are proving disappointing because the concentrate is found to contain excessive amounts of other minerals such as ilmenite. The Naraguta company is one of the successful mines. It was formed in January 1910, for the purpose of working in the province of Bauchi, and is a subsidiary of the Champion Gold Reefs of West Africa. C. G. Lush is consulting engineer and F. O'D. Bourke is manager. During the 14 months ending March 31, 551 tons of tin concentrate was won from 10 acres of land by sluicing and calabashing. The sale of this produce brought an income of £62,603, and after paying all expenses, including taxes, there was a profit of £27,161. Out of this, £17,500 has been distributed as dividend, being at the rate of 10%. The property bought by the company on flotation is 5 miles in extent, and other tracts are to be acquired. The results are excellent, considering the crude methods at present possible.

Rhodesian Gold Production

STAFF CORRESPONDENCE

The gold production of Rhodesia has been stationary for two years or more, and in many quarters the want of progress is interpreted pessimistically. It is no use denying that the country is in the hands of the big people, not so much, of course, as in earlier days, but still sufficiently to discourage the independent small man. Much of the pause in the increase of output has been caused by the big houses taking over the properties of small people, and suspending output while further development is done and machinery provided. In other cases properties have been recently developed by the big houses that promise to be important producers before long. The Cam & Motor and the Shamva are perhaps the most promising of these. In the meantime the Globe & Phoenix and the Eldorado continue to take the lead.

As regards the Eldorado, the reports reaching London indicate the presence of much rich ore. The mine was first developed about eight years ago and it was floated as a going concern by the Rhodesia Exploration & Development Co. in 1906. It is situated northwest of Salisbury. The ore is refractory and is treated in stamps, Chilean mills, grinding pans, and cyanide plant. H. Ewer Jones, the consulting engineer, reports that ore has now been exposed on the sixth and seventh levels for lengths of 1073 ft. and 875 ft., respectively, and that on the seventh level 100 ft. of the main lode averaged 4 oz. per ton over a width of 6 ft. On the eighth level, where the cross-cut from the shaft has met the lode, the orebody is 6 ft. wide and assays 5 oz. per ton. Also a winze has been sunk from the seventh level and the ore exposed for the whole of the 70 ft. sunk averages 43 dwt. over 5½ ft. The ore reserve is calculated at nearly 200,000 tons averaging 16.3 dwt. per ton. During the year ended March 31 last, 82,802 tons of ore was treated, yielding 48,264 oz., or 11⅔ dwt. per ton, a recovery of 94% of the estimated contents. The profit distributed to shareholders was £90,000.

THE WANDERER MINE, SELUKWE, RHODESIA.

One of the lowest grade gold-mining properties in Rhodesia is the Wanderer, Ashton, and Camperdown group in the Selukwe district. The ore is disseminated through the so-called banded ironstone. When the mines were first started the ore was of higher grade and operations were more profitable than nowadays, and from 1903 to 1906 the average annual output was 25,000 oz. Then came several lean years, and in 1909 the Camperdown was acquired. The annual amount of ore now treated is nearly 200,000 tons, of which rather more than one-half comes from the Camperdown and the remainder from the Ashton. During the past twelve months the assay value of the ore was 3 dwt., and 2.35 dwt. was recovered. The year before there was only 1¾ dwt. in the ore and 1.38 dwt. was recovered. It will be seen that the extraction is not high and is less now than a year ago. The ore is crushed in rolls and cyanided direct. Experiments are being made with a view to improving the metallurgical work. The profit for the past year was £15,000, and in all probability the current year will give such good results that the company will get on the dividend list again.

A Mexican Mill

Through the courtesy of C. H. [illegible] we present below a view of the Guerrero mill of the Compañía Minera Real del Monte y Pachuca, the well known Mexican property of the United States S. R. & M. Co. The mill, originally opened April 27, 1908, with 40 stamps, has been enlarged until the plant now includes 60 stamps of 1050-lb. weight crushing to 3 mesh. There are also 10 Evans-Waddell Chile mills, 12 Wilfley tables, 40 Johnston vanners, of which only 5 are in use at present, 12, 4 ft. 6 in. by 18 ft. tube-mills, of which 4 have El Oro lining, and a complete cyanide plant, of which the outside vats and agitators are shown in the illustration. The plant has a capacity of 15,000 tons and yields $[illegible],000 in silver bullion per month. The Real del Monte is possibly the oldest Spanish mine in Mexico. Work is known to have been in progress here as early as [illegible], and the patio process was applied here, for the first time, in 1557. It is a striking fact that a mine older than the invention of that process is still an important producer and has lived to be benefited by cyanide and electricity, after having used successfully the patio and the barrel process.

HACIENDA DE GUERRERO, HIDALGO, MEXICO.

An Engineer's Diary

An occasional engineer keeps a diary and the practice has so much to commend it that it deserves to become universal. I do not refer to the diary of personal interest, kept in fancy-covered gilt-edged books, begun January first, exactly, and discontinued February second, approximately, but to a systematic record of the progress of and incidents connected with the specific construction work in hand. Two questions relating to such a diary naturally suggest themselves to the engineer, namely, what class of information should be recorded, and would such a record have permanent value. Naturally the selection of the material will depend upon the office system of the engineer. The diary should be a supplementary record. For example, if a cost-keeping system has been adopted on the work and cost-keeping clerks are employed, the engineer's diary need not cover the feature of the work. If systematic cost-keeping is not otherwise arranged for, the diary should contain at least general cost records which the engineer readily can collect and compile daily.

During the progress of construction many troublesome situations arise of varied character. Often there are slight changes made in the plans as a result of situations and conditions which had not been anticipated. Difficulties arise in construction, and special methods are required to overcome them. Accidents occur to men and machinery and frequently both need mending and adjusting. In fact, the varied duties and responsibilities of the engineer in charge, in relation to matters of detail, are such that they constitute the most interesting part of his work. The methods used by him in overcoming the multitude of difficulties, large and small, incident to every piece of construction, go far toward determining the value of his services. Surely many of these methods, which at the time are regarded as mere incidents in the day's work, deserve permanent record.

That such a record, faithfully kept, would be of permanent value to the individual keeping it seems obvious. That it would be of value to others may not be so obvious and may be questioned by some. A diary which preserves the spirit and details of a piece of work will certainly always be of interest to the man who wrote it, and it will be of value to him in many ways. Before a job is finished it will become necessary to fix the date of some occurrence connected with it. If litigation arises the diary frequently comes in very handy when introduced as evidence and is given much weight in arriving at the truth and in establishing facts. The output per man per day on different classes of work under varying conditions is a matter of record with the diary keeper, and such data are of great value to the compiler and to others when similar conditions arise.

At the end of a job, or as soon thereafter as it becomes convenient, it becomes a very simple matter to edit the diary and thereby prepare an excellent article for publication in a technical paper, or for presentation before an engineering society. It is very important to note that an article so prepared would be rich in specific data and would be correspondingly valuable. While a job is in progress the resident engineer frequently is too busy to think of writing an article, and after the job is finished he often finds that he has forgotten many details which he feels should be included in a description of the work, so the article is never prepared. Many who are willing to contribute to technical literature never do so for that reason.

An article on construction, prepared after the work is completed, becomes largely a general description unless notes are available, which were taken during the progress of the work. General descriptions are of more interest than value to the reader, and are paid for proportionately. Specific information relating to engineering work is merchandise with a good market value, and diaries are specific information mines.—*Engineering & Contracting.*

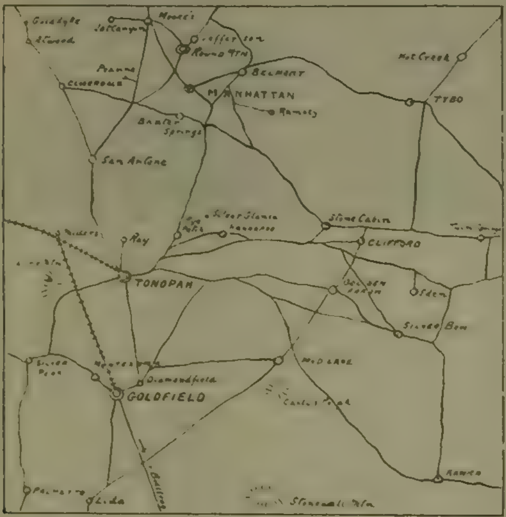
RESCUE TRAINING should not be undertaken just after eating, nor less than two hours since the last meal. During work in a mine the wearer should frequently rest by sitting down a few moments.

Developments at Manhattan

By An Occasional Correspondent

Manhattan, the 'Camp of the Pines' of central Nevada, launched in 1906 in the boom period of the Nevada excitement, now gives indications of making good. Its early promise is being realized in a substantial manner: one mining company has begun paying dividends, while lessees' operations have been profitable for some years. The froth and frenzy of the initial excitement, attended by the wave of insincere advertising of the unscrupulous, have passed, which is but a repetition of the history of every Western mining centre since the '50s, though the 'booming' was on an exaggerated scale in the case of Manhattan.

The status of mining is about as follows: No mines of importance, comparable with the Mizpah at Tonopah, the Combination at Goldfield, or the Nevada Hills at Fairview, were opened by the initial development. The ore found, while good, was scattered through the limestones and shales, and the owners were too busy scattering the shares to an eager public to pay much attention to serious mining. The position of Manhattan, 52 miles from the railroad at Tonopah, and 90 miles from that at Austin, and its situation at an elevation of 7000 ft., was against economical working. For the first mill the bill for freighting by railroad and team was said to have been $25,000. Small leasing operations predominated almost from the outset. By the fall of 1907, when the panic crippled practically all the banks of Nevada mining districts, the parent companies were not only deeply indebted to the banks, but their shares were scattered across the continent. Over 300 companies were affected.



PART OF NEVADA.

The spring of 1908 saw the first mill of importance in operation: this meant some ready money for the hungry lessees. The yield from the ore-dumps, however, went principally to satisfy the banks, yet it put things on a more substantial footing. The mill was erected on Mustang hill, and belonged to the Manhattan Ore Reduction & Refining Co.; it was subsequently purchased by the War Eagle company and is thus known. Organized and built upon the results of the experimental work of Francis L. Bosqui by J. H. G. Wolf, with the support of several mining companies, it has been the underlying means, by running as a custom plant, of holding men at the camp and furthering deep development. The treatment involves crushing by stamps, sliming all the pulp in tube-mills, precipitating with zinc-dust in a Merrill press. The mill was designed throughout for 20 stamps with tube-mills, or a capacity of 100 tons per day; 10 stamps only have been erected as yet. The advent of electric power in 1909 from the big plant that supplies all southwestern Nevada, by promoting cheaper mining and working of the ores, coupled with the discovery at the same period of placer gold on the bedrock of Manhattan cañon through a length of 5 miles, were the means of bringing the district back into public notice. The progress has been marked and substantial since then. For example, an orebody has been found and has yielded to date $250,000 in the Big Four mine on Gold hill. This property's surface was pecked at superficially in the early days, and, though favorably situated near the western end of the anticlinal dome or uplift in which valuable ores are found, no serious prospecting was attempted. This orebody is not exhausted, and is being explored at 400 ft. in depth; the ore is sulphide and yields about $40 per ton, with a reputed mill-extraction of 95%. The discovery of the Big Four orebody has encouraged more extensive development generally, particularly on Gold hill. The Litigation Hill end (east) has yielded considerable ore from shallow depths (so far) from the main lode traversing that section. Base ores, but of high value, have been developed from the Consolidated property eastward, but the ores of the remainder of the camp are practically free milling, requiring, at the most, all-sliming and cyaniding. The yield of the mill for the past twelve months, treating 11,500 tons, is reputed to have been $316,918, or some $28 per ton. This should be gratifying to the observers who visited the camp only in the early days, when so much chicanery and exploitation of the unwary were rampant. Manhattan may yet become an important producer, and while it will probably never yield as Tonopah and Goldfield have done, it may rank well with any of the late desert camps.

The yield of placer gold of the cañon is said to have been $300,000. The gold is coarse, angular, has quartz attached frequently, and gives but little evidence of having traveled far. How profitably the above yield has been won is not known; its chief significance is in the fact that while geologists have determined the surface erosion to have been relatively slight, placer gold is persistent for six miles or more into Big Smoky valley. As in the ancient channels of California, the valuable gravel, $5 to $15 per yard, is at or near bedrock.

Pangasinan, Philippine Islands

An examination of the northern portion of Pangasinan has been made by Mr. Fanning of the division of mines, Bureau of Science, in order to investigate the reported occurrence of oil, gold, copper, and other minerals. About 300 square miles of territory was covered and the essential features of the geology were determined and mapped. The detailed report and geological map is on file at the Bureau of Science and is open to the inspection of those interested. In brief, Tertiary sedimentaries of limestone, sandstone, and shale occur over the area except to the south and east. The structure is monoclinal with gentle dip to the northwest. Some slight folding has taken place, but there is no evidence of extensive faulting or shearing. Many persons have reported that oil seepages are frequently seen in the rainy season, and that the smell of gas is distinct. The examination was made in the dry season and no evidence of oil was seen, although the structure is adapted to oil accumulation. The area most favorable for such accumulation extends from Anda on the north to Balincaguin on the south and from west of Bani to Alaminos on the east. Artesian wells are soon to be bored at Anda, Bani, and Alaminos, which will probably give some evidence as to the possibility of oil. Some of the adjacent area can still be located as placer claims; or lease on occupied land can be had for small sums. The district was further examined for the occurrence of the valuable metals and the existence of gold, silver, copper, lead, zinc, and bismuth has been confirmed. However, as far as is now known, the deposits are of no commercial value.

Signaling From Mine Cages

A new device which permits those in the cage to signal and telephone to and from elevator cages when the latter are in motion, and which is of especial value for mine hoists, because the usual bells, whistles, etc., used are unreliable even for shafts of medium depth, has been put out by the Wernerwerke of the Siemens-Halske Co., Charlottenburg. The simplest signaling device uses two uncovered wires which hang free and may be pressed together at any point of their length, thus making electric contact and giving the signal. Where the speed is but moderate, the usual press-buttons may be employed, but where the cage travels rapidly and the service is regular, such devices do not suffice. The signaling arrangement proposed by Ryba has either two free-hanging wires with sliding contact, or employs the cage cable as one conductor; but as many separate signal devices are necessary as there are levels from which it is wished to signal; and where the mine is deep and the levels numerous, there is risk of tangling and breaking of free-hanging conductors. Another apparatus employs steam or compressed air which operates a whistle. A device patented in Germany about 1881 used the cable as return electric conductor; but as cables are liable to part at high speeds, and as the insulation was not perfect, it had no success.

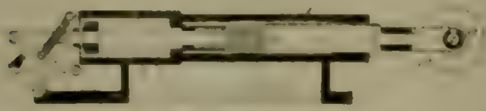


FIG. 1. SECTION THROUGH SIGNAL APPARATUS.

The sender of the device here illustrated is shown in lengthwise section in Fig. 1. In the cast-iron cylinder *a* the spiral spring *b* moves the piston *c* when the hand-lever *d* sets free the latch *e*. At the free end of the piston there is a loosely hinged contact roller *f*, which a hollow, hard-rubber cylinder *h* insulates from its shaft *g*. The conductors *i* (Fig. 2 and 3) of profile wire of 100 sq. mm. cross-section, and weighing 0.9 kg. per metre, or say 1.8 lb. per yard, are attached by wrought-iron clamps *k* to double-bell porcelain insulators *l*, which are protected from mechanical injury by hard rubber and are attached by clamping-plates *m*, *m*, to the shaft-framing *n*, every three metres (9.84 ft.). The current is furnished by eight elements of 11.3 volts and 4 amperes; the signal is given by a 'buzzer'. Fig. 4 shows the entire system.

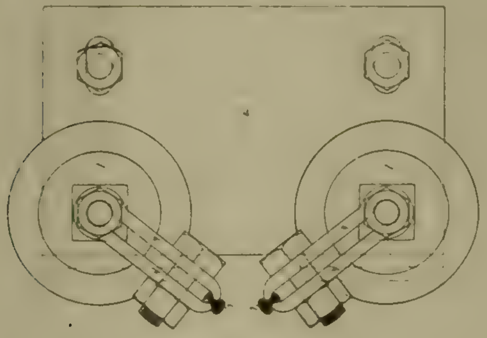


FIG. 2. PLAN.

Recent extended tests thereof have been made by the Prussian State Mining Inspection Department at Louisenthal. The place selected for the experiments is in the wettest portion of the mine, where the water constantly splashes from the levels into the shaft; the length of this section being 98 ft. The signal sender was built into the uppermost of the front section of the elevator cage, under the roof. In order to set the apparatus in function, it is only necessary to lift the lever *d* which frees the pawl *e*. The pressure of the spiral spring *b* then forces the contact roller *f* against the contact conductors *i*, thus closing the circuit and setting off the alarm. To repeat the signals the lever *d* is raised and lowered as often as is required; in fact, the Morse code may be used.

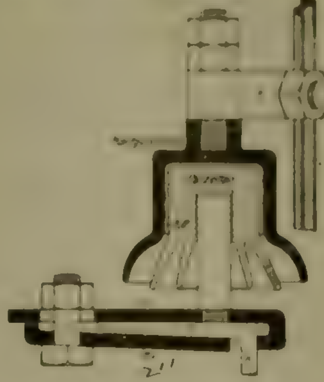


FIG. 3. CONDUCTORS.

Instead of the ordinary alarm, buzzer, bell, or other similar signal, there was also employed in the tests an electric horn. The signals were given at a cage speed of 1378 ft. per minute, 1186 ft. being the highest permitted for miners. The experiments, which were continued throughout an entire year, show that during this time the appparatus was thoroughly reliable. This is the main essential of such a device. The running of the conductors interfered with nothing else, and was itself attended with no special difficulty. Attempts have been made to telephone from the moving cage to the levels; there is, however, but little use for such facilities, especially when the cage is in rapid motion, as the stopping place would be

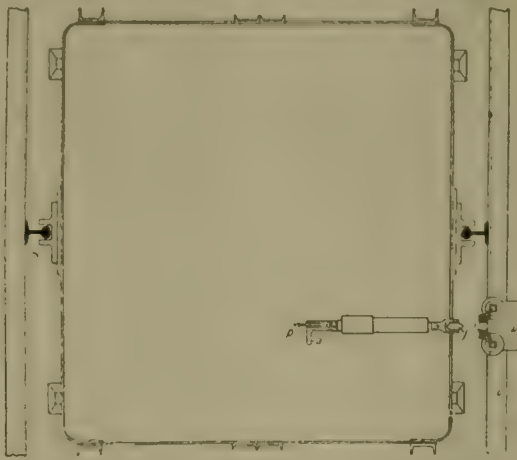


FIG. 4. GENERAL ARRANGEMENT OF SIGNAL APPARATUS.

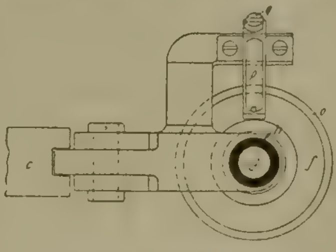


FIG. 5. SIDE VIEW.

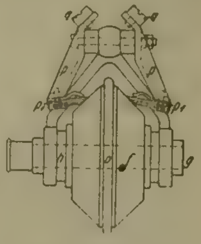


FIG. 6. END VIEW.

reached before telephonic connection were established. For cases of danger, however, the contact roller *f* could be altered as in Fig. 5 and 6; there being a hard-rubber disk between two parts fully insulated from each other. Above the roller there would be a spring current-taker *pp*, connected with the contact strip *i* and the cage telephone by the screws *q*. In telephoning, the operation would be the same as in signaling; but in rapid running the noise of the cage would vitiate all attempts. For telephoning from the cage when standing still, the arrangement shown in Fig. 5 and 6 would be unnecessary.

Loss of Treasure in Ships

By Alex. Del Mar

There are but few accounts of the loss of treasure in ships before the discovery of America, the most notable one being a sum of livres, probably equal in silver metal to about $200,000 of the present day, sent by Blanche, regent of France, to Louis IX, then at Acre in Syria, and lost at sea. But after the Spaniards began to plunder the New World, these losses became so numerous and important that they largely influenced the flow of the precious metals, the course of trade, and the finances and politics of Europe. The following list, covering the sixteenth and seventeenth centuries, though probably imperfect, is the result of considerable research:

1502. The fleet of Francisco de Bobadilla was lost off San Domingo, with 200,000 castellanos of gold, equal in fine metal to about $600,000 of the present day: "the product of two years of unexampled cruelty and oppression." (Prescott, 'Ferd. and Isabella', II, 500.)

1522. December 20. Eighty-eight pesos in gold bars and the wardrobe of Montezuma, rich with jewels, among them pearls the size of hazelnuts, shipped by Cortes to the king of Spain, captured by a French corsair named 'Jean Florin'. (Helps, 'Spanish Conquest', III, 16.)

1572. The Lisbon fleet from Brazil with half a million of gold crowns captured by the Dutch. (Motley, 'Dutch Republic', p. 476.)

1573. August 9. Drake returned from a piratical voyage on the Spanish Main with such a quantity of gold and silver that he was able to divide 4700% net on the stock of the 'adventurers' who had fitted him out. The booty was so vast that much of it had to be buried in Mexico and may never have been recovered. (Merchants 'Mappe of Commerce', 1683; Beckett, biography.)

1580. November 3. Drake returned from his cruise around the world with $4,000,000 in gold and silver captured from the Spaniards. In the 'Cacafuego' alone he found 13 chests of coined money, 80 pounds of gold, 6 tons of unrefined silver, besides wrought plate to a great amount. ('Halcyon Age', p. 3.)

1586. Drake plundered and sunk a number of Spanish galleons, some of them laden with treasure, but the amount lost is not known.

1587. Drake sunk 100 Spanish vessels, 10,000 tons, some of them laden with treasure, in Cadiz harbor.

1588. July 19. The Spanish Armada defeated by the English in the Channel. The survivors attempted to escape by sailing to the north of Scotland. Several were wrecked on the Scottish coast with a large amount of treasure. This is believed to still lie at the mouth of one of the Scotch rivers.

1598. The Spanish galleon 'Good Jesus', bound from the isthmus of Panama to Spain, was lost with $2,400,000 in gold and silver. (E. Howland, 'Ocean's Story'.)

After the English came the Dutch. The Spaniards had now removed the home port for their plate ships from Seville to Cadiz, which was much better defended.

1626. Admiral Peter Hein surprised the Spanish fleet off the northern coast of Brazil and captured several galleons with rich booty, much of which was lost in the engagement; amount not stated.

1628. September 8. Admiral Hein intercepted the Spanish plate ships off the coast of Cuba and pursued them into the bay of Matanzas, where he made himself master of the whole fleet with its rich lading, amounting in value to more than 11,600,000 florins. He himself fell in action in the following year.

1656. Notwithstanding the security of the port of Cadiz, the British admiral Blake had the temerity to attack it and sink the entire plate fleet which had just arrived from America, all but one vessel, on board of which he found upward of two million dollars. (Anderson, 'Hist. of Com.', II, 438.)

1657. Next year Admiral Blake attacked and sunk the entire Spanish plate ship at the isle of Tenerif, one of the Canaries. The treasure lost on this occasion was greater than that of the preceding year. The consequences to the Crown of Spain were most disastrous. *(Ibid.)*

After the Peace of Ryswick, 1697, these attacks upon the Spanish plate fleets ceased for a brief period, when new circumstances arose to revive them; so that the loss of treasure in ships during the eighteenth century was greater than it had ever been before.

California Oil Dividends

Dividends aggregating $694,038 were paid during July by California oil companies.

Companies.	Rate.	Amount.
Central	0.01½	$ 15,738.09
Claremont	0.02	10,000.00
Columbia	0.01	9,992.30
Euclid	0.00½	1,750.00
Globe	0.00½	3,000.00
Homestake	0.10	2,000.00
Linda Vista	0.01	2,500.00
Mascot	0.02	10,000.00
Monte Cristo	0.05	25,000.00
Mount Diablo	0.03	14,024.55
New Pennsylvania	0.00½	2,498.48
Olinda Land	0.00½	3,200.00
Palmer	0.01	18,020.10
Paraffine	0.01	3,000.00
Peerless	0.00¼	25,000.00
Sauer Dough	0.02½	4,987.50
Section 25	0.25	10,000.00
State Consolidated	0.00¾	4,231.11
Union Oil	0.006	181,015.80
Union Provident	...	89,620.03
United Petroleum	...	48,450.60
Western Union	0.00½	5,000.00
W. K.	0.03	15,000.00
Total		$704,038.56
Mexican Pet., Ltd., pfd.	0.00⅔	80,000.00

July Copper Review

By Misha E. Appelbaum

Although the copper market was firm throughout the month of July, very few transactions took place during the last two weeks of that month. The price fluctuated between 12⅝ and 12¾c., delivered 30 days, for electrolytic, and 12⅞ to 13c., delivered 30 days, for Lake. The deliveries for the month of July showed, as expected, large European consumption, and the falling off in domestic deliveries showed a natural shrinkage, which usually occurs in July and August of every year. The large decrease in the production cannot be interpreted as a favorable factor for the reason that while it helped to reduce the surplus, such low production cannot be anticipated in future, it having been due this month to climatic conditions. The surplus on the first of August, both here and abroad, was smaller than for quite some time past, and with a domestic revival of business, copper would certainly advance, or at least rule steady at present prices. Should a revival not occur, lower copper prices are bound to prevail, as Europe cannot be expected to take larger quantities of copper, or even keep up present ratio.

Variscite Near Lucin, Utah

By Leon J. Pepperberg

[*]A glance into the shop windows of any city is all that is necessary to convince one that there is a large demand at the present time for what is termed craftsman or barbaric jewelry. This type of ornament consists of various precious and semi-precious stones and gem matrices worked into large and small settings of gold, platinum, silver, or alloy material and built along the lines of quaint oriental or other designs. A discovery of variscite deposit, which from surface indications promises gems of good quality and a considerable amount of matrix material, is then both of scientific interest and economic importance, since its occurrence in this locality has not been described heretofore and since it is well adapted to the manufacture of the types of ornaments mentioned above.

The gem deposit here described is in Sec. 22, T. 8 N., R. 18 W., of the Salt Lake meridian and base line, about four miles north of Lucin, a small station on the main line of the Southern Pacific railroad, and about seven miles east of the Nevada-Utah line. The group of hills occurring here is composed largely of igneous rock, quartzite, and some cherty-chalcedonic limestone. They stand out prominently in comparison with the surrounding flat treeless desert.

The deposit occurs on a brow of one of these hills where the quartzite which contains the variscite has a thickness of from 150 to about 180 ft. and can be followed along the strike for about 600 ft. Four claims have been located along the outcrop of the gem-bearing quartzite which strikes north and has a dip of about 35° easterly. The development consists of one 22 ft. shaft and three open-cuts, in addition to which there are natural exposures of the deposit. In several places the quartzite stands from 6 to 15 ft. above the surface, and it is so thickly studded with different grades of variscite that it is easily distinguished by the bluish-green tint of this mineral.

Variscite is a hydrated aluminum phosphate. In the Lucin deposit the purer specimens are commonly nodular, oolitic, and brecciated in structure, while those showing the concentric and mottled structures may be considered variscite matrix. When found in nodular form the variscite is commonly coated with a thin crust of white and cream colored phosphate mixed with lime. Large pieces of pure variscite composed entirely of small prismatic crystals, usually six sided, but rarely distinct, are common. The crystals give the fracture surface of such specimens a granular effect. The real fracture of the gem quality variscite, as well as the prevailing fracture of the less pure but homogeneous specimens, is conchoidal. In color the mineral ranges from a brilliant deep emerald or apple-green through the blue greens to colorless. It is sometimes transparent, though usually translucent. The lustre of variscite is vitreous. The hardness of specimens collected is from 4 to 5 in the scale of which the diamond is 10.

According to Dana,[1] variscite has the following chemical composition: $AlPO_4 + 2H_2O$ or $Al_2O_3.P_2O_5.4H_2O$ = phosphorus pentoxide 44.9, alumina 32.3, water 22.8 = 100.

Since pure variscite is colorless, the greenish mineral as found in the deposit under discussion probably owes its color to some foreign substance.

A quantitative chemical analysis of the mineral has not been made, but careful tests showed the presence of minute amounts of iron, calcium, and a trace of chromium; consequently it is assumed that the salts of these impurities impart color to the variscite. No copper was detected. When the mineral is heated in the closed tube, much water, slightly alkaline, is driven off, while the mineral assumes a weak rose color; the [illegible] portion it becomes white. Before the blowpipe in the forceps it is infusible, but upon partial dehydration it turns a pale purple or rose-violet color, which disappears upon prolonged intense ignition, the mineral finally becoming white. If treated with cobalt solution and heated before the blowpipe it becomes blue. When treated with acid and held in the flame it imparts a greenish tinge to the flame, due to phosphoric acid. If the powdered mineral is mixed with soda and heated in the closed glass tube it develops ammonium carbonate. Variscite is insoluble in acids before heating, but afterward dissolves readily in acids and alkalies.

The quartzite in which the gem is found is of Carboniferous age, probably Pennsylvanian. It is a member of the Weber quartzite, locally calcareous, intercalated with minor Parallel Survey. The portion of this formation exposed at this locality consists of strata of massive white, gray, and reddish quartzite, localy calcareous, intercalated with minor blue-gray and white limestone beds. These beds have been highly metamorphosed, probably during a period of folding and faulting and the intrusion of Tertiary volcanic rocks. These consist of rhyolite and basalt. The forces which produced folding and faulting shattered and sheared the strata of quartzite in which the variscite is found into a sort of block breccia. After brecciation, solutions laden with silica and phosphoric acid, alternately entered the network of channels in the fractured quartzite and cemented the fragments together with chalcedony and variscite. Almost all of the angular cavities in the brecciated quartzite have been filled by these secondary deposits, but no replacement of the quartzite by these minerals was noted.

The alternate deposition of chalcedony, chert, variscite, brown limonite, wardite (?), and allied phosphates, has given certain specimens a banded structure showing concentric layers of these minerals, while other specimens are composed of but one kind of material and show no banding. The matrix presents many odd patterns and pleasing color combinations. These are due to the filling of small fractures in the variscite breccia by material of different chemical composition, or to the concentric layers of the various materials which enter into the make-up of the rock. Some of the mottled patterns are known to the trade as 'cobweb' or 'turtle back' matrix.

According to the U. S. Geological Survey,[2] three deposits producing gem variscite have been opened in Utah, one specimen has been sent in from Nevada, and crystallized variscite has been found in Montgomery county, Arkansas. From the above statement, and the fact that the newly discovered deposit of variscite with which this report is concerned is also situated in Utah, it is evident that the name 'utahlite' suggested for this gem by G. F. Kunz is particularly appropriate.

The conditions surrounding the variscite deposits of Utah are similar in every case so far reported; that is, the mineral is deposited as a cementing material in brecciated limestone, quartzites, or igneous rocks. It is usually associated with chalcedony and is much younger geologically than the rocks in which it is found. Several of the deposits are found in rocks of the same geologic age, but they seem to be strictly local deposits, and, from the evidence at hand, there is no apparent connection between them. Whether there is any relation between the variscite and the rock-phosphate deposits of Idaho, Utah, and Wyoming is not known. Some of the phosphoric acid of the variscite may have been derived from the rock-phosphate beds, which, in the case I have observed, are associated with younger geologic strata than the variscite. On this assumption the variscite would be younger geologically than the rock-phosphate beds. The phosphoric acid, however, may have been derived from the apatite in the igneous rocks of this region. Apatite is strongly attacked by waters containing carbonic acid, according to R. Muller.[3] Both lime and phosphoric acid pass into solution. Since pure cold water exerts a solvent action upon many silicates, it can readily be understood how corrosive must have been the hot acid and alkaline volcanic waters which existed in this region in Tertiary times. These waters undoubtedly played a large part in the transportation and deposition of the chalcedony, variscite, and other secondary minerals of the Lucin deposit. A part of the silica of the chalcedony may have been, and probably was, derived from the quartzite in which it is found.

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[*] Published by permission of the Consulting Geologist of the Southern Pacific Company. A preliminary paper describing this deposit was read before the Le Conte Club, December, 1910.

[1] Dana, E. S. and J. D. 'A System of Mineralogy', 1906, p. 824.

[2] 'Mineral Resources of the United States', Pt. 2, 1908, pp. 853-57.

[3] *Nature*, Vol. 36, p. 460, 1887.

From surface indications the chief value of the Lucin deposit lies in the large amount of variscite matrix which it apparently contains. Very little gem quality variscite has been recovered, but it should be remembered that the property is as yet undeveloped. To the commercial world the gem is known as 'variscite,' 'utahlite,' 'amatrice,' 'chlorutahlite,' and 'variscite matrix.' It sells in the rough at from $5 to $15 per troy pound. Rare specimens command higher prices.

Rich Float

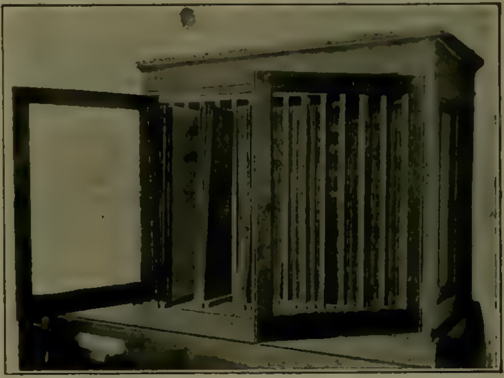
By Oscar H. Hershey

Many professional prospectors have 'rich float' stories as part of their assets. I propose to tell my 'rich float' story, as it shows what may be the outcome of a successful search for the source of gold-bearing float. Some years ago I was operating, in association with a gentleman from Missouri, a small gold-quartz mine in the valley of the South Fork of Salmon river, in Siskiyou county, California. Back of the mine there is a rugged mountain rising to about 3500 ft. above it. Occasionally I spent a day wandering over that mountain in search of quartz float; this float I subsequently ground in a mortar and washed in a gold-pan. About one piece out of three yielded from one to several very fine colors of gold, but for months I found nothing encouraging. I finally fell into the habit of not mortaring my float until the following morning, when I would be less disappointed by the result. One morning I had a particularly unpromising appearing lot, except one piece. That piece yielded so many colors of gold that it made me open my eyes wide in astonishment, and when I had time to realize that I, too, among prospectors, had struck 'rich float,' I had that peculiarly comfortable feeling that makes prospecting so fascinating. Now, at this stage, many prospectors fail to remember where they got the material, but I was not so fortunate. Calling my partner, I showed him what I had in the gold-pan; we quietly slipped into the brush and by a circuitous route reached the place. At first it seemed hopeless to find the source of the float, for it lay on a mass of loose débris that occupied a draw between two hard ledges of hornblende schist, and might have slidden a thousand feet down the mountain. I returned to the place several times. The first piece of float assayed at the rate of $350 gold per ton, but subsequently I found pieces that must have carried at least at the rate of $1000 per ton. It was a variety of gold quartz commonly found in the best veins of the region and contained galena, which mineral is present in many of the good mines of that part of the State. I had no reason to believe that it did not come from a pocket or mere seam. However, one day I crept under a thick clump of liveoaks and found the source of the float in an outcrop at the base of one of the hornblende schist ledges. Yes, it was high-grade ore, but when mined the entire orebody could be put in a hat. Much digging in the vicinity failed to develop anything else except thin seams yielding a few fine colors. Several of these seams had intersected and formed a pocket of gold quartz with all the physical characteristics (except as to extent) of the veins of that region. I had destroyed the asset quality of my 'rich float' story, and had lost a little of my respect for gold-bearing quartz float.

Returns supplied by the Witwatersrand Native Labour Association, Ltd., show the following results for the month of June: in gold mines, May, 190,392; June, 186,940; in coal mines, May, 8379; June, 8212; in diamond mines, May, 10,425; June, 10,597; total, May, 209,196; June, 205,749.

A Convenient Folio Case

The United States Geological Survey has been engaged for some years in the construction of a great topographic and geologic map of the United States. Individual topographic sheets are issued as completed, and as the geological surveys are likewise carried over each area a map with a brief text is printed. These reports are known as folios and are for sale at a nominal price, usually 25 cents each. The folios are 19 by 17 inches in size and exceedingly awkward to handle in the fields and to file for ready reference. At the same time, it is convenient to have the unfolded map. Where a large number are kept, the problem of storing them so that each shall be readily accessible is difficult. The accompanying illustration is from a photograph of one form of case which has been found quite satisfactory and which may be readily built in any cabinet shop. This case should be 1 ft. 9½ in. deep and 2 ft. 1 in. high, excluding top and base, or 2 ft. 8 in. including them. A convenient distance between partitions is 1¾ in., and a convenient width over all, 3 ft. The case may, however, be made wider if desired, so that it will stack readily with any of the standard unit bookcases. Such a folio case as illustrated will hold without crowding about 150 folios, each one being instantly accessible. An important point in the construction of the case is the sliding shelf on which the folios stand. Each shelf is made with a bit of tin or wood standing vertically at its rear end, to prevent folios being pushed in too far. The Survey is now publishing a field edition of the folios which are of ordinary book size, but the earlier ones are not available in this form. Indeed, many of the early ones are already out of print and difficult to obtain in any form. For library purposes the large form will probably continue to be preferred.



CASE FOR GEOLOGIC FOLIOS.

Copper Exports

The question has arisen as to where the large output of American copper has gone. Many believe that there is something unexplained in the decrease in the visible supply the last two years with America's record-breaking output. In this connection the following statistics, compiled by the *Boston News Bureau*, may be of interest. They show the total copper exports from the United States the last five years and the proportion taken by Germany, the Netherlands, and Great Britain:

Years.	U.S. Exports.	To Germany.	To Netherlands.	To Gt. Britain.
1910 ...	676,485,000	183,600,000	215,000,000	87,000,009
1909 ...	675,711,680	144,262,720	206,317,440	153,614,720
1908 ...	661,876,000	137,453,392	195,562,619	117,810,314
1907 ...	508,929,401	107,607,390	156,652,270	81,409,441
1906 ...	454,752,018	96,629,040	151,650,293	55,097,670

Petroleum Production in California

According to *The California Oil World* of Bakersfield, the State's total net petroleum production for the first six months of 1911 was 37,379,508 bbl. At the same rate the output for the year will be 77,171,542 bbl. The production last year was 74,849,700, making this year's estimated gain 2,321,842 bbl. This is the world's record for any State or country. The estimated field consumption for the six months was 2,461,797 bbl. The probable surplus for the year will be 7,065,000 bbl., which, added to the 39,000,000 in storage, will equal 46,000,000 bbl. The following is a statement of the net production for the first six months of 1911:

San Joaquin	Bbl
Coalinga	8,842,522
Kern River	6,221,124
Maricopa	1,885,686
Midway	9,142,513
McKittrick	2,660,838
Total	28,752,683
Southern:	
Salt Lake-Sherman	1,455,679
Los Angeles City	219,900
Whittier Coyote	544,019
Fullerton-Puente	2,806,008
Newhall	71,861
Ventura	210,005
Total	5,307,472
Coast Region:	
Santa Maria-Lompoc	3,286,659
Summerland	32,694
Watsonville	....
Arroyo Grande	....
Total	3,319,353
Grand total	37,379,508

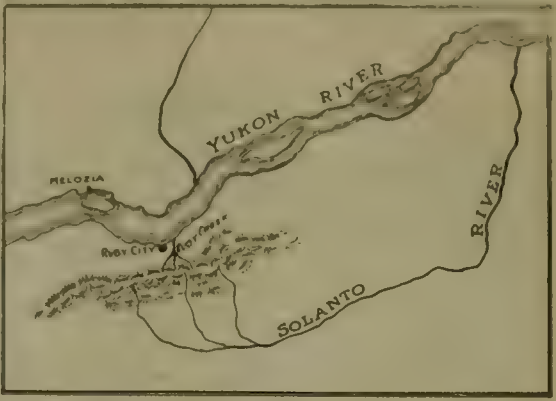
Kyshtim Corporation

The progress of the Kyshtim Corporation is of interest to Americans because so much of the capital and technical talent has been supplied from the United States. The company was formed in October 1908 to acquire the share capital of the Kyshtim Mining Works Co., which owns and operates iron mines, gold and copper deposits, and timber land in the Perm Government in the Southern Ural. R. Gilman Brown is consulting mining engineer, Walter G. Perkins is consulting metallurgical engineer, H. H. Knox is advisory consulting engineer, and Leslie Urquhart is general manager. Also, H. W. Turner, of San Francisco, is making a geological study of the copper deposits. During 1910, 89,509 tons of copper ore averaging 3.38% copper was mined, chiefly from the Koniukhoff mine. The production was 1674 tons of blister copper, containing 2578 oz. gold and 22,272 oz. silver. Subsequent information shows that from January 1 to June 10 of this year the production was 1712 tons copper. Until November, smelting was done at the old plant, and in that month the first new blast-furnace at Karabash started operations, followed by No. 2 in March of this year. Two basic-lined converters have also been erected. In addition, there is a small Siemens-Martin reverberatory at Kyshtim to treat the fine ore and flue-dust. It is now planned to build a new reverberatory at Karabash to extend the work in that direction. The whole of the copper is electrolytically refined on the spot. The copper ore reserve was calculated in June at 1,500,000 tons averaging 3½% copper. As regards the financial results for 1910 of the Russian company, the profit of the copper works was £64,335, of the ironworks £23,260, of the timber department £37,371, and in addition the sale of pyrite for sulphur content, income from gold gravel production and other small items brought the total receipts to £144,882. Against this, £85,047 was debited for general expenses, taxes, and interest on loans from banks, and £18,256 was paid as interest on mortgages. The amount paid to the credit of the Kyshtim Corporation was £41,579, which has been applied chiefly to debenture interest and management expenses.

Revival of an Alaskan Gold Camp

Staff Correspondence.

Ruby City is on the south bank of the Yukon, about 35 miles below Fort Gibbon, Alaska, where Ruby creek enters the river. Gold was found there some years ago, but no great amount was taken out. Ruby creek is short and heads in a low range of slate hills. Recently gold has been found along the creeks on the slopes opposite Ruby. These creeks flow into the Solatna river, which swings northeast and joins the Yukon thirty miles or thereabout above Ruby creek.



RUBY PLACERS AND QUARTZ FIELDS.

Good pay has been opened on Long creek, Big Dome, and on Fox gulch. Tom Aiken and Frank Manley have options already on some of the best properties.

The territory over which pay-dirt has been opened is about ten miles long, and the streak on Long creek is about a thousand feet in width.

Bob Martin, who has taken options along Fox gulch, has reached bedrock in two holes, and has a boiler on the way in.

Mining machinery is arriving daily at Ruby, but the trail to the creeks is so soft that none of it will be moved until winter. A sawmill has been set up.

During the first week in July gold-bearing quartz was found on Ruby creek itself, one mile south of the town. The vein was located by Henry Matson, M. B. Peterson, and Harry Weir. It is large and decomposed on the surface, but yields gold in the pan. As there has been no thought of quartz, there is no powder and no drill steel in Ruby. The vein has only been opened with picks and shovels when sufficiently weathered. The owners have uncovered quartz for 24 ft. and have got down 12 feet.

The richness of the rock as shown in their pannings has caused a quartz-staking stampede.

While there is much activity at Ruby, there is no demand for labor, as the work done is actual prospecting of their own ground by the locators. Only the men who want to take a chance for themselves, and who can go there with outfits or some money to carry them over the winter, should go into the district.

If the camp is proved it will be done this winter after thawing and hoisting plants are erected.

The creeks are long and the ground shallow; but it is all frozen and will have to be thawed. From the head of Long creek the whole country south to the mountains behind the Innoko, a hundred miles away, is a network of creeks and gulches, virgin ground of promise to the persistant and intelligent prospector.

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Battery Foundations

The Editor:

Sir—From Mr. Waters' criticism of my foundation bolts in your issue of August 5, it would seem that I should have shown more views or have been more explicit in description. Perhaps some others have looked at my one view in the same light. The 5 in. angle is drilled for the bolt $2\frac{5}{8}$ at $2\frac{1}{2}$ in. from the edge, and the flange is then slotted from the hole to the edge. The bolt head thus bears, expressed by the boundary lines of its head, 5 in. on each of three sides and $2\frac{3}{8}$ in. on the fourth side, leaving no possible side strain upon the bolt.

M. P. Boss.

Lark, Utah, August 9.

The Economy of Dynamite

The Editor:

Sir—If the power generated in the explosion of 25 lb. of 40% gelatine dynamite such as is commonly used in the breaking of a 3 ft. round in a 4 by 7 ft. tunnel could be entirely utilized, it would be sufficient to break the rock to 6 in. cubes, hoist it to the surface from 1000 ft., and have enough surplus energy to operate a mill consuming 100 hp. continuously for four days. It would be sufficient to hoist the broken rock through a vertical distance of 250 miles. If it could be as advantageously applied as in the breaking of rock in a rock breaker it would be sufficient to break up the entire amount of rock from over 4000 ft. of a 4 by 7 ft. tunnel. These figures are derived by taking the initial pressure of dynamite at 120,000 lb. per square inch at the moment of explosion and assuming a consumption of 1 hp. for crushing one ton of rock in one hour. They are only approximations but are sufficiently correct for the purposes of this article.

From the above assumptions it may be calculated 1 lb. of dynamite will generate about 724,150,000 ft. lb. of energy and the cost of the power so generated would be about 32c. per horse-power month with powder at 16c. per pound. These figures bring out forcibly two important facts in connection with the use of dynamite: (1) that dynamite is an economical source of power; (2) that its use in connection with the breaking of rock is accompanied by an enormous waste of energy, beside which the generation and use of steam from coal or other forms of generating power is economy personified.

The two principal causes for the loss of energy from dynamite are, its disadvantageous application, and the escape of confined gases without performing any useful work. Incidentally there is a waste of energy in the jarring and loosening of the rock away from the point of breakage and in a useless comminution of a portion of the broken material. A practical miner might suggest that there was a further waste in a useless breaking of air-pipes and machines, the knocking out of stulls, and in the scattering of rock over the level. In spite of the imperfect utilization of the expended energy, which amounts from the above figures to less than 0.1%, and in spite of the many injurious effects of dynamite when used in confined workings, it still continues to hold first place as a means of breaking rock in mining operations.

The question that suggests itself from the above figures and which it is the purpose of this article to briefly discuss, is whether it is possible to improve upon the above conditions, or whether the use of dynamite presents inherent advantages that it is impossible to overcome.

Anyone who has had intimate experience with underground work will agree that the conditions arising from the explosion of dynamite underground are, to say the least, undesirable. They are the primary cause of the tramp miner, or, to put it differently, they are the cause of the practical miner being a tramp. Enticed by high wages offered as compared with other vocations, but finding the physical conditions unendurable, he migrates to new fields, only to find the conditions repeated. This is not a hypothetical condition. It is one which actually exists and one which I, though a college graduate, have been compelled to face and endure in the course of my training to become a mining engineer. A consideration of these conditions at once suggests that the proper place for the use of dynamite would be upon the surface in the generation of power where its injurious effects would be less pronounced. There has not been, as yet, any system devised whereby this program could be put into effect. So far as I know, no attempt has been made to utilize the power of dynamite in the running of machinery and few would care to experiment in this direction.

Many attempts have been made to excavate rock with machinery alone, particularly in the oft repeated attempt to produce a tunneling machine, which has invariably been a failure. I am not familiar with the exact causes assigned for the failure of such machines, but a consideration of the results obtained and power employed in the drilling of rock strongly suggests why any machine designed for the cutting of the entire face of a tunnel has been and will continue to be a failure. If we assume that a modern stoping machine having a 2 in. cylinder, weighing 75 lb., and consuming 40 cu. ft. of free air per minute at 90 lb. pressure, will drill a $1\frac{1}{2}$ in. hole at the rate of 5 in. per minute, and from this deduce the power and weight of a machine necessary to remove the entire face of a tunnel, we obtain the following results. To remove a 3 ft. round from a 4 by 7 ft. face in 6 hr. actual working time, there would be needed a machine weighing 4200 lb. and consuming 2400 cu. ft. of free air per minute. The cost for power alone, on a basis of $10 per horse-power month, would amount to $9 per foot of advance. If the items of labor, steel, and supplies be considered, it can readily be seen that the cost of any such method must be prohibitive without considering the difficulty of moving such a machine from one point to another in the mine.

The lesson that this argument and the results of actual trials teaches is that if a tunnel or similar opening in rock is made without the use of explosives, it must, for economical reasons, be by breaking rather than by cutting or grinding.

STUDENT.

Los Angeles, August 5.

Exports of Iron and Steel

An increase of over $51,000,000 in the exports of iron and steel manufactures and a decrease of over $4,000,000 in the imports of this class of merchandise are striking characteristics of the foreign commerce of the United States in the fiscal year just ended. Iron and steel manufactures exported aggregated $230,725,351 in value, against $179,133,186 in 1910 and $183,982,182 in the former high record year, 1908. The exports of iron and steel manufactures in the fiscal year 1911 were $51,592,165 in excess of those of the preceding year and $46,743,169 in excess of the highest record ever made prior to 1911. Ten years ago, in 1901, the exports of iron and steel manufactures amounted to but $117,000,000; twenty years ago, $29,000,000, and thirty years ago, $16,500,000, in round terms. The chief growth has occurred in the last dozen years, the total having never touched the $100,000,000 line prior to 1900, in which year it was $122,000,000. By 1905 it had risen to $135,000,000; by 1908, to $184,000,000; and in 1911, as already indicated, the total was $231,000,000.

A MAN may inhale with comfort air containing 3% of carbon dioxide and 16% of oxygen, if such air is not under any greater pressure than that of ordinary air at the surface of the ground.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

CLAY SLATE is not the only rock that swells upon exposure to the atmosphere, for decomposed granite and many other igneous rocks are known to do the same thing.

A CRADLE is not an economical apparatus for washing gravel, this is shown by the fact that where it is used the ground is often washed several times over, often times with almost as good results. It is the best device available in early work, and is still used in many places.

TITANIUM is being used with great success in making steel rails. The New York Central line has given rails treated with ferro-titanium a thorough test in the Grand Central terminal yards, and now requires that all rails made for its lines shall be treated with titanium alloy.

HIGH COSTS of mining are often due to poor management, particularly in the amount and distribution of the labor. One California gold mine recently examined had 78 men on the pay-roll, of which only 23 were in the ground. To supply 15 stamps, 8 machines were kept in service.

REALGAR is a soft, orange-red mineral, of a resinous lustre, and having the composition As_2S_2. It occurs with the arsenic minerals, the most notable localities being in Borneo and Hungary. The artificial sublimate is used in fireworks and in signaling, and also, to some extent, as a pigment.

FREE gold, when present in an ore even in quite small amount, is readily seen in the pan or horn-spoon, though as little as one ounce of ore be taken for the test. Ore worth no more than $2.50 per ton will show a decided 'prospect' in pan or spoon, when manipulated by experienced hands.

LEAD POISONING results from inhaling the dust or fumes of lead in mines or metallurgical works. A dilute solution of sulphuric acid, one drop of acid in 100 drops of water, is said to be an antidote for lead poisoning, the acid attacking the lead oxide in the system and forming lead sulphate, which is harmless.

ASBESTOS, as a material of engineering, is unique. Soapstone has great heat-resisting qualities and is a good electric insulator, but it can only be used where massiveness is permitted. Mica also withstands heat and provides excellent dielectric resistance. Its brittleness bars it from use as an insulator in many cases. Asbestos may be used much more widely than either.

DIAMONDS first came from India, the famous mines of Golconda being between Hyderabad and Masuhpatam: In 1728 diamonds were found in Brazil, having been for some time thrown away with the other gravel obtained in gold washing. For a time these mines were very famous, but are now completely obscured by the South African fields, which were discovered in 1867.

DEPTH of some of the main shafts in the Kalgoorlie, Australia, goldfield is as follows: Great Boulder Proprietary, 2800 ft.; Sons of Gwalia, 2440; Ivanhoe, 2270; Great Boulder Perseverance, 2100; Golden Horse Shoe, 2100; Chaffers, 2100; Associated, 2000; Lake View & Star, 2000; Kalgurli, 1850; South Kalgurli, 1800; Associated Northern, 1100; Hainault, 950; Golden Ridge, 500.

QUICKSILVER when fouled, by lead or other mineral substances, will not readily form into globules, but if disturbed shows a tendency to form in elongated drops. Retorting is the best method of cleaning foul mercury, but this must be done at as low a heat as possible or the base metal will pass over with the quicksilver, and its condition be little if at all, improved. The addition of dilute nitric acid to a bottle of impure quicksilver tends to purify it.

VALUE of an oil as fuel is in proportion to the combustible matter it contains as shown by its heating value. This value may be expressed in small calories per gram or B.t.u. per pound. Sulphur, moisture, and earthy matter lower the heating value of an oil and decrease the furnace capacity; they also may have a deleterious effect on boiler and furnace, and may impair the operation of burners.

THERMODYNAMIC efficiency of the vapors from distillate or gasoline in a gas-engine is low, on account of their high explosiveness, which causes pre-ignition, thus limiting compression to so low a value that it requires about 20,000 B.t.u. per brake horse-power, while the slow-burning producer-gas will use only 9000 or 10,000 B.t.u. per brake horse-power, or an increase in utility of 50 to 55 per cent.

AIR-HAMMER DRILLS have only been adapted as yet to drilling 'uppers' in which the drillings run out by gravity from the holes. The limiting angle is about 20° when ribbed steel is used; as the rotation of the steel helps to convey the drillings down the inclined sides of the hole. On this account ribbed steel should be used rather than hexagonal or round steel, especially as both these require shaping before use.

METALLURGY is the art of extracting metals from their ores, and of purifying or refining them to the quality required by the metal-working industries. It is a branch of applied chemistry. The metallurgical industries form a highly important part of the national resources; on them the nation depends for iron, steel, copper, brass, gold, silver, lead, zinc, aluminum, in fact for all the supply of metals used in arts and industry.

DIAMOND-DRILLING was not extensively carried on at Kalgoorlie during 1910. The largest amount was done in the Associated from the 1900-ft. level. In the Great Boulder an attempt was made to cut the main lode from each new plat; in the Ivanhoe from the 2000-ft. level out east to test some unknown country; and in the Kalgurli for prospecting ahead of cross-cuts. At Eyre, near the great Australian Bight, boring was performed for a water supply for the trans-Australian railroad. Fresh water was struck at 1270 feet.

DOUGLAS FIR is used as a mine timber, both in the square and round forms, in the western part of the United States. Squared mine timbers of Douglas fir also go to Pennsylvania and to foreign countries. It is frequently preferred to all other available species because of its durability and strength, and because of the desirable sizes in which it may be obtained. Where a supply of this timber is at hand, it also goes largely into temporary work such as lagging, sills, posts, and caps. When it cannot be conveniently procured, substitutes are frequently found in lodgepole pine and western yellow pine.

COPIES of monthly reports are often distributed to all the foremen in a large works. When the number desired is too great to be conveniently made by manifolding and yet not enough to print, any of the common types of duplicating machine will prove useful. When one of these is not available, a convenient method to follow is to take an unused sheet of carbon paper, back it with a wax sheet (soft blotting paper will do), and write on it with a typewriter just as though it were ordinary paper. This gives a negative which can be used to make as many blue-prints of the reports as are required. The report will be in blue letters on a white ground.

Special Correspondence

TORONTO, CANADA

Porcupine Reconstruction Progresses Rapidly.—No More Relief Funds Needed.—Two Months Extension for Assessment Work Granted.

The principal news from Porcupine at present is the progress in the work of reconstruction, which is going forward rapidly, though necessarily under difficulties owing to the congestion of freight and the shortage of timber. Much has been done lately by the T. & N. O. Commission to prevent undue delays and provide adequate siding accommodation, and material and supplies are now moving forward freely. A large number of buildings are in process of construction. The relief committee announces that no more funds are needed for the relief of the immediate requirements of the fire sufferers, the amount subscribed to date amounting to $52,294. The provincial government has extended the time for doing assessment work on claims in the Porcupine district for two months. A number of prospectors are now returning to work on their claims. The Dome Mines has a large force at work constructing a spur to connect its property with the railway. The Pearl Lake has ordered a plant, including a 12-drill compressor and a 200-hp. motor which will be run with power from the Mattagami river. In the Jupiter a 4-ft. vein rich in native gold was found in cross-cutting at 100 ft. A party representing Bewick, Moreing & Co., of England, including E. C. Moreing, Sir William Bell, Graham Prentice, J. L. Loring, and G. Lovell, visited the Porcupine camp last week. It is stated that the company has concluded negotiations with a syndicate represented by L. S. Collard, G. T. Hartt, and R. Howard, under which the exploitation of 52 Porcupine claims in Murphy and Wark townships will be undertaken by the company. The Vipond will put in a new mill and power-plant, including an 8-drill compressor. The main working shaft is to be sunk to the 200-ft. level, and cross-cuts run at this depth to tap No. 2 and 3 veins. A new vein of quartz found on the Dome property since the fire has been discovered to enter the Dome Extension. At the Hollinger reconstruction is progressing well. The company is manufacturing its own lumber, the mill on Miller lake turning out between 15,000 and 20,000 ft. per day. The foundations for the compressor and boiler are about finished. At the Crown Reserve claim some rich ore has been found at 50 ft. on No. 2 vein. The shaft will be put down to 100 ft. Another shaft is going down on a vein which shows 12 ft. of quartz on the surface. Some important sales have lately been made. The North Thompson claim has been bought by John C. Hicks, of New York, at a price said to be about $250,000. Baron G. von Polenz, of Berlin, has bought the two Christ claims in Tisdale, south of the Hollinger, on account of British investors, for $235,000. The Routley location near Pearl Lake has been sold to Daniel F. Yost, C. A. Burdick, and other New York men, for a price not stated. The McAulay-Brydge location in Bristol township has been taken over by B. E. Cartwright for $50,000.

The stock market, both as regards Porcupine and Cobalt issues, has been characterized lately by inactivity, with a decidedly downward tendency due partly to the season, but emphasized in the case of some of the mines by unfavorable rumors. Nipissing has experienced a decided slump, one of the reasons given being that the profits of the first six months of the year, amounting to $858,891, fell materially short of the dividend requirements. This is easily accounted for by the shortage of power early in the year. Moreover, prospecting for the discovery of new orebodies has been on a limited scale this season, in view of the intention of the company to undertake hydraulic prospecting as soon as a plant can be installed. This will include a turbine pump with a capacity of 4800 gal. of water per minute, and a 700-hp. motor. Trenching has not been found altogether satisfactory, and it is proposed to remove the oreburden entirely by the hydraulic process so that no veins may be missed. The pinching out of the veins of the Temiskaming in the diabase formation raises an important question as to the permanence of some of the mines at depth. Willet G. Miller, Provincial Geologist, and Cyril W. Knight, are now making a further study of the Cobalt field as revealed by the developments of the last few years, especially as regards the ore-bearing possibilities of the diabase. The Trethewey mill has been overhauled and the fine-grinding apparatus discarded. Automatic samplers have been installed. With the mill treating 2500 tons per month there is upward of two years' supply of ore in sight. At No. 4 shaft near the Hudson Bay the vein has been found at the second level. The Rochester has contracted with the Lumsden Mining Co. to explore the former property from the 250-ft. level of the Lumsden, where a 4-in. vein of smaltite showing a little silver has been found. At the Buffalo the extensions to the cyanide plant have been completed and it is running satisfactorily. During July the mill ran 575 hours and treated 3487 tons of ore averaging 40 oz. silver before treatment, the expenses of the mill for the month being $4622. The Millerette mine, Gowganda, has shipped 30 tons of concentrate, the first output of its new mill.

WASHINGTON, D. C.

Mine-Safety Demonstration.—Meeting at Pittsburg.

Thirty thousand miners are expected to attend the great national mine safety demonstration to be held in Pittsburg, Pennsylvania, October 26 and 27, under the auspices of the Federal Bureau of Mines, the American Red Cross, the Pittsburg Coal Operators' Association, and the United Mine Workers of America. The date, which was originally set for September 16, has been changed so that Mr. Taft may be present on the second day, October 27, to witness a mimic mine explosion in a temporary steel gallery on Forbes field, an exhibition of rescue work by helmeted miners, following the explosion, and to review the parade of miners. The President will make an address and will present souvenir prizes to the miners taking part in the first-aid and rescue-work exhibitions. Walter L. Fisher, secretary of the Interior Department, the Governor of Pennsylvania, and Joseph A. Holmes, the Director of the Bureau of Mines, will also be present. The general arrangements for the demonstration are in charge of H. M. Wilson, engineer-in-charge for the Bureau of Mines. The demonstration, the purpose of which is to teach greater safety in mining, will begin the morning of October 26, at the experiment station of the Bureau of Mines. The first day will be devoted to the interests of the mine operators, mine owners, mining engineers, and superintendents of mines. There will be an explosion of coal dust in the experiment gallery and tests of safety lamps in gas. The dangers of electric sparks in gas and coal dust will also be shown in one of the galleries. A class of miners will be trained in the use of the oxygen helmet. In the afternoon, the operators, engineers, and superintendents will witness an actual mine explosion in the experimental mine of the Bureau at Bruceton, Pennsylvania, twelve miles from Pittsburg. Coal dust will be allowed to accumulate in the mine, and black powder, against the use of which in mines where there are dangerous conditions the Bureau is agitating, will be used. In other words, the Bureau's experts will carry out in this mine all the bad practices which they believe lead to explosions. The next morning, October 27, the demonstration will take place on Forbes field, the Pittsburg baseball park, in the presence of the President of the United States and other distinguished visitors. A temporary steel gallery will be erected on the playing field and the cause of the recent great explosions in coal mines will be dramatically shown in an explosion of coal dust. Immediately following the explosion, members of one of the rescue corps of the Bureau, in their oxygen helmets, will rush into the smoke-filled gallery and go through the work of rescue. Supposed victims of the explosion will be brought forth and given first-aid. Expert rescue teams from the principal coal mines of the country will give friendly exhibitions and then the miners will pass in review of the President.

NICARAGUA, PIS PIS DISTRICT

Work Stopped at Bana Cruz.—Title Difficulty Delays Bonanza Sale.—Electric Power for La Luz & Los Angeles.—New Mining Laws.

Charles D. Kaeding, who, at Bana Cruz, has been opening up the Union American group, under option, in the interests of San Francisco operators, has discontinued all work and has left, with N. J. Kelsey, for San Francisco, by way of New York. The properties, while showing a fair grade of ore, were over-priced for the amount of ore in sight. The Bonanza property, recently under option to Bradley and Mackenzie, is doing better than ever before. The sale of the property has been indefinitely postponed owing to limitations of title, part of which has been cleared up by the abrogation of all concessions on April 28. Joseph Lapierre, the owner, has left for a year's tour of Europe, leaving P. A. O'Brien in charge; the mill has been overhauled and the eight Huntingtons are running steadily. The cyanide plant is being remodeled and preparations made for the treatment of the slime by the use of a vacuum filter.

Under the management of Paul Rener, the owner, the Concordia mill keeps steadily at work, crushing about 25 tons per day of good grade ore; the mill has 10 stamps, 750 lb. weight each. This property is under option to John F. Cowan of Salt Lake City. W. E. Connelly, formerly of the Constancia mine, is mine foreman. The Constancia, with the only really modern mill in the district about half completed, has been idle for some time on account of financial difficulties. The mill was to consist of 10 stamps, 750 lb., a Hardinge conical mill, Trent agitators, and Oliver filter. The process was to have been the all-sliming cyanide process. The property is now under option to Mr. Cowan. Work still continues on the new mill for the Dos Amigos mine. No further steps have been taken toward a mill on the Guillermina property. The Josephina property is idle.

The La Luz & Los Angeles property continues to be one of the largest producers in the country and has many thousands of tons of high-grade ore in sight. The present difficulty is power, as under the combination of gasoline, water, and steam-power the power costs about $25 per horse-power month. Steps are being taken toward the use of electric power, and the company's electrical engineer, Mr. Watson, of Pittsburg, has been investigating the various sources of power in the vicinity. Harry J. Amphlett is manager. Although the La Luna property has plenty of ore, the mill is incomplete and a temporary shut-down took place on June 17. The Lone Star, lying close to the Bonanza, was under option to Messrs. Bradley and Mackenzie, and since the postponement of the sale has been running 30 stamps most of the time. Norman McInness is owner and is in Managua on legal business. T. W. Bouchelle is metallurgist and acting manager. Operations on the Mars mine have been temporarily suspended, owing to Mr. Sherrick's trip to the States with Mr. Lapierre, and Mr. Loebner's trip to Managua on legal business. The Mining Exploration Co. has brought suit against the owners of the property for $60,000 for alleged breach of contract.

The Panama property, Sydney J. Sydney, manager, has been arousing considerable interest in the district on account of the approaching start in operation of the new mill. The mill is supplied with ore from the mine by a wire-rope tramway, which has given some trouble, but is now said to be operating satisfactorily. The ore is to be crushed in rolls and tube-mills, agitated with cyanide solution, and filtered on a filter of Mr. Sydney's own design. The mill will be in operation as soon as boiler capacity can be provided. Nothing has been done on the Rosa Lee property for over a year. A 3-stamp prospecting mill is being placed on the property and should be in operation by August 1. There is a large tonnage of good-grade ore in sight. Montgomery Rener is owner and manager. The Potosi adjoins the La Luz & Los Angeles and is owned by Jose Aramburu. No work has been done to show the extent of the orebodies and the owner is making arrangements to put in a mill.

An attempt is being made to remodel the Siempre Viva mill and construct a filter for the treatment of the slime. In the meantime the 20 stamps are running on oxidized ore from the old stopes. About 8000 tons of average $8 ore has been reclaimed from the abandoned ground with as much more in sight. In addition, a foot-wall vein has been cross-cut parallel to the main vein in the foot wall, a 40 ft. distance, that shows 6 ft. of $14 ore. Henry B. Kaeding is manager. The Santa Rita mine, in the [illegible] district, has been having trouble with the steam plant, but is running smoothly now. The Trinidad, Richard Lehmann, owner, has been idle for some years. A little prospecting was done lately, but nothing of any importance.

By decree of April 28, later ratified by the Chamber of Deputies, all onerous mining and other concessions were declared abrogated and the ground thrown open for location. This removes the greatest bar to the progress of the mining industry in this country. A commission is also at work reforming the mining laws, having the particular point in view of allowing the location without discovery of mineral of sufficient ground on the dip of a known vein to protect the extralateral rights. With these points conceded and the concessions canceled, there should be apparent a decided impulse ahead in the mining industry here.

DURANGO, COLORADO

Activity in La Platas.—Neglected.—Mancos Country.—A New Find near Durango.

There is more activity in the La Plata mountains this season than there has been for many years, owing to several promising finds and to the increased number of producing mines. The idleness of two of the best properties, the Idaho and May Day, due to litigation over apex rights, has, however, greatly curtailed the output. The Incas mine, contiguous to the above-mentioned properties, is maintaining a production of two to three cars a week of a good grade of gold-silver ore. The Comstock, which was the first producer in the district and in the early days yielded $70,000 or more from surface workings, is being developed by a cross-cut adit. Three shifts are at work and the vein will soon be cut below a body of $100 ore from which a carload was shipped last spring, when the melting snow made further operations in the shaft impossible with the equipment at hand. The ore contains a comparatively rare mineral, cosalite—a sulphide of bismuth and lead—and is rich in the precious metals, specimens assaying several hundred ounces gold as well as considerable silver. The Copper Hill mine, at the mouth of Bedrock gulch, is shipping from surface workings one or two carloads a week of ore carrying 9 to 12% copper, several ounces silver, and some gold. The Neglected, which has produced at least $500,000 from its 150-ft. shaft, is said to have a large tonnage of $20 to $30 ore in sight, and a deal is now on for the sale of a three-fourths interest for $750,000. Cyanide tests have been made by a Denver specialist and a 100-ton plant is contemplated in case the sale is made. The owners of the mine have begun the construction of a five-mile wire-rope tramway to the Hermosa river, where it is intended to build the mill.

Recent developments have greatly stimulated prospecting, and the East and West Mancos territory, which has been dormant for several years, is being ransacked by prospectors, with the result that several promising finds have been made in abandoned workings and elsewhere, one of the best being a 4-ft. fissure in an adit which was driven by Durango men ten to twelve years ago. The strike was made by Mancos prospectors, and it is understood that the owners of the Idaho mine have taken hold of the property. Pannings show free gold as coarse as grains of wheat. On the East Mancos at the Doyle Consolidated sixty men are working, most of them on the construction of a large cyanide plant and roasting furnaces, for the reduction of the base ore of these mines. About four miles below the Doyle mine the Ben Hill M. Co. is sinking on a promising contact fissure about 2 ft. wide, which carries sufficient free gold to make good shipping ore; and farther down the river, near the railroad, a company of Mancos men have an encouraging showing of gold ore and will soon make a shipment to the Durango smelter.

A rich find is reported about ten miles northwest of Durango. O. N. Kee, a prospector who was sent out recently by the grubstake committee of the Denver Chamber of Commerce, sent some samples to Denver which assayed 22.36 oz. gold and 26.5 oz. silver per ton. The Cumberland mine, at the head of the La Plata river, which is under lease and bond to Telluride men, recently started its mill and a satisfactory recovery is reported.

BUTTE, MONTANA

Air-Hoist Not Yet Working.—Colorado to Ship.—Tuolumne.—Labor Contracts.

Minor changes have been necessary in the new compressed-air hoisting plant of the Diamond mine of the Anaconda company before it would work satisfactorily. It was expected that the hoist would be started August 1, but it has not yet been put into commission. It is now thought that in another week it will be working all right, and then the High Ore mine will be shut down and work started to make changes there. The Anaconda Copper Mining Co. has been made defendant in a suit for $5,000,000 damages, the alleged value of ore mined from the Wild Bill lode claim, mined by the company, but of which one Edward Hancock claims to own a tenth interest, and he claims that he has never received an accounting of the ore mined from the property by the Anaconda company since August 1899.

Orders have been received from F. A. Heinze, president of the Davis-Daly Copper Co., to begin shipments from the Colorado mine in Butte, the only promising property owned by the company. The tramway from the mine to the Northern Pacific railway has been connected with ore-bins on the latter road and during the coming week mining will be started in the Colorado. The mining will be done on the 1400 and 1700-ft. levels where considerable ore has been blocked. It is expected that 100 tons per day will be hoisted and shipped alternately to the Washoe and East Butte smelters until it is determined from which the better returns are obtained, the rates given the Davis-Daly being about the same from each smelter. The ore in the Colorado is not of high grade, the average in copper being between 3 and 4%, with unusually high silver content. It is reported that a new orebody has been found on the 1400-ft. level, about 4000 ft. west of the shaft of the Colorado. Heinze's Stewart mine in the Coeur d'Alene district is becoming an important producer and is earning good profits. About 500 tons of concentrating ore is being shipped daily to the mill, and about 2000 tons of first-class ore and of concentrate is shipped each month to the smelter at East Helena.

The Tuolumne Copper Mining Co. is engaged in erecting a new hoist at the Tuolumne mine. It is not likely that the new plant will be ready for operation before November 1. The company is at present producing copper at the rate of 500,000 to 650,000 lb. per month. Tuolumne has been one of the unfortunate new companies of Butte that has suffered from misrepresentation by over enthusiastic and overly interested brokers, who have repeatedly represented that the company is producing 1,000,000 lb. per month from ore that yields 160 lb. of copper per ton. Tuolumne is mining only its richest ore and the average is 5 to 6%. The policy of secrecy established by the North Butte company at Butte is being closely maintained, although the impression is permitted to get out that developments are gradually showing an improved condition in the mine. The station and skip pocket at the 2800-ft. level have about been completed and in a week or so the new cross-cut south to the Edith May vein will be started. W. D. Thornton, president of the Greene-Cananea Copper Co., who is in Butte, does not confirm the rumors of an early resumption of dividends by the company, although he expresses himself well pleased with the improving conditions of the mines.

The Western Federation of Miners, recently in convention in Butte, refused to strike from its laws a provision adopted two years ago, opposing contracts by local unions with mining companies or other employers regarding a scale of wages. The action is important in view of the fact that the contracts of the Butte, Anaconda, and Great Falls unions with the Anaconda Copper Mining Co., will expire next spring. Many members of the Butte unions wanted the privilege of renewing the contract, but the majority of the delegates opposed it. The action does not mean, however, that the Butte miners contemplate a demand for an increase of wages, but it will leave them free to continue working at the present rate of $3.50 per day just as long as they want to work for that. In other deep-mining camps wages have lately been raised by employers to $3.75, and it is possible that a request for an increase will be made.

GOLDFIELD, NEVADA

Goldfield Merger Plans.—Tonopah Belmont in Goldfield.—Consolidated Output and Plans.

Engineers in the employ of the Goldfield Merger Mines Co. are now engaged in preparing plans for the beginning of an elaborate system of development, including the sinking of a four-compartment, 2000-ft. shaft. The control of this company was recently acquired by W. A. Clark, George Wingfield, and others interested in promoting a revival of activity in their district. It is stated by an officer of the newly formed Deep Mines Co. that Mr. Clark's decision to enter the Goldfield district was based upon the reports made for Spurr & Co. by George H. Garrey, formerly of the United States Geological Survey, and that Mr. Spurr will act as geologist and consulting engineer for the new concern. The exact point at which the new shaft will be sunk has not yet been determined, though it has been announced that it will be on the Moonshine claim of the Gold Horn group, not far from the centre of the property. The engineers may yet decide to enlarge and sink to depth the old company shaft on the Moonshine, already over 600 ft. deep. Reports to the effect that J. R. Finlay will act as manager for the new company are not confirmed. Plans are now being worked out by the engineers but the work of sinking may not begin for another month.

It is announced by M. B. Cutter, president of the Tonopah & Goldfield railroad and a large stockholder of the Tonopah Belmont Co., that a new shaft and other development work of an extensive character will at once be started on the Goldfield Belmont, adjoining the Daisy and Black Butte on the north and which is practically owned by the principal stockholders of the Tonopah Belmont. The new work is under the supervision of Frederick Bradshaw, engineer for the Tonopah Belmont company. The Goldfield Belmont has been shipping ore of excellent grade from the 300-ft. level and lessees have taken a considerable amount of $100 ore from the 50 and 150-ft. levels, assays in the winze from the latter yielding to $1400 per ton. The new work will be conducted on the Quartzite No. 1 claim adjoining the Black Butte on the northeast, and development and extraction will continue at the old shaft. This ground was studied last January by Mr. Garrey.

The customary production of 950 tons daily is being made by the Goldfield Consolidated Mines Co. and it is probable, from apparently authentic reports, that the August output will be considerably larger than that of either of the past two months. It is said that large bodies of excellent ore have been exposed between the 1000-ft. level of the Clermont and the 1200-ft. of the Grizzly Bear, particularly on the latter level and on the intermediate, which was started 100 ft. on the dip of the vein below the 1000-ft. level of the Clermont. There is no doubt of the fact that the company is reserving a large tonnage of high-grade ore in the mines, which is left standing and blocked, and which may be drawn upon at any time for the purpose of enriching the mill-heads. It has been the object of the management to increase the tonnage treated to the utmost capacity of the mill and to keep down the mill-heads to the lowest figure compatible with the maintenance of the present dividend rate, in order that all ore of value might be treated at once, thus avoiding a second handling of any low-grade material.

NEW YORK

Market News.—Copper Figures.—Arizona Copper Co.—Guggenheims and Development Company of America.—Porcupine.

General conditions in the stock market have become acutely bad within the past week. There has been a drastic slump, and the brokers have exhausted their vocabulary saying things concerning the Stanley committee's investigation of the Steel Corporation and are placing all the blame for financial stagnation upon so-called meddlesome politicians. The Copper Producers' report for the month of July shows domestic deliveries decreased some 5,000,000 lb., while exports increased approximately 75,000,000 lb., a higher figure than has been reported any time since last December, and an increase of 4,500,000 lb. above the export figure of a month ago. It may be entirely unjust, but there is a suspicion that not all of the wonderful export demand is actual. There may be no justification for the thought, but the suggestion made a month ago is strongly emphasized by the current figures. The decrease in surplus copper stocks was, in round numbers, 20,000,000 lb., while production was 112,167,934, a smaller return than any month in the year, save February. Accumulated stocks are now smaller than any time in 1911. The small refinery output, decreasing domestic deliveries, and an abnormal export figure, make up an interesting copper situation with latent possibilities. It is apparent that some of the factors in the copper metal market do not altogether relish the publicity brought about by the Producers' Association, and if it were possible to disband, or drop the organization without criticism, it can hardly be doubted that the Association would be allowed to expire. The Government is said to have undertaken an investigation of the Association, and if an order forcing the disbandment of the Association should follow, protest, if any, would undoubtedly come from the consumers instead of the producers. Perhaps one of the reasons for desiring a little less publicity may be found in the commanding position of the porphyries as shown in the recent quarterly report of the Utah Copper Co. The company met a reduction of one-quarter of a cent per pound by merely increasing its output and so automatically lowering costs.

While not yet made public in detail, it is understood that the committee which has been inspecting the properties and plant of the Arizona Copper Co. has made a satisfactory report. The site for the new smelter is yet a matter of discussion, but it is thought that the company will be largely guided by the suggestion of L. D. Ricketts.

It is being repeated that the Guggenheims are looking over the various subsidiaries of the Development Company of America, which include Tombstone Consolidated, the Imperial Copper, and the Saddle Mountain properties. The Development Company of America has been trying to devise a satisfactory plan of organization without any remarkable success, and there is no doubt a sale on any acceptable basis would be welcomed.

The worst set-back which mining interests have received in the East for a long time is the ruthless demoralization of the list of Porcupine issues. A short time since, preparations were being made for the launching of a full-fledged, electrifying mining boom. Some big deals were talked of as completed; the entrance of the Consolidated Gold Fields was made much of, with the result that they were no sooner in, than they publicly announced their exit, with the statement that they thought they were getting too much free advertising. Recently there has been a demoralizing slump in Hollinger, in which the Bewick-Moreing syndicate had acquired 50,000 shares and held an option for a like amount in addition. Now the option has not only been allowed to lapse, but the original 50,000 shares is believed to have been dumped into the market, helping the decline from $16 to $10.50. One of the chief factors against the early normal development of Porcupine was the absurd valuation placed on raw claims by owners and prospectors in the first days of the camp. Many mining men and promoters were anxious to have a stake in the new field but balked on paying exorbitant prices for prospects. For the present, Porcupine is dead marketwise, and its revival will be harder to accomplish than was its initial start. Most of the New York newspapers refuse to allow the name of the district to appear in the paper, either in advertising or in reading matter. The Englishmen appear to have not lost their faith in the camp, although Hollinger now stands a failure as a market matter, much as did Nipissing in the early days of Cobalt. When the Guggenheims dropped Nipissing, the Cobalt share activity received a blow, from the effects of which it has never fully recovered. Now Bewick, Moreing & Co. have placed Hollinger in much the same plight.

LONDON

Bullfinch Failures.—Closing the Foxdale Mine in the Isle of Man.—Wheal Kitty.

A year ago there was an abortive boom in England in connection with shares in Bullfinch mines in West Australia. Owing to the vigorous opposition to these schemes on the part of *The Mining Magazine* and others, the hollowness of the pretensions of many of the companies was recognized before things got too far. The companies that were actually floated are now beginning to sink. The Bullfinch East has decided to wind up, but this was not an important flotation. Much more interest has been aroused by the announcement that the Bull Ant is a failure. This company was promoted by Messrs. Doolette, and the London stockbrokers, Lionel Robinson, Clark & Co. The company still has £63,000 cash, and some shareholders want this distributed and the company wound up. The promoters, however, are averse to this course, and are disposed to do something for the shareholders. They therefore have offered to give one share in the Bullfinch Proprietary, their more prosperous company, in exchange for two shares in the Bull Ant. The shareholders will therefore get a rather longer run for their money.

The lead and zinc mines of Great Britain are either slowly dropping out of existence or are gradually decreasing in output. The Welsh mines are now producing less every year. An old landmark that is to disappear is the Foxdale silver-lead mine in the Isle of Man, that has been worked continuously since 1852 by the Isle of Man Mining Co. Up to 1890 the distributed profits were about £7000 or £8000 per year, and since then the dividends have gradually fallen and nothing has been paid since 1907. Some months ago it was found that the margin of profit had disappeared, and operations were only continued on the basis of lower wages. The men, however, did not agree to this arrangement for long, and struck work. The directors had no alternative, therefore, but to close the mine.

The progress of J. H. Collins' tin mine, the Wheal Kitty & Penhalls, at St. Agnes, Cornwall, continues to be satisfactory. The policy has been to mine lower-grade ore during the period of higher prices of the metal. The ore raised and treated during the first half of 1911 was 7816 tons, yielding 98 tons of concentrate, which sold for £11,602, as compared with 7636 tons, 110 tons, and £11,091, respectively, during the previous six months. The price obtained averaged £119 per ton, as compared with £100. The profit was £1875, out of which £1492 was written off for depreciation and for shaft-sinking. Dividends at the rate of 10% per annum on the preferred shares absorbed £841, part of which was provided out of the balance £1967 brought forward from the previous half-year. The equipment of the new Sara's shaft with pumps and haulage gear has been completed down to the present sump, and sinking will be resumed shortly. The development covered 1691 ft., or 1 ft. for every 4.6 tons of ore hoisted. The work on or near the adit-level has proved satisfactory, and a lode averaging 20 in. wide and containing 33 lb. of recoverable black tin per ton has been followed for 384 ft. The prospects at the Gooninnis sett recently acquired are not particularly hopeful. In future, much more ore will be drawn from the Sara's section.

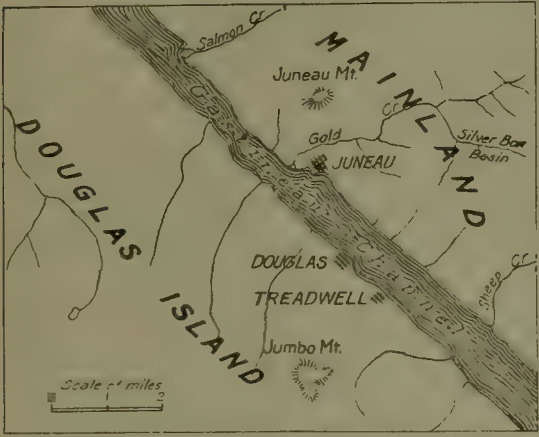
General Mining News

ALASKA

Juneau District

The total production of the Alaska Treadwell G. M. Co. for the month ended July 15 is valued at $188,297.39. The ore crushed amounted to 76,020 tons, and 1465 tons of sulphides was saved. The total realizable value of the output was $182,171.73. Operating expenses amounted to $86,729.95, leaving a net operating profit of $95,441.78. Construction expenses for the month are extraordinarily large, as they include the entire machinery bills for the new central hoist and crushers. They are given as $64,791.91. The ore milled yielded $2.41 per ton. Over 650 ft. of development work was done.

The report of the Alaska Mexican G. M. Co. for the month ended July 15 shows that 17,806 tons of ore was crushed, yielding $2.62 per ton. The total production for the month is valued at $46,627.60, with a realizable value of $46,161.33. Operating expenses amounted to $27,356.32, leaving a net operating profit of $18,805.01. The machinery bills for the new central hoist and crushers brought the construction expenses to $21,620.23. Over 160 ft. of development work was done. The sulphides saved amounted to 424 tons.



MAP SHOWING DOUGLAS ISLAND.

Prince William Sound

A small lode assaying $17.20 has been found at Kimball pass by G. A. O'Connor. It is more than 6 ft. wide.

A rich quartz vein recently was discovered a mile and a half from Ptarmigan Drop road-house by Lars Holland and Tom Hooleson.

An important discovery of free gold has been made on Shoup glacier and many claims have been staked. Specimens brought from the original lode discovered by Cliff Johnson and Captain Cameron are reported to have assayed $172 and $242 per ton. Eight lodes have been uncovered.

Work has been started on the Whalen & Anderson property on Shoup bay. Specimens showing free gold can be picked up almost anywhere there, according to press reports. The property is 1600 ft. above sea-level.

The Owl M. Co. recently imported two pack-horses for Shoup bay. They are the first horses there.

Seward Peninsula

A large dredge is being constructed at Port Clarence for dredging placer tin deposits.

ARIZONA

Cochise County

A milling plant will be constructed in the near future by the Fluorine M. & M. Co. of Pearce. The vein-filling contains fluorite, phonolite, rhyolite, and andesite as well as quartz. Free gold has been found. The east drift on the 110-ft. level will be connected with shaft No. 1. A winze will be sunk on the same level between No. 1 and 2, to follow a rich vein found there. C. S. Mounonier is treasurer.

Gila County

Inspiration Copper Co. on the first of the month had 23,018,000 tons of ore developed and averaging over 2% copper, and 2,516,000 tons partly developed, making a total of 25,534,000 tons. Operation is continued steadily.

CALIFORNIA

Butte County

(Special Correspondence.)—Richard R. Grass is constructing a 6-ton Bryan roller mill at Forbestown for custom ore from the small mines of this district. A larger mill later may be built half a mile from here.

D. C. Mitchell with ten men is engaged in development work at the Carlisle mine, which formerly was operated by Eugene Schmidt of San Francisco.

Forbestown, August 14.

Monterey County

(Special Correspondence.)—While surface indications at Gorda indicate gold ore, very little development work has been done. The Plaskett brothers are getting on an average twenty-five 100-lb. sacks of rich free-milling gold ore per day from a 3-ft. vein. The brown oxide ore from this vein assays about $3000 per ton. They are uncovering ore which has been covered by settling of the earth-crust on the steep mountain-side and are sacking it to prevent it from being carried away by the next winter's rains. Over 300 ft. of the vein is in sight, and they will have sacked over 100 tons from surface ore before following the vein beneath the crust. Mr. Bushwell, at Bushwell's camp, is sacking rich free-milling ore from a well defined vein in decomposed slate.

Plaskett, August 9.

Nevada County

(Special Correspondence.)—The North Star M. Co. has commenced the reopening of the Nevada City mine, one of the Champion group. The clearing out of the old drain tunnel is under way, and the shaft will be repaired and re-timbered. An electric hoist has been delivered at the shaft and will operate from the 400-ft. level, when the shaft has been intersected by the drain tunnel. The Nevada City mine comprises two claims, but the property has never been developed extensively. Within a few weeks it is believed the new electric pump at the Providence shaft will be in commission. The pump has a capacity of 750 gal. per min., with a vertical lift of 980 ft., and will be operated by a 250-hp. electric motor. In the main Champion workings considerable development work is progressing. More men constantly are being added to the force, and the North Star people are showing a disposition to conduct work on a broad scale. The surveying party recently sent out by the St. Gothard Gold Co. to determine costs, etc., of increasing water-power facilities, has practically completed its labors. Within a short time it will be known what action the directors will take. In the meantime the property, generally known as the Delhi, remains idle for lack of sufficient power. Othello Scribner and associates of San Francisco are conducting vigorous work at the West Point, in the Rough & Ready district, four miles below Grass Valley. It is stated that crosscuts and drifts are going ahead, while good ore has been stoped. This is the company that recently acquired the California mine, in the same field. The Pennsylvania-W. Y. O. D. mine, at Grass Valley, is reported to be improving under new management.

Nevada City, August 12.

San Diego County

The Universal M. & D. Co. has been organized under the Arizona laws for development work in the Pine Valley district. It is planned to treble the depth of the workings and to increase the capacity of the mill on the property from 10 to 20 tons. Later a cyanide plant will be added. The ore deposits at the Universal, or Nobles, tuite occur at the contact between mica schist and a granitoid rock, in pockets, stringers and in a porphyritic dike. So far only the first two have been prospected. The officers of the company are Henry A. Cogswell, president; Charles A. Arnold, vice-president; R. E. [illegible], secretary; and Thomas A. Wetzel, treasurer and general manager. Railroad connection will be made at Campo, 18 miles distant from and about 2000 ft. below the mine. The line is under construction.

The Balaklala Copper Co. has commenced dismantling its smelter at Coram. It is reported that 100,000 lb. of steel material has been sold to the McCormick-Saeltzer company of Redding. A rumor is finding belief that the Balaklala and other companies are interested in the proposed acquisition of an ideal smelter site in Washoe county, Nevada. It is said that 800 acres of land already have been bought and that construction work will start in the near future.

SIERRA COUNTY

(Special Correspondence.)—The second payment was made this week on the Independence mine, at Alleghany. The property is being operated by San Francisco capitalists. The vein shows strength as developments progress. Fred A. Pearson is manager. The Neocene Mining Co. recently received a shipment of 300 tons of cement, to be used in constructing a new restraining dam at the Scales hydraulic mines. Gravel of good grade has been recently uncovered, and the management has not decided whether to operate the deposit by means of giants, or by drift mining. The necessity of constructing another restraining dam is the costly obstacle to the employment of another giant. Los Angeles people are chiefly interested. The Brandy City M. Co. is operating six monitors at its hydraulic property, in the old Brandy City district. The channel lies between Slate and Canyon creeks, and ranges from 200 to 600 ft. wide. At the present workings the depth is about 200 ft. The strata are exceedingly hard, necessitating blasting, for which black powder is employed. The restraining barrier is a gravel and cement dam, 20 ft. thick. The line of sluices exceeds 1½ miles. This property is understood to be the largest active hydraulic mine in central California, and was reopened after lying idle for nearly 20 years. The company has its own electric-power plant. San Francisco people holding a bond on the Omega have ordered the immediate construction of a six-drill compressor. The electric separating process is used.

Downieville, August 11.

SISKIYOU COUNTY

(Special Correspondence.)—The Siskiyou Syndicate has started a lower adit to open the orebodies on the Cub Bear mine. The adit is about 30 ft. on the vein, with good progress being made. About 65 tons of ore, valued at about $40 per ton, has been extracted and stored. On the surface the 3-ft. vein has been exposed for 100 ft. A cross-cut has passed through 12 ft. of mineralized rock that prospects well. The Cub Bear is in the Russian Creek district, traversed by the Salmon river. Rich quartz is coming from the Homestake, where a narrow shoot of high-grade ore has been opened from the surface to No. 3 adit. This property was recently acquired by R. S. Taylor. John Boyle is superintendent. It is reported that rich ore is being developed in the Highland mine, recently acquired by a Dutch syndicate. This property is the most famous high-grade producer in the county. The Siskiyou Coal Co. is pushing vigorous work on its deposits near Agen. The drills are proving the field quite extensive, and samples of the material are pronounced of commercial grade.

Etna, August 11.

YUBA COUNTY

The Yuba Consolidated Gold Fields, in the year ended February 28, 1911, handled 13,970,728 cu. yd., yielding $2,927,246, which, together with its miscellaneous revenue, brought its total gross earnings up to $2,998,708, and of this amount the net profit was $2,181,336, all but $200,000 of this being paid out in dividends. The average cost per yard was 10.7 cents.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence.)—The Dives-Pelican and Seven-Thirty M. & M. Co. will construct an aerial tramway from the dumps of the Zero mine to the Pelican mill which from now on will be operated on company account, the leasing company having surrendered its privilege. Work was resumed this week on the North Star property in East Argentine. M. Bonham is owner. H. M. Vincent, owner of the Revelle property, has resumed operations. Holcombe & Co., leasing on the Seven-Thirty mine, are shipping ore that mills 160 to 490 oz. silver per ton. The streak is 10 in. wide. A shipment of 16 tons of smelting ore from the Eade lease on the Capital mine brought a net settlement of $1150. The orebody is from 14 to 18 in. wide. A vein of galena 20 ft. wide has been found in the breast of the adit on the Paragon vein in West Argentine that mills 65% lead and 42 oz. silver per ton. Wm. Coggswell is owner.

Georgetown, August 10.

SAN MIGUEL COUNTY

The survey for the surface trolley from the Ophir adit to the Tomboy mine has been completed. The line will be about a mile long and will be used for conveying ore from the Revenue property, recently purchased by the Tomboy, to a tunnel which will be driven to the 1750-ft. level on the latter property. The ore will be hoisted through the Colorado shaft and crushed at the Tomboy mill.

TELLER COUNTY

An attempt to accelerate the drainage of Cripple Creek mines by constructing two more laterals from the Roosevelt drainage tunnel will be made, according to F. L. Sigel. The laterals will be about 120 ft. long, and it is believed they will cut known watercourses. The water at present is receding at the rate of about 7 ft. per month, and the tunnel is delivering about 5800 gallons per minute.

Press reports state that Miller & Co., lessees, while working on the 300-ft. level of the Stratton's Independence mine, discovered ore assaying 14 oz. gold per ton in one case and 22 oz. gold per ton with a second sample. Philip Argall is manager for the company.

IDAHO

IDAHO COUNTY

The Elk City reduction plant is to be ready for ore-treatment by September 1. A large quantity of concentrate in that district will keep the concentrating-plant busy for some time. The plant will be operated next week, according to the announcements.

SHOSHONE COUNTY

Oscar B. Wallace has resigned the management of the Interstate Silver-Lead M. Co. in order that he may give his entire attention to the Ruth M. & M. Co., in which he is heavily interested. Jack Feeley, formerly of Boulder, is the new manager for the Interstate company.

The Bullion M. Co. has let a contract for the construction of a flume for water-power purposes. The wagon-road from the mine to the railroad has been completed. James H. Taylor, of Wallace, is manager for the company.

The Argenta M. Co. has had its claims surveyed for patent and holds a receipt for patent pending. Since the last report, in January, the adit has been driven 150 ft., making a total of 420 ft. It is rumored that soon equipment will be secured. E. Lindsly is manager.

MICHIGAN

HOUGHTON COUNTY

If a quorum is obtainable, the directors of the Quincy M. Co. will meet soon in Boston to take action on the regular quarterly dividend of $1 due in September. In addition to the $440,000 required annually for dividends, the company has an annual charge for additional territory secured from the St. Mary's Land Co. Reports state that with a $10\frac{1}{2}$c. cost and the market close to $12\frac{1}{2}$c., the company's margin of profit on 22,000,000 lb. of copper per year has not been much larger than dividend requirements.

MONTANA

Lincoln County

(Special Correspondence.)—The Kalispell-Lincoln M. Co., acording to officers of the corporation, has made arrangements to work two shifts of men on the company's property in the West Fisher gold district. It is the intention to put in a stamp-mill soon. The ore is free-milling gold and the vein is 3 ft. wide, with a pay-streak through it which averages 14 in. in width and which is said to assay $100 to the ton. J. J. Hibbard, of Libby, is manager for the company.

Libby, August 13.

NEVADA

Churchill County

(Special Correspondence.)—The 100-ton mill of the Nevada Wonder M. Co., at Wonder, began operation on August 1. A five days' test run was made in June for the purpose of aligning the shafting and testing the mechanical operation of the mill, and since that time such changes as were shown to be necessary have been made, so that now the mill is in good operating order.

The ore is trammed from the mine in side-dumping, 3-ton ore-cars, and dumped into a 200-ton bin. It is then crushed through a Blake crusher and elevated into a 100-ton battery-bin. Thence it goes through a battery of ten 1400-lb. stamps, through a Chilean mill, and a tube-mill. From the grinding department it passes through a Dorr classifier into collecting-tanks and through the usual arrangement of thickeners and agitators, and finally passes through Oliver filters. Zinc-box precipitation is used. The refinery is equipped with Faber du Faur tilting-furnaces. The mill is furnished with Callow cones and Deister concentrating-tables, but at present these are not being used, as the ore is all-slimed and satisfactory results are being obtained without them. So far, the mill gives promise of high percentage of extraction; the tailing going out contains from 50c. to $1 per ton. No clean-up has been made. Water is amply supplied through 10 miles of 4-in. pipe from Horse creek, which heads in Mount Grant. The 100,000-gal. storage-tank above the mill is constantly overflowing.

Development at the mine has been pushed rapidly since May. Sullivan $2\frac{1}{4}$-in. drills and Waugh stopers have been in use since July 12, and over 200 ft. of work per week is being done. Ore for the mill is being furnished both from the development faces and from stopes. The mine machinery equipment consists of a Leyner hoist, a Laidlaw-Dunn-Gordon compressor, and a Sturtevant blower, all operated by electric power; a Leyner drill sharpener and automatic ore-gates from the mine-bins are operated by compressed air. J. A. Burgess, formerly of Tonopah, is superintendent.

Wonder, August 14.

Esmeralda County

A new shaft is to be sunk on the Quartzite No. 1 claim of the Goldfield Belmont M. Co. The shaft, it is announced, will be a deep one, and the means for extensive exploration. It is stated no more leasing will be done.

It is reported that Goldfield Con. during July reduced its cost of production as compared with June, to $7.50, as against $8.06. The record figure, for January, is $7.29. During recent months the poorer grade of ore mined has necessitated an increase in the tonnage of ore treated. On July 31 nine months of the company's fiscal year were completed, and reports show earnings well in excess of dividend requirements.

Humboldt County

Press reports state that Gordon Campbell, one of the pioneer operators in the National district, is arranging a merger of the Consolidated, north of the National mine, the First National, the Mammoth, and White Rocks groups, and possibly other properties. His plans include the organization of a company capitalized at $15,000,000.

Lincoln County

Deeds have been filed conveying the properties formerly owned by the Con. Pioche M. Co. and the Nevada-Utah M. & S. corporation to the Amalgamated Pioche Mines & Smelters corporation. The details of the transfer have been published. A trust deed also was filed from the last corporation to the Paterson Safe Deposit & Trust Co. of Paterson, N. J., as security for the payment of $500,000 of 10-year 6% interest-bearing gold bonds. Work was started at No. 1 shaft August 5.

Nye County

A solid low-grade quartz vein has been found on the Stone Cabin claim of the Jim Butler group near the 600-ft. level of the Stone Cabin shaft. The best ore is found in the transverse fractures of the vein.

The Tonopah-Belmont's gross production for July was valued at $278,107.07, or nearly $5000 more than the June production, according to press reports. During the month, 6883 dry tons was sent to the mill and 2285 dry tons to the smelters, making a total of 9168 tons forwarded. The gold bullion produced amounted to 3931.428 oz., and the silver bullion to 395,868.71 oz. The net profit for the month was $149,170.27. The last figure implies an addition to the reserve fund, as the regular quarterly dividend of 25c. requires monthly earnings of $125,000. The company is reported to have in its treasury already over half a million dollars beyond what will be needed for its next dividend.

The report of the Tonopah M. Co. for July shows a net profit of $120,415. During the month 14,118 dry tons of ore with an average value of $18.89 per ton was sent to the mill. The gold and silver bullion shipped amounted to 256,587 oz. and was valued at $189,765. The concentrate shipments amounted to 113 tons and were valued at $47,860.

At the Montana-Tonopah, 55 bars of bullion, weighing in the aggregate 3629 lb., and 79 tons of concentrate were shipped during July. The production was far in excess of that for June. In the first week of August, 186 ft. of development work was done. Stoping in the numerous levels continues. In the 765-ft. level cutting-out work has been started preparatory to driving drifts on some of the veins, which, intersected at that level, show promising ore.

Tonopah Extension reports show an average for the first week in August of 140 tons of ore milled per day.

The management of the Buckeye-Tonopah, after the recent fire, replaced four sets of timbers at the top of the shaft, although only the collar set, and two other sets were damaged. The newly timbered top is started for a double-compartment working shaft and manway. The surface will be prepared for the new steel head-frame, and pending its arrival a temporary wooden frame will be used.

The Buckeye Eagle mine has received a complete equipment, valued between $6000 and $7000. The equipment consists of a large Leyner hoist with a drum capacity of 1800 ft. of cable; a 52-hp. G. E. motor, geared to hoist, with controller, switches, etc.; and three transformers, together with two Truax ore-cars, buckets, steel cable, and sheave-wheel.

Work has been suspended in the old raise and stope from the 950-ft. level of the North Star, and a new raise has been started nearer the shaft.

NEW MEXICO

Grant County

It is announced that by the end of this month or early in September the Chino Copper Co. will be treating ore at its new mill. By October 1, it is believed, two sections will be in operation, each treating about 1000 tons per day. Stripping at the mine has progressed in a satisfactory manner. A good body of ore, according to report, is being developed southwest of the Hearst mine.

(Special Correspondence.)—John M. Sully, manager for the Chino Copper Co., and G. C. Bowles and C. F. Bruff, construction engineers for the Utah Copper, Ray, and Chino companies, had an exciting experience at the hands of bandits on August 10. On their way, by auto, to Hurley they were stopped by three masked men between Bayard station and Hurley, through an erroneous report that the mining men were carrying pay-roll money for the latter place. Sitting in the tonneau, the bandits forced the autoists to undertake an impromptu 'elimination run' by turning out of the road into rough country. After the machine had been stuck in a sand arroyo, the road agents relieved the men of their valuables and also the spark plug of the automobile. The men walked to Hurley. The bandits later 'got the drop' on the sheriff's posse in Martin's canyon and took the horses and guns. As yet the robbers have not been captured.

Santa Rita, August 12.

SOCORRO COUNTY

(Special Correspondence.)—The Ernestine Mining Co.'s mill treated 1410 tons of ore in the past two weeks. The last two clean-ups for July yielded 13,094 oz. gold and silver bullion and 20,000 lb. of high-grade concentrate. Grading for the new power-plant has been started, the construction being under the direct supervision of one of the leading engineers of the West. Sixty tons per day is being mined and teamed to the Treasure Mining & Reduction Co.'s mill. All machinery in both mine and mill is operated by electricity generated by water-power on Whitewater creek, at a total cost of less than $10 per day. This is at the rate of $18 per horse-power year. Bids are being obtained for the construction of a wire-rope tramway from mine to mill which will admit crushing 40,000 tons of dump ore at a good profit. New ore-zones are being discovered in the mine under the intelligent work of the foreman, and the property will be capable of producing a much larger tonnage.

At the Socorro Mines 5300 tons was milled during the month of July, producing 33,400 oz. gold and silver bullion and 21,000 lb. of concentrate. Concentrate from this mill yields about $2000 per ton. The usual good extraction of 93% is being maintained, and the developments throughout the mine are satisfactory. Good progress was made by the Oaks Co. in the main drainage and transportation tunnel during the week. Development work continues in the Little Charlie tunnel of the Mogollon Gold & Copper Co. which is yielding a high-grade average mill-ore, from which much shipping ore is being assorted. Work continues in the new shaft of the Maud Mining Co. as heretofore.

Mogollon, August 11.

SOUTH DAKOTA

LAWRENCE COUNTY

Wasp No. 2 paid its regular dividend of one cent per share, and an extra dividend of the same amount, during July. Mining costs are being reduced somewhat, and the mill kept running at capacity, 480 tons per day. John Gray, general manager, has left for Europe to spend the summer.

UTAH

BEAVER COUNTY

The South Utah Mines & Smelter Co. in July produced 254,462 lb. of copper, 2096 oz. of silver, and 106 oz. of gold. Over 19,500 tons of ore averaging 1.21% copper and yielding 1750 tons of concentrate was received at the mill. The concentrate averaged 8.07% copper.

SALT LAKE COUNTY

At the annual meeting of the Cardiff M. & M. Co., August 11, it was announced that the company had on hand, July 11, $3771.63. On August 31, 1910, the company had on hand $1744.71; two assessments brought $5001.77, and ore-sales returned $24,876.82 net. Of this total of $31,623.30, $27,851.67 was paid out by check. The ore-receipts specified were between the latter part of July 1910 and January 18, 1911, and were from the sale of 632½ tons. Ezra Thompson, president, has stated that work soon will be started on the new adit to connect with the bottom workings which will give 600 ft. vertical depth. Ore is reported to be marketed at the rate of 100 tons per month.

WASHINGTON

FERRY COUNTY

(Special Correspondence.)—At the Knob Hill mine the raise from the No. 4 level is up 105 ft., the last 5 ft. being in ore that has a shipping value reported better than $60 per ton. On the No. 2 level, 68 ft. above, the same pay-shoot has been followed 220 linear feet. At the San Poil Con., the North San Poil raise has holed through into the shaft. In stoping at the south end of the pay-shoot 3 ft. in width, and going northward from 2 to 4 ft. in width, the ore assays from $15 to $20 per ton. The north drift has only 30 ft. to run to the end line, and after driving that distance the drills will be removed to the end of the south drift on the No. 4 level. Last week four carloads of ore was shipped to the smelter, and the same quantity has already been shipped this week. The smelter returns are now running from $27 to $30 per ton. At 120 ft. north of the raise, on the No. 2 level, two rounds of holes have started a new stope from 4 to 6 ft. wide, and the ore assays from $12 to $20 per ton.

The Illinois M. Co., in Keller district, has installed a 25-hp. gasoline engine, an air-compressor and receiver, a Wood's 2½-in. drill, and 600 ft. of pipe, and is resuming operations at the mine. The Rebekah M. Co. has five claims on the south half of the Colville Indian reservation, covering about 3500 ft. of a copper-bearing vein. The ore assays about $28 per ton.

Republic, August 12.

SPOKANE COUNTY

United States Smelting, Refining & Mining Co., which operates custom plants in Mexico, California, Utah, and other States, has taken out a license in Washington and appointed A. C. Barke, formerly connected with the smelter at Northport, Wash., as its representative. The company also has agents in the Coeur d'Alene and Nelson districts. Arrangements are being made to secure the Canadian output of lead in the event the duty is taken off.

CANADA

BRITISH COLUMBIA

Stockholders of the Island S. & R. Co., the $10,000,000 corporation organized by Donald D. Mann, have authorized the construction of a testing plant for the treatment of lead, zinc, and other refractory ores in British Columbia. Mr. Mann shortly will visit Stewart with several mining experts.

At the International mine, work has been started on the main working-adit at a depth of 700 ft. from the upper showings. A second prospect-adit is being driven at 500 ft. Indications are promising. Roy Clothier is in charge.

Albert Lund, owner, with Joseph Rogers, of the Mamie and Bessie claims, above the Bear River M. Co.'s property, reports a large copper-gold ore deposit there, of which recent samples assayed as high as 35% copper and $2.50 gold per ton.

The British Columbia Copper Co. in June produced 816,676 lb. of copper, making a total of 5,144,365 lb. for the six months ended June 30, against 2,978,227 for the same period last year. In June 11,472 oz. silver and 2428 oz. gold were produced.

Charles Camsell, of the Dominion Geological Survey, recently stated at Hope that his surveys near Steamboat mountain resulted in finding only evidence of coal beds. He laughed at the idea of finding gold there.

Press reports state rich-looking ore has been found in the cliffs of Coquahalla valley.

The annual report of the Granby Con. M. S. & P. Co. for the fiscal year ended June 30, shows that the production for the year was the smallest since 1906. Assuming a copper cost of 10¾c. per pound and a selling price of 12.33c., the net income from the 17,795,215 lb. of copper produced was about $282,000. In the fiscal year ended June 30, 1910, it cost the company 10.3c. per pound to produce about 22,000,000 lb. of copper. The higher cost this year was due to a temporary shut-down of the smelter, a decline in ore content, and higher fuel charges. The estimate of earnings does not include several 1% dividends on its holdings of the Crow's Nest Pass Coal Co. In the year, Granby Con. paid one dividend of $1 on its 148,495 shares. Since the payment, 1500 shares of treasury stock were issued as part payment for new property, making 149,995 outstanding shares. The smelter was enlarged some months ago and has eight furnaces.

GRANBY SMELTER.

Discovery of platinum near Slocan Junction has resulted in a rush of locators to the Kootenai river, where a syndicate, headed by Alfred Jeffs, has staked 14 claims on the dike. The assays from samples range in value from $72 to $176 per ton. The extent to which claims are being located will be understood when it is known that one prospector staked a claim which included the city power-plant at Nelson. Ranchers in the district are defending their holdings against invaders.

CHILE

O'Higgins

The first 1000-ton unit of the 3000-ton concentrator of the Braden Copper Co. has practically been completed, and cable reports of its being placed in commission are expected daily, states Pope Yeatman, consulting engineer for the company. One of the generators at the company's hydro-electric station is in position, but has not been adjusted. The first part in commission will represent 6000 kw. Most of the important development has been at the Fortuna mine, but work is now being pushed at the Tiente mine, where sulphides assaying 4% copper have been found in large quantity. It is believed that the orebodies at Braden are of primary origin, and hence persistent in depth.

GUATEMALA

The executive mining concession granted the Guatemala M. & D. Co. has been approved by the national assembly, states R. S. Reynolds Hitt, American Minister at Guatamala City. Archibald E. Spriggs, as representative of the company, is the original grantee. The company has exploring parties, one of over 50 men, already in the field.

MEXICO

Chihuahua

The Estella M. Co. is putting down a 2-compartment shaft and, if favorable indications are shown, cross-cutting and driving will be done. The threatened labor trouble at the Santa Eulalia will not affect the Estella, according to W. F. Swoyer, manager of the latter mine. A large amount of capital was invested by London men in the Santa Eulalia during the recent rebellion. Development work is being pushed at the Sierra Mojina. In regard to the last, Mr. Swoyer stated in an interview: "The present management intends operating on a large scale in the near future, putting in economical devices for extracting the ore and facilitating transportation to Gallego." Mr. Swoyer is in the office of the Estella M. Co., Calle Victorria 319, Chihuahua.

Jalisco

Machinery for the Mirador M. Co. is being received at Magdalena, shipping station for the Hostotipaquillo district, and is being forwarded as fast as possible to the proposed site, according to press despatches. The plant, which will occupy part of the El Favor M. Co.'s mill-building, will consist of 15 stamps, concentrators, tube-mills, and a cyanide equipment. The Mirador and El Favor properties, which are close together, are controlled by the Makeever brothers of New York.

Two adits are being driven on the Mina Grande property, Hostotipaquillo district, to cut the veins of the Mina Grande below the old workings. The company recently made a shipment of ore from the old workings of the Juarez mine to the San Luis Potosi smelter which averaged 6500 gm. per ton, according to newspaper report. W. A. Hoeing, of Guadalajara, is general manager for the company.

Oaxaca

Steel timber-sets are being placed throughout the Los Ocotes property in the Ejutla district, according to Associated Press despatches in Mexican papers, and the main shaft is being enlarged to two compartments. It is the property of the Teziutlan Copper M. & S. Co. Denouncing of claims in Oaxaca camps was more general during the recent insurrection period than at any other time in the past two years. Mining conditions have not greatly suffered, and there has been little trouble from strikes.

The San Jose mill and mine in the Dierra Juarez district have resumed operations after being shut down for nearly a year. Charles Davenport is in charge.

A. W. Hollenborg is resuming development work on the Cajones silver properties, owned by Louisville, Ky., men. The ore is found in extensive flat veins rich in sulphides. Transportation facilities are poor, but water-power and fuel are available, and ultimately, it is reported, a treatment plant will be built.

Parral

A new pumping outfit is to be placed in the near future on the Esmeralda property, where a remarkably rich vein, according to report, was found a short while ago. Wade Armstrong is manager of the mine.

Sonora

The two new electrically-controlled converter stands being placed in the Greene-Cananea smelter will enable the company to increase its output heavily. The stands will be of the same pattern as those now in use.

Greene-Cananea made its largest monthly production of the past year in July, 3,994,000 lb. of copper. The silver yield was 112,921 oz., the second largest this year, and the gold extraction of 582 oz. is exceeded in the company's history only by the output of April 1909, 611 oz. In March this year the copper production was 4,000,000 pounds.

The Mina Mexico smelter, near Toiuchi, has been closed down, as heavy rains have interfered with the transportation of supplies.

The Guaymas smelter of the Pacific S. & M. Co. will soon be blown in. Courtenay De Kalb, general manager for the company, has stated that he is in the market for ore.

George W. DuBes, owner of the San Jose mine, near Alamos, has bought a steam-hoist, compressor, and air-drill, which soon will be put in place on the property.

The Padre Hoben M. Co. soon will start work on the property near Chinipas. The mine was purchased from Father Hoben of Pecos, Texas. The purchasers are Battle Creek, Mich., investors.

URUGUAY

A New Jersey oil company has entered the Republic, states F. W. Goding, consul at Montevideo. A system of depots will be established and a refinery will be built either at Montevideo or Buenos Aires. American enterprise gradually is entering that part of the continent.

Decisions Relating to Mining

Specially reported for the Mining and Scientific Press

Injury to Miner—Questions for the Jury

The question as to whether the particular condition created by a loose rock and the successive explosions of dynamite rendered the place unsafe, and whether ordinary care required that the rock be removed or supported in place, and whether or not, if it was negligence to leave the rock in place, it was the negligence of the defendant, and whether or not it was contributory negligence on the part of the plaintiff to continue work in such apparent danger, are all questions of fact for the jury to determine.

Lewis v. Detroit Vitrified Brick Co., (Michigan) 129 Northwestern, 726. Feb. 1911.

Pollution of Water by Mining Company

The sale to a mining company of the right to mine coal under the grantor's land does not give the company the right of polluting a watercourse on such land by copperas and slack from the mine. And it cannot avoid liability for injuring land for agricultural purposes by reason of placing the slack and copperas in a watercourse, by showing that the mine was operated in a careful and prudent manner. Neither is it a defense to an action for such damages that the land-owner did not object to the opening of the mine.

Nebo Consolidated Coal & Coking Co. v. Lynch, (Kentucky) 133 Southwestern, 763. Jan. 1911.

Construction of Mining Lease

Where a lessee agrees to pay the lessor a royalty depending upon the amount of minerals mined, he thereby impliedly obligates himself to begin developing within a reasonable time and to continue the same. And where the lessee convenants to prospect the land and in case he discovers minerals to pay the lessor a stipulated royalty on the ore mined, such covenant to prospect is in the nature of a condition and the lessee must proceed with and persist in prospecting with reasonable diligence and continuity of effort. And a suspension of prospecting operations for a period of 14 months justifies the finding that the delay was unreasonable.

Loveland v. Longheury, (Wisconsin) 129 Northwestern, 650. Jan. 1911.

Employment of Minor in Coal Mine—Negligence

The statute of West Virginia provides that no boy under 14 years of age shall be employed or shall be permitted to work in any coal mine. But the statute is not construed to mean that an employer shall respond in damages for all injuries sustained by such a boy though employed in a coal mine. While such a boy may have a civil remedy for an injury sustained in such unlawful employment and resort to the violation of the statute for evidence of the negligence which caused the injury, still the statute does not imply that the employer shall respond in damages other than those given by the common law. It does not impose an absolute liability for civil damages, but it may be shown that the employer is liable for damages at the common law for injuries sustained by reason of the violation of the statute; neither can it be said as a matter of law that such an employer is chargeable in damages with the injuries that result. "The true question to be determined," say the Supreme Court of West Virginia, "in an action based upon a failure to obey a statute like the one in consideration, is: Did the unlawful employment cause the injury? The trial of the case must be guided by this question. If the injury complained of is a natural and probable consequence of a violation of the statute, then that violation is correctly taken as the proximate cause of the injury. If the very injury has happened which was intended to be prevented by the statute law, that injury must be considered as directly caused by the non-observance of the law. But if the injury is one that happened by causes independent of the violation of the statute, it is not actionable on the basis of that violation. If the intervening event against which the statute evidently did not intend to provide, and the appearance of which was not anticipated by the spirit and purpose of the act, has in fact caused the injury, that event is plainly the proximate cause."

Norman v. Virginia Pocahontas Coal Co., (West Virginia) 69 Southeastern, 857. Dec. 1910.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

H. C. Callahan is in London.

C. E. Singer is at Pueblo, Colorado.

D. C. Jackling was in San Francisco.

V. B. Sherrod is at Goldroad, Arizona.

N. S. Kelsey is at Jackson, California.

Charles Janin is resting at Lake Tahoe.

J. C. Nichols has gone to San Salvador.

C. W. Merrill has returned from the East.

Hennen Jennings has been in San Francisco.

Howard D. Smith has returned to San Francisco.

Albert Burch is expected in San Francisco today.

M. H. Kuryla is at San Sebastian, Jalisco, Mexico.

G. F. Beardsley has gone to Monterey county, California.

S. H. Ball has left New York for the west coast of Mexico.

A. K. McDaniel was in San Francisco and has gone to Cananea.

James G. Berryhill and W. C. Orem have been in San Francisco.

Richard B. Stanford arrived in New York on August 7 from London.

Atholl F. McEwen has gone to British Central Africa by way of London.

W. E. Defty has moved from Long Beach, California, to Phoenix, Arizona.

E. E. Carpenter is with the Nevada Hills Mining Co., at Fairview, Nevada.

Dana A. Langley is at Clifton, Arizona, having left Mogollon, New Mexico.

W. A. Barrington, of Mexico, will be in Kansas for the next three months.

Courtenay De Kalb has been in San Francisco and has gone to Tucson, Arizona.

A. P. Dumas is with the Mina la Cruz y Anexas, at Zimapan, Hidalgo, Mexico.

S. E. Bretherton is in Plumas county, California, examining land for gold-dredging purposes.

Wm. J. Priestley, Jr., is superintendent and mine manager for the Fairbanks Alaska Exploration Company.

Ralph Arnold has returned to California from London, having come by way of Trinidad, South America.

T. M. Hamilton is superintendent for the American Smelting & Refining Co., at Charcas, San Luis Potosi, Mexico.

L. W. Bahney has been elected to the chair of metallurgy in the Sheffield Scientific School, New Haven, Connecticut.

Harry J. Wolf has lately been appointed manager, for the lessees, of the Stanley Mines Co.'s properties at Idaho Springs, Colorado.

Market Reports

LOCAL METAL PRICES.

San Francisco, August 17.

Antimony	12—12¾c	Quicksilver (flask)	...50
Electrolytic Copper	14—15¼c	Tin	47—48½c
Pig Lead	4.75—5.70c	Spelter	7—7¾c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50—9.75; large $7.50—8.50

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Aug. 10	12.43	4.50	5.96	52⅛
" 11	12.43	4.50	5.98	52⅛
" 12	12.43	4.50	6.00	52
" 13	Sunday		No market.	
" 14	12.43	4.50	6.05	52
" 15	12.43	4.50	6.05	52
" 16	12.43	4.50	6.05	52⅛

ANGLO-AMERICAN SHARES.

Cabled from London.

	Aug. 10. £ s. d.	Aug. 17. £ s. d.
Camp Bird	1 9 0	1 9 0
El Oro	1 3 0	1 3 0
Esperanza	1 16 10½	1 16 3
Dolores	1 5 0	1 5 0
Oroville Dredging	0 5 9	0 5 9
Mexico Mines	7 1 3	7 2 6
Tomboy	0 19 4½	0 19 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing prices, Aug. 17.		Closing prices Aug 17.
Amalgamated Copper	$ 60⅞	La Rose	$ 3¾
A. S. & R. Co	70½	Mason Valley	7½
Braden Copper	4¾	Miami Copper	19⅞
B. C. Copper Co	3⅞	Mines Co. of America	4⅝
Butte Coalition	16	Nevada Con	17⅛
Chino	18⅝	Nevada Utah	⅝
Davis Daly	¾	Nipissing	8⅛
Dobie	1	Ohio Copper	1⅛
Dolores	5	Ray Central	1⅜
First National	1	Ray Con	15
Foley O'Brien	1	South Utah	¾
Giroux	5⅛	Superior & Pittsburg	16
Goldfield Con	5⅛	Tenn. Copper	32
Greene-Cananea	6⅝	Trinity	4
Guanajuato Con	⅛	Tuolumne Copper	4
Hollinger	10⅛	United Copper	2½
Inspiration	6⅝	Utah Copper	40¼
Kerr Lake	4¾	Yukon Gold	3¾

COPPER SHARES—BOSTON.

	Closing prices, Aug. 17.		Closing prices Aug. 17
Adventure	$ 5	Mohawk	$ 40
Allouez	24¾	North Butte	24
Calumet & Arizona	47½	Old Dominion	36½
Calumet & Hecla	400	Osceola	89
Centennial	9	Parrot	0
Copper Range	54	Santa Fe	¾
Daly West	5¼	Shannon	7⅞
Franklin	8¾	Tamarack	25
Granby	28¾	Trinity	3¼
Greene Cananea, ctf	6⅝	Utah Con	12⅞
Isle Royale	12½	Victoria	1½
La Salle	3	Winona	6¼
Mass Copper	5¾	Wolverine	100

(By courtesy of J. C. Wilson, Mills Building.)

NEVADA STOCKS.

San Francisco, August 17.

Atlanta	$ .17	Mayflower	$ .06
Belcher	.53	Mexican	4.17
Belmont	6.62	Midway	.17
B. & B	.16	Montana Tonopah	.69
Booth	.03	Nevada Hills	3 50
Chollar	.14	Ophir	1.82
Combination Fraction	.09	Pittsburg Silver Peak	.68
Con. Virginia	.85	Round Mountain	.69
Florence	1.40	Sandstorm Kendall	.04
Goldfield Con	5.60	Savage	.23
Gould & Curry	.14	Tonopah Extension	.86
Jim Butler	.27	Tonopah of Nevada	5.87
Jumbo Extension	.19	Union	1.57
MacNamara	.18	West End	.56

(By courtesy of San Francisco Stock Exchange.)

Recent Publications

COAL AND OIL OF WYOMING. Wyoming State Board of Immigration, Bull. No. 3. 16 pp.; ill. Cheyenne, 1911.

THE RESOURCES OF TENNESSEE. State Geological Survey, Vol. 1, No. 1. 32 pp.; ill. Nashville, 1911.

ANNUAL REPORT OF THE MINISTER OF MINES OF BRITISH COLUMBIA, 1910. 269 pp.; ill., maps, index. Victoria, B. C., 1911.

TRANSVAAL CHAMBER OF MINES, TWENTY-FIRST ANNUAL REPORT FOR THE YEAR 1910. Johannesburg, 1911. 440 pp., charts, index.

THE RECALL AMENDMENT. *Transactions* of the Commonwealth Club of California, Vol. VI, No. 3. 78 pp. San Francisco, 1911.

THE MARBLES OF TENNESSEE. By Chas. H. Gordon. State Geological Survey, Bull. 2-D. 33 pp.; ill., maps, index. Nashville, 1911.

A NEW ANTELOPE FROM THE PLEISTOCENE OF RANCHO LA BREA. By Walter P. Taylor. University of California publication, Vol. 6, No. 10. 6 pp.; ill. Berkeley, 1911.

THE ELECTRICAL SECTION OF THE BUREAU OF MINES, ITS PURPOSE AND EQUIPMENT. By H. H. Clark. U. S. Bureau of Mines, Technical Paper 4. 12 pp. Washington, 1911.

USES OF COMMERCIAL WOODS OF THE UNITED STATES (Cedars, Cypresses, and Sequoias). By William L. Hall and Hu Maxwell. U. S. Forest Service, Bull. 95. 62 pp.; index. Washington, 1911.

Commercial Paragraphs

GEORGE H. GARREY, formerly of the U. S. Geological Survey, and formerly mining geologist with the A. S. & R. Co., the American Smelters Securities Co., and Guggenheim Exploration Co., and recently manager of the southern division of Spurr & Cox., Inc., has just opened an office as consulting geologist in the Crocker building, San Francisco. Mr. Garrey will continue to act for Spurr & Co., handling their San Francisco business.

At a meeting of the Board of Directors of the WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, held in New York on August 1, the following officers were elected: Chairman of the Board of Directors, Robert Mather; President, Edwin M. Herr; Vice-Presidents, Loyall A. Osborne, Chas. A. Terry, Harry P. Davis; Acting Vice-Presidents, Henry D. Shute, George P. Hebard; Comptroller and Secretary, James C. Bennett; Treasurer, T. W. Siemon; Auditor, F. E. Craig. E. M. Herr is elected to succeed Edwin F. Atkins, who has been president of the company since June 1910, and who declined re-election. Mr. Herr has been First Vice-President of the company since 1905. He has announced the appointment of Calvert Townley as assistant to the president.

'Step' Concentrator Belt

The Goodyear Rubber Co., San Francisco and Portland, Oregon, is meeting with success in the sale of its 'step' concentrator belt. The surface of this belt is composed of a series of transverse steps with 'treads' ¼ in. wide and 'risers' 1/32 in. high. When the belt is running on a concentrator the 'treads' are horizontal. The heavy particles of mineral are held on each step and gradually travel toward the mineral-discharge end of the machine. This belt is well worth investigation. Other products of the Goodyear Rubber Co. are dredging sleeves, hose, packing, belting, crack-proof miners' boots, ponchos, and oiled clothing of all kinds.

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EDITORIAL

SANTA EULALIA, in Chihuahua, has been interestingly compared to Leadville, in Colorado, and, indeed, there are many points of resemblance in the ore deposits of the two districts. Recently a company has been formed to develop deep levels in that part of the Mexican district which corresponds to the 'down town' part of Leadville.

OUTLOOK for higher prices for silver is not encouraging. It had been expected that before this time the Indian Government would have resumed purchases of the metal. Crop conditions, however, have been bad. A drought has made famine measures necessary over half the country, and there has been an unfavorable planting season. As a result the natives are drawing on rather than adding to their buried hoards.

PLANS for the meeting of the American Institute of Mining Engineers in San Francisco in October indicate that the sessions will be of unusual interest. Mr. F. W. Bradley, chairman of the sub-committee in charge of the matter, is arranging for one session devoted exclusively to improvements in cyanidation. Probably others will be similarly devoted to special topics. It is well that attention be not concentrated too exclusively on excursions, delightful and profitable as they always are. The Institute is primarily for technical work and workers.

PHILIPPINE gold mining has not made the rapid advance that was at one time anticipated. For this condition there are many reasons. Those which apply to dredging are discussed lucidly on another page by Mr. R. Y. Hanlon, whose experience in examining placers and whose knowledge of the Far East give especial emphasis to what he writes. Apparently placers of real value occur. Their extent is largely unknown, and there are difficulties, though not insurmountable ones, in the way of their development. Handling large dredges in a tidal estuary none too well protected from storms, and digging swampy wood-filled gravel, is not easy. Ground, however, that contains 25 to 60 cents per yard in gold, permits incurring considerable expenditure and warrants careful investigation.

ZINC ore prices have gone up at Joplin owing to temporary shortage of supply. For the week ending August 12 the basis price for 60 per cent blende rose from $42 to $45, and $47 per ton was paid for premium grades. Flooding of the mines caused the shortage, but by September 1 conditions should be normal. For the first 32 weeks of this year the total sales of blende have amounted to 332,078,300 pounds and of galena 54,374,630. The total value is estimated at $7,891,543. Zinc is in much better position in many ways than is copper. That everyone is working on a narrow basis is shown by the fact that temporary flooding of mines at Joplin raised the price of ore $3 per ton. The surplus of spelter that was on hand at the beginning of the year is understood to have been absorbed, and there is now an active demand both for ore and metal. In the meantime new plants have not been built as rapidly as the gas plants in Kansas have gone out of commission. The American Zinc, Lead & Smelting Company has plans under way for a coal-burning smelter in Illinois, and doubtless other plants will follow. As to ore supply, the most important recent move has been the entry of some of the big companies into the Tennessee field. It has long been known that East Tennessee includes large areas of zinc-bearing territory. The ore, it is true, is of low grade, but with operations conducted on a large scale, and with present prices, there is an opportunity for profitable business.

CHINESE workmen in the furniture factories in Victoria have organized a union and adopted union methods of restricting work to their own members, according to *The Australian Mining Standard.* The Chinese guilds are well known in the East, and the only surprising thing is that retaliation has not sooner been attempted. The ideal of 'A White Australia' rests on good grounds, but, as the *Standard* points out, its advocates have in many particulars taken unwise methods to realize it. A Chinese labor union may sound funny at first, but is really a serious matter.

OAKLAND, California, is living over a gas well, according to the enthusiastic statements of the Oakland Natural Gas Company, which corporation proposes "forcing the earth to disgorge its hidden treasure." Fine sentiment, that! It would be truly a hard old world that would refuse so determined an assault. It seems that the secret of the earth has been discovered by Mr. C. L. Cofer, who is described as a "vegetable scientist" and who, by means of his "Terrestrial Wave Detector" has determined that "there is unlimited gas within easy distance of Oakland." There may be. We do not know. But neither, we believe, does Mr. Cofer.

AMERICAN CONSERVATION, the official organ of the National Conservation Association, has suspended publication—"not because it has failed to meet the expectations of its founders, for it has not failed—but because it absorbs time and energy needed for the practical constructive work of the National Conservation Association." The officers of the latter feel that the need of the present is less that for active propaganda and more for constructive legislation. It marks a distinct epoch when the leaders of the movement announce that "We have passed the time when to continue agitating along the old lines is either necessary or desirable."

LEADERSHIP is discussed informingly by Mr. Woodrow Wilson in a recent interview in *Harper's Weekly.* It is always interesting to know how a man who does a thing especially well, looks at his work, and Mr. Wilson has shown unusual qualities as a leader. His own notion is that the real leader is not the man who impresses his own wishes and views on others, but rather he who rightly hears and rightly interprets the finest and best public opinion. He gathers the general inspiration and brings it to a focus. "It is something like what Bagehot says of Sir Robert Peel: 'It was not that he did extraordinary things, but that he did ordinary things extraordinarily well. He is the true leader who interprets the general conscience rightly, and rightly makes it operative.'"

CHINA must adopt modern methods in Manchuria if she wishes that province to develop as have the Western nations. In some cases, particularly in the interior, superstitions have prevented mining in China, but such is not the case in Manchuria. The people in Manchuria are free from many of the prejudices of those living in other parts of China. The system of concessions has failed to develop China's mineral resources to any marked extent, and it would seem desirable to adopt a claim system in Manchuria, such as is used by Western nations. As is recommended by the *National Review*, published at Shanghai, registration of companies should be made possible only at Peking, and Chinese jurisdiction should be admitted in articles of association. In this way China might succeed where Japan has virtually failed, and develop her vast mineral resources.

OCCASIONALLY something is said about geologists being impractical, and, in particular, there has been quiet comment upon their activity in examining and reporting upon oilfields. There is some point to the criticism, but by way of maintaining equilibrium, we quote below from a report made by a 'practical' man and seriously put forward as a basis for investment: "The contour shows a series of undulating hills, with a number of low precipitous bluffs. There is exposed to view two distinct and intact anticlines and all kind of shale, such as chico fossil, pelecypoda fossil, gasteropoda fossil, etchgon fossil, echinodernate fossil, vaqueros fossil, jacatalitoss fossil, tulors fossil, the black shale and red sand strata, which does appear at the right time and place, is the most positive indication for petroleum oil of high gravity; and extraordinary as it may seem, no true synclinal depressions or subsidence appear in center of oil belt formation, being intact along its original flow of bedding. * * * The geological age of the formation exposed ranges from the cretaceous to the jurassic trassic carboniferous. Permian and upper devonian of the high points; the calaceous is mostly in evidence in the foothills near the outcrop or apex. Jurassic form the chief exposure along and adjoining the Southeast and Northwest portion of the oil belt. The exoding of the indications of oil are so exposed that it makes this field a positive one as to results and not one-fourth of one per cent of a gamble. I judge from the indications and practical drilling in the State of California, as the writer drilled the first oil well in the State. * * * I also examined the water conditions; this I find to be an underground river, which is easily traced."

Japan in the Pacific

In a recent article Mr. Albert B. Hart has taken issue with Mr. R. P. Hobson's fantastic statements upon the present and future relationship between Japan and the United States. Mr. Hobson is undoubtedly a brave man, he is presumably deeply versed in matters of naval technology, but his opinions upon international relationships appear to be of negative value, and Mr. Hart pays them too much deference in devoting so many words to their controversion. Discussing the subject in too much detail often serves only to obscure its most essential features. Mr. Hart has not brought out the really fundamental factors bearing upon the over-discussed topic of a possible war with Japan as clearly as might be desired. Wars are like prize-fights; they are not only unnecessary and brutal, but are also often quite as much a question of 'backers' as of principals. Japan is backed by the large financial houses of Europe that have furnished her huge amounts of capital to carry on the ambitious campaign of industrial expansion that she is now waging. Her backers would no more permit her to divert her energy and resources from industrial work into a futile war with the United States than the backers of a prize-fighter would allow him to stop the battle in order to climb out of the ring and chastise a bystander who, after the manner of the irresponsible sensation-loving part of the daily press in America, had hurled annoying epithets. It must be remembered that Japan is now in a position vitally different from that at the beginning of the Russo-Japanese war. Then her European loans were comparatively small and she was relatively foot free. Now her indebtedness to Europe is enormous. She must keep herself in a position to pay the interest; otherwise, to use a rough but not inaccurate simile, her European bankers will foreclose their mortgages. The financial positions of both China and Japan are precarious. Both are now doing business largely upon borrowed capital. China is a country of large resources, her indebtedness is comparatively small, but her financial system is antiquated and inadequate, and the policies of her rulers are vacillating. Japan's finances are managed with admirable skill, but her resources are small and her indebtedness is great. It is difficult to say which is in the less favorable position.

But what, except childish folly, is there to bring about a war between Japan and the United States? Boiled down to its essential features, it would appear that 'husky' Westerners, who take a pride amounting to affectation in their collarless shirts, corduroy trousers, and dusty high boots, refuse to take seriously the Japanese gentlemen who look upon a silk hat and frock coat with almost religious veneration. Thereby the Westerner offends the Easterner's sense of dignity. On the other side, some Americans feel that since their recent victory the Japanese are 'too fresh' and 'need taking down a peg'. These are the reasons of schoolboys, they do not merit the serious attention of mature minds. There is, however, a vital issue at stake between the two countries. Will the United States allow herself to be euchred out of the position which of right pertains to her, the leadership, not domination, in the Pacific? In the solution of this problem, fiery orations for the benefit of constituents and twelve line 'scareheads' are worse than useless. Attention to the business side of the problem has been too long delayed, but work of signal importance has already been accomplished. The group of American bankers who have been represented in the Far East by Mr. Willard Straight, backed by the firm support of Mr. Henry P. Fletcher, now Minister to Chile, and Mr. William J. Calhoun, the present Minister to China, has played a game of financial strategy with commendable skill and has gone far toward rewinning for America and Americans that measure of respect from the Far East that had previously been frittered away. Now that States are no longer playthings of kings, economic conditions control all deep-seated movements, and leadership belongs to business statesmen rather than to word-spouting alarmists.

Is This Mining?

Frenzied finance is not conducted alone on Wall Street, if we may judge from revelations made in the Spokane County Superior Court of Washington, where Mr. L. E. Collier, receiver for the Naomi Gold Mining Company, has recently filed his report. This company is capitalized at $1,500,000 and exchanged its capital stock with Mr. W. D. Irwin for mining claims in Oregon. Afterward Mr. Irwin transferred 500,000 shares back to the company, which treasury stock was turned over to a Mr. L. L. Ratliff, 'sales manager'. For the sale of this stock the latter was paid 65 cents out of every dollar received, and of the remaining 35 cents, the receiver finds no trace. In the meantime the company accumulated debts to the amount of $4000, in part for doing assessment work.

The story is unusual only in that the details are a matter of court record. Everyone familiar with mining in the West can recall many such cases of reckless company promotion. Stockholders in any business so conducted have only the most infinitesimal chance of recovering their capital, to say nothing of making any profit, yet it is on the basis of participation in some such scheme that many men condemn mining. Most States require that any non-assessable stock shall only be issued when fully paid either in cash or property. In the latter lies the joker. There is no ready and adequate means of determining the value of the property exchanged for the stock. If the two parties to the transaction agree, the law is supposed to be satisfied. As a matter of fact, the buyer and seller are usually one and the same, that is, a man owning a mine or merely a few claims, organizes a company of which he and his friends are to hold control, and transfers the property to the company in exchange for the whole of its capital stock. By this fiction the stock becomes 'fully paid'. There is some question whether, in cases where the estimated value of the property was palpably and greatly exaggerated for the purposes of the transaction, later buyers of the stock do not assume a contingent liability when purchasing it at any price below par. Actually the question is not raised, and this simple device operates regularly to defeat the purpose of the law, which is, to make sure that at the time stock is issued, each share shall be paid out only for cash or property honestly worth the full par value of the share. In the case under consideration, even without detailed information of the property in question, it requires but little knowledge of mining to be sure that the property of the Naomi Gold Mining Company was not worth $1,500,000 at the time it was acquired. Gold mines worth that amount of cash are rare, particularly in Oregon. Furthermore, if the property was honestly worth that much money, there would have been no necessity for paying 65 per cent commission to sell the stock needed for development. Again, any property worth so much real money would hardly be on land requiring assessment work to hold title. All the evidence indicates that unproved prospects, probably not even on patented ground, were sold for '$1,500,000'. There probably never has been such a prospect that was honestly worth that amount of money, whatever it may have become worth later.

In all such promotions the real investor stands no chance whatever. Control is fixed in the hands of men who coolly appropriate two-thirds of any possible returns, and the poor victim pays nearly twice as much as his real investment, to the slick talker who persuades him to part with his money. Generally, also, the promoters sell their own rather than treasury stock until enough money has been realized to fully clear them of even the minor expenses incident to finding a few prospects and organizing a company. Often an examination will show that the title to even such property as is transferred to the company, is imperfect if not actually bad. Many times when old mines or producing properties are promoted, it is not a title, but an option to buy, a bond and lease perhaps, that is acquired by the new company. This fact rarely is stated plainly in the literature or by the agents. It is because such stocks are widely distributed by pertinacious salesmen among people unused to mining, that the industry has acquired an exaggerated reputation for financial risk. If the mining industry is to flourish, capital will have to be raised in large amounts, and, directly or indirectly, this money must come from the accumulated surplus earnings of individuals. The only feasible way of securing the funds necessary for mining, as well as for investment in other industries, is through stock companies. Capital, however, will not steadily flow into an unprofitable or dishonestly managed industry, and mining needs not only improved technical direction, but more honest financial guidance. Laws designed to protect investors more strictly have been adopted in Nevada and other States. Doubtless they will be enacted elsewhere, but above and beyond that there is needed here, as in other walks of life, a higher standard of honesty; a standard that involves obedience to the law, even if cunning lawyers can find a way 'to get around it'. More of the spirit of fair play is demanded.

American Influence on Mining Operations Controlled in Europe

By C. A. Tupper

After a three months trip through all of the principal countries of Europe, west of Russia, I can summarize the situation as one most favorable to the further extension of American influence in methods of mining and ore reduction, and, consequently, in the sale of machinery.

In the treatment of iron ore, the manufacture of coke, steel-making, or the utilization of waste products and gases, the flow of ideas and improvements in equipment has been from Europe to the United States, rather than the reverse; but machinery for mining work in general and for the recovery of metals other than iron from ores has been developed to a greater degree of efficiency in this country than abroad, owing not only to the wider range of American experience, but also to the greater opportunity here for specialization in designing. Hence, the field for American engineering, and the openings for the sale of American mining and metallurgical equipment, are large.

This might not be true if the Continent of Europe, of and by itself, were to be considered; but the investments made by British and Continental capital in mining enterprises the world over, particularly in the colonies or other dependencies of European countries, lead annually to the purchase in London, Paris, Brussels, Berlin, Hamburg, St. Petersburg, Vienna, Prague, Budapest, and other large commercial centres, of much machinery for export. Some of the leading American manufacturers, through branch offices and agencies, are securing a large part of this trade, and a portion of it is even placed directly in this country by representatives of European owners; but there is much more of the business that can be obtained by proper cultivation of the field abroad. Having been given exceptional opportunities of observing conditions, I can state this most emphatically. Moreover, by keeping watch of the experience of European users, at the mines under their control, American manufacturers put themselves not merely in a position to meet the most advanced requirements of such users, but also to learn, in doing so, how many of our own ore-reduction problems can be more effectually solved.

In coal mining, European interest is principally enlisted by electrical operation, cutting machines, better ventilation and dust removal, and the prevention of accidents; in iron mining the use of large breakers, steam-shovels for loading, wet magnetic separation, dryers, and briquetting is foremost; in the recovery of lead, zinc, copper, and tin, the introduction of multi-hearth, mechanically stirred furnaces of large capacity have been given much attention; and in gold and silver mining the various operations attending cyanidation still have more thought devoted to them than any remaining feature of the work. With all of these and other minerals and metals, however, consideration of the problems of concentration is also exceedingly active.

Anyone who can show an improvement in any phase of the cyanide process will find interested auditors on the other side of the Atlantic; but he must be able to demonstrate it by results applicable to the purchaser's conditions, for so many unfounded claims have been made in behalf of American apparatus that Europeans are now chary of accepting any more on faith. Samples of ores from their mines are, however, usually obtainable for tests; and the erection of equipment on approval, where needed, is ordinarily not difficult to bring about. One successful plant in a district under European control will also enable many similar sales to be made, as the work at the various plants is closely followed by the engineers at neighboring properties.

I have mentioned cyanidation first because it holds the leading place, at present, in the thoughts of the mining men abroad, particularly in connection with relatively low-grade ore; but similar opportunities exist in practically all other lines. Machinery of any kind that stands for a better output or shows increased economy in its operation is readily salable to mine owners; and the matter of price cuts far less figure than might be supposed. The German system of computing efficiency has come largely into vogue. More and more, by means of actual working tests, mine owners are figuring carefully just what increases of output or saving in costs may be brought about by contemplated improvements, on the basis of a year's run. The specific opportunities can, perhaps, be best illustrated by reference to the various types of apparatus involved.

In the line of pneumatic tools the manufacturers of the United States are generally conceded a leading place, and American rock-drills predominate. Their sale is being effectually pushed in London, particularly by one company, but more might be done on the Continent. Air-compressors are also salable to a less extent, those adapted to motor drive being most in demand. For both compressors and drills, however, the competition of European manufacturers, from the standpoint of efficiency, has become increasingly strong; and in some recent trial runs American machines seem to have been carefully excluded. For electric firing in blasting operations, European systems have generally given satisfaction.

In the construction of hoists or winding engines American practice has generally fallen behind European. The electric hoist, operated by alternating current motors for the most part, is rapidly displacing steam-driven units, and the arrangements worked out abroad for subjecting the electrical end to variable speed control are superior to the work of all but one or two American designers. The driving motor most successfully used is not the wound-motor induction machine familiar in this country, but a commutator alternating current motor in which speed variation is effected by an automatic shifting of the position of the brushes. British and German over-winding safety devices have also been well developed.

Stamp-mills of well known American types still hold their own. Supremacy in this respect is threatened by the present European tendency to use tough alloy steels, such as vanadium, for the stems, shoes, dies, and other parts subject to heavy strains, shock, or impact; but this will not be for long, as American manufacturers are experimenting along the same lines. For prospector's use the light portable steam-stamp of American design is in a class by itself.

Tube-mills and ball-mills made in the United States come into strong competition with German and Swedish machines, which sell at relatively low prices and are exceedingly durable in all their parts. American ingenuity in the matter of introducing the feed, in tube-mill lining, in the discharge mechanism, and in the arrangement of gearing, counterbalances these advantages to some extent; but it will pay manufacturers to find means of using better material at less cost. By substituting a special alloy metal which could be made thinner and yet considerably tougher than that now employed, a reduction of weight, of the power for driving, and of transportation charges might be effected, thus placing American companies in a better position to compete for the business and benefiting users. In this connection it should be stated, also, with reference to all mining equipment, that greater study should be given to the matter of sectionalizing and shipping knocked-down. The increasing capacities and weights of machinery to be set up in distant countries render this more and more desirable. For improved grinding and amalgamating mills and reducing pans there are also good opportunities of sale.

American samplers, feeders, distributors, amalgam tables and traps, classifiers, launders, vanners, concentrating tables, pulp thickeners, filters, clarifying presses, agitators, furnaces, and retorts, are favorably regarded, for the most part, by European mine owners, and then sale ought to be extended far more than it has been. Concentrating apparatus can be easily demonstrated and if several American manufacturers were to unite in sending a joint exhibit abroad to be shown in, say, London, Paris, and Vienna, or Budapest, the returns would unquestionably justify the outlay many times over.

American gyratory breakers of the heaviest types easily surpass any crushing machinery made in Europe, and, while many such have recently been sold abroad, the surface of the possible demand has only been scratched. In Norway and Sweden, alone, the preparations now being made to open further vast deposits of iron ore for transportation to tide-water by electric railways or aerial systems, will lead to the erection of many plants such as that at Varanger Fjord, which was the first in the world to use a breaker as heavy as No. 18 for ore crushing, the largest previously in use anywhere having been No. 12. Sledging rolls of the Edison type can also be adapted to the same service, and the largest jaw crushers, up to 42 in. opening, will be used in future to a considerable extent. For crushers of the smaller varieties, such as the Blake and Dodge, as well as crushing rolls, the demand is limited by the competition of the excellent machines manufactured in England, Belgium, and Germany. The same is also true of trommels, screens, and various subsidiary apparatus.

American steam shovels and dredges are, generally speaking, far in advance of European models; and in their adaptation to mining work there is a widening field for sales to European operators. Compact electric-power outfits, sufficient to make these machines self-contained, can also be placed with them, but the purchaser's specifications should be obtained and carefully followed. Cranes, including the gantry and locomotive types, loading bridges, and other handling machinery will also sell well if properly introduced, particularly when prompt delivery is an object.

Furnaces and smelters constructed in accordance with American plans have grown in popularity as a result of favorable reports submitted by foreign engineers who have visited some of the principal plants in the United States, Mexico, and British Columbia. There are accordingly exceptional opportunities for the sale of the equipment comprised in such plants. This is true even of auxiliary details, from minor parts to blowers or blowing engines, as the tendency is to buy under one contract, thus concentrating the responsibility and guarantees. That tendency is not so observable in other lines, where orders are usually distributed among numerous concerns.

In magnetic separation European practice leads American, in my judgment, for the more common processes; but some complex problems have been worked out on this continent which can be profitably brought to the attention of mine owners on the other side where similar conditions exist.

The market for elevating and conveying machinery is constantly being extended, as the economies to be effected by the best modern systems become better known, and American manufacturers have every possible chance abroad of disposing of their products in this line. The same is true with reference to aerial tramways; but here our people will have to meet skilful and determined competition from English and German firms. In the design of conveying machinery, also, foreign manufacturers have shown great ingenuity in making belts, buckets, and pans do double duty by carrying different material on their return trip. Every advantage offered by gravity is also carefully taken. For ore cars and buckets the tendency is toward the larger sizes, with self-loading, tilting, and discharge—both compressed air and electric power being used for this purpose.

In the line of power-plant machinery, apart from hydro-electric units, Americans have little to offer Europeans other than boilers, super-heaters, economizers, and some auxiliary apparatus, the equal or superior of which cannot be found in Great Britain or on the Continent. An exception may possibly be made of engines to operate on producer-gas; but, as most of our improvements for that purpose originated in Belgium and Germany, it is not reasonable to suppose that the greater standardization and simplifying of parts, automatic adjustment to running conditions, at which our designers have arrived, will give American builders more than a temporary advantage. Pumping machinery manufactured in this country can ordinarily be sold to Europeans only in connection with complete outfits, but apparatus of proved economy for some special class of service is always given consideration. Hydraulic turbines and impulse wheels of American build are fully as efficient or more so than the best European designs. The latter have, in fact, been modeled of late years mainly after American types. There is, therefore, no reason why our builders should not get their fair share of this class of business for plants constructed in various parts of the world. Auxiliary details from banded wood pipe to governors and pressure regulators are also included.

What impressed me most, on the other side of the Atlantic, is the thoroughness with which everything connected with equipment and planning of operations is gone into by the company directors and their engineers. It would be well worth the while of manufacturers here to send some of their best men abroad, at intervals, on engineering or sales work, with a view to having them imbibe some of this spirit of exactitude. Loose or careless statements do not 'go' in Europe. An American who makes assertions of any kind regarding the efficiency of certain machinery or operating methods is pinned right down to the facts; and the exaggerations with which we are too familiar on this side, meet with prompt exposure. The larger companies would also find it beneficial to have the engineers whom they employ come in contact with European experts on their own ground. From those who visit this country they fail to get the same benefit of association, as they are not as communicative as when at home, and if they remain in this country to work they are apt to fall into the ways of Americans, or at least to refrain from criticism that would be wholesome. The traveler abroad is also surprised to find how widely diffused and intelligent is the attention given to mining, which has not come into the disrepute, from the standpoint of real investment, that has characterized the business in the United States. True, there is no lack in Europe of wild-cat companies and stock-jobbing schemes; but the placing of capital for small interests, as well as large, has been done, of late, in nearly every case upon a sound conservative basis.

In Cornwall, Wales, the Scandinavian countries, France, the Iberian peninsula, north Africa, Italy and the islands off its coast, Austria proper, Hungary, Bohemia, and Germany, old mining districts are beginning to be exploited on a more scientific basis; and, in places where the original purpose was to recover limited quantities of gold and silver, the baser metals are now sought. Southeastern Europe, including the Balkans, and Russian possessions from the western Ural ranges to eastern Siberia and the confines of Turkestan, will be extensively opened to mining operations with the next few years. Systematic exploitation of the vast mineral resources of northern and central Africa has already begun. From Morocco, where the more recent imbroglio really started in the efforts of the *Corps des Mines*, a French organization said to be backed by the Rothschilds, to get at the lead and other deposits in the Atlas mountains, to the *Haut Katanga* (Upper Congo) country bordering Rhodesia, various groups of capitalists are now behind prospecting and development work throughout what were in Stanley's time the 'dark' portions of the continent. Tin, copper, and diamonds are the principal attractions at present; and, within the coming decade, there will be some large plants put up for the treatment of the ore, that of copper in particular. One such plant, composed entirely of American equipment, is now going in not far from the western shores of Lake Tanganyika. Meanwhile railroads from the west coast, built under French, British, and Belgian auspices, are penetrating the country, opening it to further exploration and settlement. It will not be long before one of these effects a junction with the Cape to Cairo line. European capital, especially that of the Continent, is also seeking further fields of development in Mexico, Central, and South America, in some of the islands of the Pacific, and in the Far East from Borneo to Manchuria and Korea; while English and Scotch investors are paying more attention to northern India, Burma, Siam, and the colonies of the British Crown.

In all of this development American engineers cannot fail to play an important part; and the reflex influence upon methods used in this country, upon the manufacture and sale of machinery, and upon the world's metal markets, will unquestionably be great. The present high standing of American engineering, so far as it relates to mining and metallurgy, is due in no small measure to the publicity given it by the widespread circulation in Europe of the leading American mining journals. Both their reading columns and their advertisements have contributed to produce a favorable impression of American enterprise. It goes without saying that the *Mining and Scientific Press* has long been regarded abroad as an authority on mining standards; and in this connection I was interested to note how strongly *The Mining Magazine* has taken hold upon the European mining public, not only of Great Britain, but also on the Continent. Its vigorous editorials, denunciation of mal-administration or shams, and enterprise in bringing the world's progress in mining to the attention of its readers, has won for the journal a place in the ranks of conservatism which must surprise even its proprietors. The offices of the paper also serve as a rallying point for American mining engineers and salesmen and as a meeting place with European interests, which I heard spoken of by both parties with considerable appreciation. I found, however, that the business manager was overwhelmed with inquiries as to where the London or other European representatives of this or that American machinery mentioned in the descriptive articles of that paper and the *Press* were to be found. Many such questions can be readily answered from his own knowledge and from a classified file which he keeps; but frequently it takes a great deal of telephoning among other agencies to discover who is handling the apparatus, or else to learn that no representative for it exists. When American manufacturers do have agents abroad and are prepared to make sales through them, there is no excuse for keeping that fact generally unknown. The information ought at least to be given to the European offices of American mining journals and to American consuls in the leading commercial centres, all of whom will be glad to have it for reference. Nor should there be failure to follow this up with notification of any changes. One of the best means, also, of presenting the information prominently and keeping it fresh is to have a list of European representatives appear at the foot of advertisements. This is the method uniformly pursued by American machine tool builders, and is one reason why nearly two hundred of them are selling their products in Europe today.

European representatives, once selected, should be given adequate backing and support. They must be, themselves, thoroughly posted on the construction, special features, and operating advantages of the machines which they have to sell; their inquiries dictated by customers' requirements should have prompt attention at the home office; they should have the aid of good descriptive literature couched in terms comprehensible to European managers; and their promises of delivery, directions for shipment, terms of payment ought in all cases, if properly made, to be scrupulously complied with. Nor should they be led, through correspondence or otherwise, to make any claims for the apparatus which will not stand the most rigorous tests. For his own part, the manufacturer desirous of building up an export trade through sales to European mine-owners, should realize that respect for the established methods and traditions of European users of machinery is an important factor. There are decided advantages in voluntarily ascertaining and catering to these, instead of being driven into doing so. Yielding gracefully to unavoidable conditions, instead of vainly combatting them, also avoids many troublesome situations; and in dealing with Europeans of any class the value of absolute good feeling and courtesy is not to be overestimated.

Suggestions on Cyanide Practice

By J. B. Stewart

Several writers have from time to time called attention to the advisability of separate treatment for natural slime. I think that much may be done in this direction to develop the highest efficiency in many plants. E. M. Hamilton has pointed out that at El Rayo mine a higher net profit per day was obtained by treating very fine sand separate from the slime. The essential reason for this treatment at El Rayo was that whereas the extraction obtained from the sand and slime when collectively treated was just as high as when separately treated, still the time of treatment required for such an extraction reduced the capacity of the plant a great deal. By treating separately, a shorter treatment for the slime gave the maximum extraction, and only a trifle longer treatment was required on the sand. The result was more tons treated per 24 hours with the same equipment and a higher return with no increase of costs. In the same way I believe that the natural slime separated before final regrinding begins, would yield the maximum extraction much quicker. In this direction I expect much advance in reducing tank capacity and volume of solution.

The success reported for the Just process must call for considerable argument in the near future, regarding the relative merits of two theories which seek to explain the best conditions for rapid dissolution of silver values in a slime charge. I would like to see the topic 'Diffusion versus Circulation' discussed. Is it necessary to circulate solution faster or slower than the slime, to promote a perfect diffusion of the dissolved values, from the immediate surface of the slime particles to the general mass of solution? Or can the same rate of extraction, accomplished by the above method, be obtained by merely keeping the slime particles suspended in the solution, depending upon a purely physico-chemical diffusion of the dissolved metals rather than mechanically assisting such an action?

Touching on the subject of the economic limit for moisture in the feed for a tube-mill, it is only necessary to note the difference between the consistence of sand and slime, each containing 25% moisture, to realize that whereas the sand might grind all right at that dilution, certainly the slime would not do so. As the surface of the material increases, due to reduction in size of its grains, the amount of moisture required to keep it mobile necessarily increases. This points to the advantage of stage grinding in which, for instance, ¼-mesh product could be introduced at 20% moisture in the first stage and after classifying the discharge, the second stage could be conducted with 39% as suggested by Walter Neal's experience at Dos Estrellas.

Next, as to stage grinding, I wonder that the advantages of this refinement have not made greater headway in general practice, and I also wonder why the high-speed Chilean mill has come into favor instead of a short-length tube-mill as the intermediate grinding unit, in several large companies which have already adopted stage grinding. Certainly the operating cost for the Chileans must be much greater than it would be for 15-ft. tube-mills. In fact, I should consider the tube-mill more efficient in power, duty, labor, and supplies than the Chileans.

In conjunction with stage grinding as already suggested, it would seem preferable to use the Callow screen to separate the coarse feed for the primary grinders and Dorr classifiers for the secondary mills. Whereas there can be no doubt of the efficiency of the cones provided with diaphragms, as described by Mr. Neal, for dewatering a tube-mill feed, still I doubt whether they lend themselves so well as the Dorr classifiers do, to re-handling the entire discharge of the tube-mill. The Dorr machine is a classifier and a dewatering machine as well, with no rival for compactness and saving in grade or elevation about the plant. On the other hand, the dewatering cones using baffles must be preceded by other cones for separating the greater bulk of slime, and this entails much more difference in elevation.
—*Inf. y Mem. del Inst. Mexicano de Min. y Metallurgia.*

The Electrical Precipitation of Suspended Particles

By F. G. Cottrell.

*The removal of suspended particles, from gases, by the aid of electric discharges is by no means a new idea. As early as 1824 it was suggested by Hohlfeld[1] as a means of suppressing ordinary smoke, and again a quarter of a century later by Guitard.[2] These suggestions, which do not seem to have stimulated any practical study of the question, were soon entirely forgotten and only brought to light again by Sir Oliver Lodge[3] many years after he himself had independently rediscovered the same phenomena and brought them to public attention[4] in a lecture before the Liverpool Section of the Society of Chemical Industry, November 3, 1886. The first recorded attempt to apply these principles commercially appears to have been made at the Dee Bank lead works. The general principle of electrical precipitation of suspended matter was at this time patented by Alfred O. Walker, of the above firm, in several countries,[5] but these patents have long since expired. The apparatus was erected in 1885 by the works manager, W. M. Hutchings, with the cooperation of Mr. Lodge, and briefly described by the former just before its completion as consisting of a system of metallic points situated in the flue from the lead furnaces and excited from two Wimshurst influence machines with glass plates 5 ft. in diameter, each machine being driven by a 1-hp. steam-engine.

The apparatus undoubtedly did not in practice fulfill expectations, as nothing further is found of it in the literature. The most apparent weakness of the project lay, perhaps, in the reliance on the Wimshurst machine, which had then just been brought out and from which a great deal more was anticipated[6] that has been justified by experience, at least as far as commercial applications are concerned.

Since that time an occasional patent[7] or article[8] has served to keep the subject in the public eye, and in 1903 Lodge himself took out a patent[9] covering the use of the then new mercury arc for rectifying high potential alternating currents for this purpose. Up to the present time none of these patents seem to have been carried into successful commercial operation on the large scale in the chemical or metallurgical industries. Some four years ago while studying various methods for the removal of acid mists in the contact sulphuric acid process, I had occasion to repeat the early experiments of Lodge, and became convinced of the possibility of developing them commercially. The work here described may fairly be considered as simply the reduction to engineering practice as regards equipment and construction, of the fundamental processes long since laid open to us by the splendid pioneer work of Lodge, a feat vastly easier today than at the time of the original attempt.

The precipitation of suspended matter, whether in gases or liquids, may be accelerated by electricity in the form of either direct or alternating current, but the mode of action and the type of problem to which each is best applicable differ in certain important respects. Where an alternating electromotive force is applied to a suspension, the action consists for the most part in an agglomeration of the suspended particles into larger aggregates out in the body of the suspending medium and a consequently more rapid settling of these aggregates under the influence of gravity. Thus, if powerful Hertzian waves are sent out into foggy air, the alternating fields set up in space cause an agglomeration of the particles of liquid into larger drops which then settle more rapidly. Considerable work aimed at the application of this phenomenon to the dispelling of fog on land and sea has recently been done in France and England, but little as to definite results seems as yet to have been published. The field appears, however, one of considerable promise. Another application of alternating current along these lines is found in a process now in use in the California oilfields for separating emulsified water from crude oil. This process grew out of the work here described and was developed some two years ago by Buckner Speed and myself to meet certain peculiar conditions existing in these fields.[10] Alternating current may thus be used to advantage where the masses of gas or liquid to be treated are fairly quiescent and a simple agglomeration of the suspended particles into larger aggregates is sufficient to effect separation by gravity or otherwise.

In the case of the large volumes of rapidly moving gases in smelter flues, the agglomerating and settling process is, however, too slow even when the flues are expanded into as large dust chambers as are commercially feasible. It is in such cases that direct-current methods have been particularly important. If a needle point connected to one side of a high-potential direct-current line be brought opposite a flat plate connected to the other side of the line, the air space between becomes highly charged with electricity of the same sign as the needle point; irrespective of whether this is positive or negative. Any insulated body brought into this space instantly receives a charge of the same sign. If this body is free to move, as in the case of a floating particle, it will be attracted to the plate of opposite charge and will move at a rate proportional to its charge and the potential gradient between the point and plate. Even if there are no visible suspended particles, the gas molecules themselves undergo this same process, as is evidenced by a strong wind from the point to the plate even in perfectly transparent gases. The familiar experiment of blowing out a candle flame by presenting it to such a changed point, is simply another illustration of the same phenomenon.

As above indicated, the first step toward practicability was of necessity a commercially feasible source of high-tension direct current. The obstacles to building ordinary direct-current generators for high voltages lie chiefly in difficulties of insulation, and if this is avoided as to individual machines by working a large number in series, the multiplication of adjustments and moving parts intrudes itself. On the other hand, high-potential alternating-current technique has in late years been worked out most thoroughly, and commercial apparatus up to 100,000 volts is available in the market. The mercury arc rectifier has been made practical for series arc lighting service up to some 5000 volts direct current, but although higher voltage units were at one time attempted by the electrical companies, they were later withdrawn from the market as unsuited to practical operating conditions. For high volt-

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*Abstract from *Jour. Ind. Eng. Chem.*, August 1911.

[1] 'Das Niederschlagen des Rauchs durch Electricität,' Hohlfeld, *Kastner Archiv. Natural.*, 2, 205-6 (1824).

[2] C. F. Guitard, *Mechanics Magazine*, Nov. 1850.

[3] Historical note on 'Dust Electrification and Heat,' O. J. Lodge, *Nature*, 71, 582 (1905).

[4] 'The Electrical Deposition of Dust and Smoke with Special Reference to the Collection of Metallic Fumes and to a Possible Purification of the Atmosphere,' *Jour. Soc. Chem. Ind.*, 5, 572-6 (1886), with appended bibliography.

[5] Great Britain, 11,120, Aug. 9, 1884; Belgium, 68,927, May 19, 1885; Spain, 7,211, July 10, 1885; Germany, 32,861, Feb. 27, 1885; Italy, 18,007, Mar. 31, 1885; United States, 342,548, May 25, 1886.

[6] A. O. Walker, *Engineering* (Lond.), 39, 627-8 (1885). G. Tissandier, *London Electrician*, 17, 33 (1886).

[7] Lorrain, British Pat., 6495 and 5667 (1886); Thwait, U. S. Pat., 617,618, Jan. 10 (1899); Hardie, U. S. Pat., 768,450, Aug. 23 (1904).

[8] J. Wright, *Elect. Rev.* (Lond.), 47, 811, Nov. 23 (1900); see also *Jour. Roy. Sanitary Institute*, 27, 42.

[9] Brit. Pat., 24,305 (1903); U. S. Pat., 803,180, Oct. 31 (1905).

[10] 'Dehydration of Crude Petroleum, a New Electrical Process,' Arthur T. Beazley, *The Oil Age*, 3, 2-4, Apr. 21, 1911.

ages they seem, like the static machines, to work well under the careful management and light duty of the laboratory, but fail in practice. This is particularly so in the application to metallurgical and chemical work where the electrodes in the flues have to be placed close together and worked near the potential of disruptive discharge, the occasional occurrence of which later places much more severe requirements upon generating apparatus than in the case of the series arc lighting, to which the rectifier seems particularly well adapted. This restriction does not necessarily apply to the conditions under which fog and smoke would be treated in the open air. It is to these latter cases that Lodge's efforts in late years seem to have been the more particularly directed, and here the mercury rectifier in connection with high-potential transformers may find a useful field.

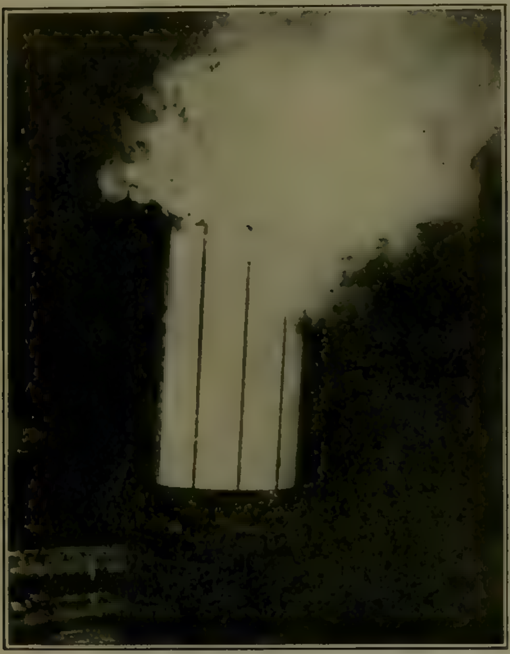

Fig. 1. ACID FUMES AT POWDER WORKS WITHOUT CURRENT ON APPARATUS.

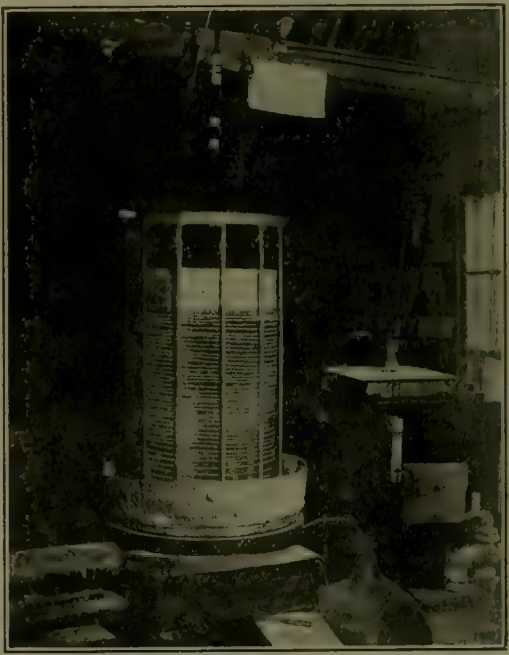

Fig. 2. ACID FUMES AT POWDER WORKS WITH CURRENT ON APPARATUS, ONE MINUTE AFTER.

The procedure actually followed in the work described below consisted in transforming the alternating current from an ordinary lighting or power circuit up to some 20,000 or 30,000 volts and then commutating this high-potential current into an intermittent direct current by means of a special rotary contact-maker driven by a synchronous motor. This direct current is applied to a system of electrodes in the flue carrying the gases to be treated. The electrodes are of two types corresponding to the plate and point in the experiment above cited. The construction of electrodes corresponding to the plate presents no special problem, as any smooth conducting surface will answer the purpose. With the pointed or discharge electrodes it is quite otherwise, and the working out of practical forms for these has proved the key to much of the success thus far obtained. In laboratory experiments, when the discharge from a single point or a few such is being studied, fine sewing needles or even wire bristles answer very well, but when it is attempted to greatly multiply such discharge points in order to uniformly treat a large mass of rapidly moving gas at moderate temperatures, great difficulty is met in obtaining a powerful and, at the same time, effective distribution of current.

It may be of interest to note that the clue to the solution of this difficulty came from an almost accidental observation. Working one evening in the twilight when the efficiency of the different points could be roughly judged by the pale luminous discharge from them, it was noticed that under the particular conditions employed at the time, this glow only became appreciable when the points had approached the plates almost to within the distance for disruptive discharge, while at the same time a piece of cotton-covered magnet wire which carried the current from the transformer and commutator to the discharge electrodes, although widely separated from any conductor of opposite polarity, showed a beautiful uniform purple glow along its whole length. The explanation lay in the fact that every loose fiber of the cotton insulation, although a relatively poor conductor compared to a metallic point, was still sufficiently conductive from its natural hygroscopic moisture to act as a discharge point for this high-potential current, and its fineness and sharpness, of course, far exceeded that of the sharpest needle or thinnest metallic wire. Acting on this suggestion, it was found that a piece of this cotton-covered wire when used as a discharge electrode at ordinary temperature proved far more effective in precipitating the sulphuric acid mists, which were then the object of study, than any system of metallic points which it had been possible to construct. Perhaps the greatest advantage thus gained lay in the less accurate spacing demanded between the electrodes of opposite polarity in order to secure a reasonably uniform discharge.

In practice a more durable material than cotton was demanded for the hot acid gases to be treated, and this has been found in asbestos or mica, the fine filaments of the one and the scales of the other supplying the discharge points or edges of the excessive fineness required. These materials are twisted up with wires or otherwise fastened to suitable metallic supports to form the discharge electrodes in such wise that the current has to pass only a short distance by surface leakage over them, the slight deposit of moisture or acid fume naturally settling on them serving to effect the conduction. If the condition of the gases does not supply sufficiently such coating, then a special treatment of the material before being placed in the flue is resorted to. The construction and arrangement of the electrodes as also of the chamber containing them naturally vary widely with the conditions to be fulfilled under the varied applications to which the process may be put. Some of the more general features of this work are described in the patents[11] already issued in this and foreign countries, while further details and modifications are covered in other patents not yet issued.

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[11] U. S. Pat., 866,843. 895,729, and 945.717.

Following development of satisfactory laboratory apparatus the attempt was made to duplicate the experiments on a scale some two hundred fold larger. This was carried out during the summer of 1906 at the Hercules works of the E. I. du Pont de Nemours Powder Co. at Pinole on San Francisco Bay, where the contact gases from one of their Mannheim contact sulphuric acid units were available. These gases at the point selected contained about 1% by volume of dry gaseous sulphur trioxide, and in order to convert this into sulphuric acid mist they were brought into contact with water. Under these conditions very little of the sulphur trioxide is absorbed by the liquid water, but the latter evaporating into the gas combines with the sulphur trioxide to form the far less volatile sulphuric acid which immediately separates as a dense white cloud of suspended particles so fine as to represent one of the most difficult of all materials to remove by filtration. Fig. 1 and Fig. 2 are from photographs taken a minute apart with the same current of fume-laden gases passing into the precipitation-chamber, but with the electric current respectively off and on. The apparatus consisted of two concentric cylinders which formed a discharge electrode, while intermediate in diameter between these two and resting on the lead pan-bottom of the apparatus was a third cylinder, also of iron-wire screen, but without asbestos winding, which together with the outer leaded glass cylinder constituted the collecting electrodes. The precipitated acid drained off from this precipitation chamber into the carboy on the right. The space between successive cylinders of opposite polarity was as nearly as possible an inch and a quarter. Current was supplied from three 1-kw., 110 to 2200-v. transformers connected in series on their 2200-v. side to give 6600 v. The fume was delivered to the bottom of the precipitation-chamber at its centre and had to pass through the three-wire cylinders and up between the outer of these and the glass container, thus being subjected to three electric fields in succession. In this apparatus the power-consumption was about one-fifth of a kilowatt, and between 100 and 200 cu. ft. of gas per minute could readily be treated. This apparatus was merely for experimental and demonstration purposes, but a still larger unit, built for permanent operation and to handle all of the gas from a Mannheim unit, has since been erected at this plant and put into steady commercial operation.

These experiments at Pinole attracted the attention of the Selby Smelting & Lead Co., whose smelter situated at Vallejo Junction, a few miles farther up the bay, was at that time the object of injunction proceedings brought by the farmers of the surrounding country. At the time the suits originated, three separate stacks at the smelter contributed to the alleged nuisance. The first, and admittedly the most serious offender, handled the gases from the lead blast furnaces and discharged several tons of lead fume daily into the air. Shortly before the commencement of experimental work at the plant, this had been obviated by the erection of the bag house. After correcting this evil, there still remained, however, a stack discharging the gases from the roasters, which, besides the invisible sulphur dioxide, furnished dense white clouds consisting chiefly of sulphuric acid, arsenic, and lead salts, and to which the bag-house was inapplicable on account of the corrosive action of these gases upon the bags. Lastly, there was the stack of the refinery carrying the mists escaping from the pots of boiling sulphuric acid used to dissolve the silver out of the gold and silver alloy coming from the cupels.

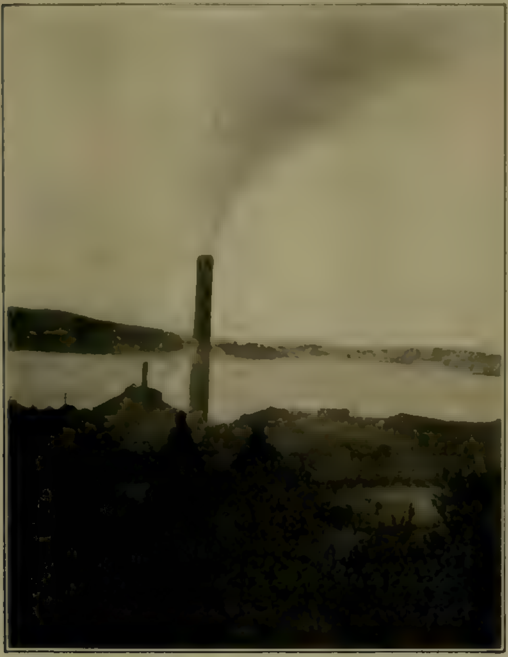

Fig. 3. GASES FROM BLAST-FURNACES AND ROASTERS AT SELBY WORKS, WITHOUT CURRENT ON APPARATUS.

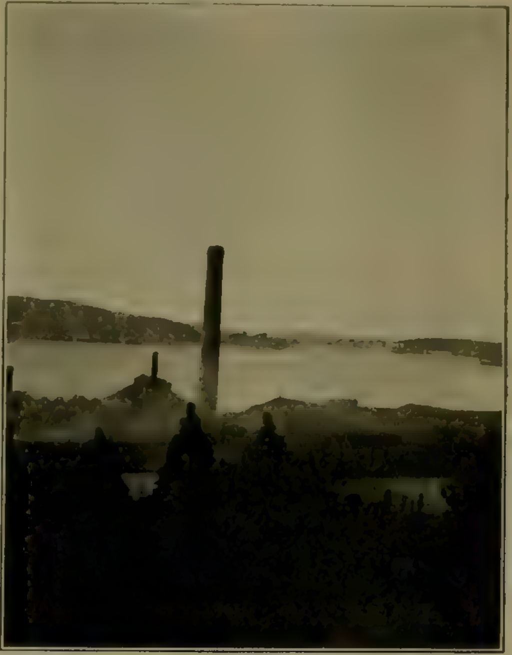

Fig. 4. GASES FROM BLAST-FURNACES AND ROASTERS AT SELBY WORKS, WITH CURRENT ON APPARATUS.

The blast-furnace and the roaster stacks each carried something over 50,000 cu. ft. of gas per minute, while the refinery stack represented scarcely a tenth of this volume. As a first step, operations were begun on this latter, and after several months' experimenting as to the best form of construction, a system of vertical lead plates 4 in. wide by 4 ft. in length and spaced about 4 in. apart, was developed. Several rows of such plates were assembled in a 4 by 4-ft. lead flue. Between each pair of plates hung a lead-covered iron rod carrying the asbestos or mica discharge material, the latter finally proving the more serviceable in this highly acid atmosphere. These rods or discharge electrodes were supported on a gridwork of buss bars extending over the heads of the plates and through apertures in the sides of the flue to insulators on the outside.

The electric current is taken from the power circuit of the plant at 460 volts, 60 cycles, and transformed up to 17,000 volts, thence through the synchronous contact-maker or rectifier to the electrode system. At first a glass-plate condenser was connected across the high-potential line in parallel with the electrode system in order to assist in maintaining the potential of the electrodes between the intervals of contact, but was found troublesome and unnecessary in practice, and in this and other installations is now omitted. The power-consumption is about 2 kw., including the driving current for the synchronous motor. The switchboard transformer and rectifier are in the engine-room of the plant and require no more attention than a feed-pump or a blower. The plant has now been in successful daily operation for over three years at a cost for labor, attendance, and repairs of less than $20 per month. In fact, while the plant was making enough bluestone to utilize all the weak acid recovered, the saving on purchase of the latter paid for the entire cost of operating five times over.

The next undertaking was naturally an extension of the process to the treatment of the gases coming from the pyrite and matte roasters of the same plant. This presented a somewhat more difficult problem, as the material to be removed consisted of a mixture of solid dust and fume with liquid sulphuric acid. From small-scale experiments it was at first thought possible to precipitate the material in a reasonably dry form and shake it in this condition from the electrodes, thus permitting of brick and iron construction. Quite an extensive plant was erected on this plan. It consisted of four parallel brick flues or chambers, each 22 ft. long, 7 ft. wide, and 9 ft. deep, and containing an electrode system of iron plates as grounded or collecting electrodes, and wire and asbestos discharge electrodes somewhat similar in general arrangement to that in the refinery flue. In this case, however, the insulating supports of the discharge electrodes were carried above the flue. This type of equipment was found poorly adapted to the particular gas conditions here present, as a much higher proportion of free sulphuric acid was encountered than the preliminary tests had given reason to expect, the weight of this free acid often exceeding, in fact, that of all the solids in the gas put together. The gases were also highly charged with water vapor both from the wet ore and the steam-atomizing oil-burners in the roasters, and this tended further to dilute the acid and produce a muddy deposit. The iron and brick construction made removal of this deposit by washing impracticable, so it was decided to further cool the gases and treat them in a lead flue similar to that used in the case of the refinery. However, the experience gained with the large brick flues in which a wide variety of electrodes were tested, made it possible to compress this new construction into far smaller compass than would otherwise have been thought possible.

The resulting construction was a sheet-lead flue of 6 by 6-ft. cross-section and 32 ft. long, containing 38 rows of 16 lead plates each 6 ft. long by 4 in. wide, with the corresponding discharge electrodes between each pair. The effect of the treatment upon the appearance of the gases issuing from the stack is shown in Fig. 3 and Fig. 4, which represent respectively the electric current switched off and on, being taken about three minutes apart. It should be remembered that in this 32 ft. of 6 by 6-ft. flue about the same volume of gases was being treated as in the bag-house, measuring about 98 by 125 by 55 ft., and further that actual tests showed that even the woolen bags used in this bag-house are completely destroyed by these roaster gases in less than half an hour. This gives a better idea of some of the possibilities which this process appears to open. The power-consumption in this case was between 10 and 15 kw. The material precipitated upon the plates was a grayish mud easily washed off and drained out through the bottom of the flue to settlers. For this purpose it was necessary, once in about every four to six hours, to by-pass the gases, shut off the current from the flue, raise its covers, and close down the electrodes from above. One man could easily carry out this whole operation in from five to ten minutes. For continuous operation on such material it is, of course, necessary to subdivide the treatment into two or more units in order that while one is being cleaned the others may be in operation.

In order to insure that essentially all the free sulphuric acid and arsenic of these roaster gases should be condensed from true gases into suspended particles, which latter are all the apparatus purports to collect, and also to protect the lead construction from softening from the heat, it was found necessary to cool the gases down to less than 150° C. To accomplish this a system of water sprays was first used in the mouth of the lead flue just before the electrodes. This served the purpose as long as clean water which would not stop the sprays was available, and successful test-runs of a week or more duration were made with this system, but as the circulating and cooling water of the entire plant is derived from the Sacramento river, which is often very muddy, the difficulties of keeping the sprays clean and open determined the management of the plant to resort to cooling by radiation through a lengthening of the flue before the precipitator. This construction and the refitting of the apparatus for continuous operation has not as yet been undertaken, and as the litigation with the farmers seems, for the present at least, to have centred more about the question of sulphur dioxide, it is likely that the completion of the work will be allowed to await the reaching of an understanding on this matter.

(To be Continued.)

Troitzk Gold Mine

The Troitzk Goldfields, Ltd., owning important mines in western Siberia, after early financial trouble, was reorganized by Hooper, Speak & Feilding. A new treatment-plant was erected, consisting of 6 Chile mills, amalgamating and cyanide plant, and much prospecting and development work was done under the direction of their resident partner, H. C. Bayldon. The new mill started work in August 1909, and work was continuous until May 25 of this year, when a fire broke out in the Stanley shaft, and not only caused the mouth of the shaft to collapse, but ruined the hoisting-plant, pumps, and air-compressor. This calamity has hastened the crisis which was impending, owing to the inability of the mine to pay its way, and a scheme of reorganization is being prepared for the purpose of refunding the loan of £58,000 advanced by the parent company, the Siberian Proprietary, and of raising £45,000 further working capital. Six months ago Mr. Bayldon had submitted a report suggesting the improvement of the position of things. One trouble was that suitable labor is scarce, and it was therefore proposed to take steps to collect a settled mining population. Other proposals were to suspend milling for a few months in order to press forward development work, and to provide an additional cyanide plant, especially for the treatment of slime. The directors have proposed and the shareholders have approved that this new work shall go forward. The report for 1910 shows that the Chilean mills treated 40,628 tons of ore and that 8257 oz. was extracted by amalgamation, 1476 oz. recovered by cyaniding sand, and 469 oz. recovered by cyaniding concentrate, making a total of 10,202 oz., being an extraction of 79% of the estimated content of the ore. The receipts from the sale of gold were £42,930, and the cost, including interest on loans, depreciation, and development redemption, was £52,359. The ore reserve on December 31 was given at 40,400 tons averaging 7½ dwt. Owing to the lenticular shape of the orebodies, it is not possible to give close figures, but judging by experience it is probable that there is a greater amount of ore available for stoping than is included in the estimate. The method proposed for raising the new capital is to create 124,993 priority shares of £1 each, entitling the holders to 90% of the profits available for dividend each year; of these 104,993 are being offered to shareholders for subscription.

THE PURPOSE of breathing apparatus used in mine-rescue work is to supply the wearer with oxygen, and to absorb the carbon dioxide and the moisture exhaled in his breath. To accomplish this purpose, the apparatus is so made as to permit the wearer to use the oxygen that is exhaled in his breath, and to permit him to breathe over and over again the nitrogen that is in his lungs and any that is inside the apparatus.

Philippine Placers

By R. Y. Hanson

Gold-bearing alluvium has been discovered in many widely scattered localities throughout the Islands, from northern Luzon to Mindanao, but with the exception of the Paracale, [illegible] and Malaguit districts, in Camarines province, southeastern Luzon, [illegible] the old Spanish reports is available. Recently the northern coast of Mindanao in the vicinity of Surigao and Cagayan has been attracting attention and, if the reports from these places are to be credited, large areas of workable and dredging ground may be developed in the near future. The district of Nueva Ecija, some sixty miles north of Manila, contains thousands of acres of gravel deposits, parts of which have been examined in a cursory manner with varying results. A thorough examination of the field might show the existence of good pay channels or deposits, but as yet nothing other than the existence of submerged clay beds of varying thickness has been proved. Systematic drilling by those holding claims in the district would be a move in the right direction. The judicious expenditure of $100 per annum, upon each group would in a few years sufficiently demonstrate the advisability of retention of the property.

The Malaguit river in Ambos Camarines, bids fair to become an important dredging field, and, equipped with modern dredges designed to handle ground of the character found in the district, should yield substantial returns. There are probably 3000 acres of alluvium upon the river, which extends from the sea a distance of about six miles before the higher plateaus are reached. This area is all a tidal plain covered with a profusion of *manglar* (mangrove) timber and buried from 2 to 4 ft. deep at high tide. The deposit consists of a topping of loam and decayed vegetation, clay, and sand, over a clean angular gravel free from large boulders and resting upon a soft to medium hard schist and granite bedrock which is quite irregular and prone to contain fissures. This description applies particularly to the upper reaches. The lower section possesses a soft decomposed bedrock which is fairly regular and usually a granite. The depth of the alluvium varies from 18 to 24 ft. at the Philippine Gold Dredging Co.'s dredge, some four miles from the sea, to 35 and 40 ft. near the river's mouth. The dredge now operating upon the river is a Risdon 3½-cu. ft. loose-connected or link-bucket type capable of handling from 30,000 to 40,000 cu. yd. per month under favorable conditions and in ground of the character for which it was designed. The actual yardage being dredged per month, in the material being worked, does not exceed 20,000, and is perhaps nearer 15,000 cu. yd., which, on the basis of the gold won plus 25% for losses, gives an actual gold content of 25c. per cubic yard. The approximate working costs, exclusive of depreciation, office expense, and interest on the investment, upon the above basis are 10c. gold per cubic yard. Owing to the fact that no record is kept of anything other than the number of ounces of gold won per month or fortnightly, an accurate estimate is impossible either here or upon the Paracale dredges, where the system is in vogue.

The Paracale district, the most widely known field in the Islands and the only one until recently upon which any dredges had been successfully operated, is situated upon the Paracale river and several branch streams which lie beyond a ridge about one-half mile north of the Malaguit river, but, unlike the Malaguit deposit, the Paracale ground lies almost entirely in an elliptical basin and contains some 2000 acres of alluvium some 300 acres of which are in narrow valleys leading from the basin. The deposit, with the exception of a 300-acre cocoanut grove bordering the bay and the upper reaches of the streams, is submerged from 2 to 4 ft. at high tide and covered with *manglar* timber which appears quite formidable to one unacquainted with its characteristics, but which offers no serious obstacle to dredging and which might even be considered a valuable asset as it makes excellent firewood when dried and affords the most desirable fuel for power around at a very nominal cost, about $1.25 per cord. The deposit consists of a stony clay over a clayey sand, sometimes quite tough, especially in the cocoanut plantation, underlain by gravel consisting, in the main, of quartz fragments and sand and occasionally a small percentage of clay. The quartz fragments are small in the valleys and the upper portion of the basin. In the lower section they are coarse and large fragments, weighing several hundredweight are found. These are saved and run through a 5-ft. Huntington mill yielding an average of $15 per ton in free gold. The concentrate from a Wilfley table is saved for shipment and is reported to be worth about $100 per ton.

The bedrock throughout the deposit is a soft decomposed granite or schist, schist predominating, and possesses a uniform grade or slope toward the sea. The thickness of the alluvium varies from 15 ft. at the upper end of the valleys to 45 ft. at the lower where the Paracale dredge is now operating. The gold is in nugget form, coarse and fine, with an appreciable quantity of flour. It is clean and lends itself readily to amalgamation. The roughness of the larger particles indicates clearly the local origin of the deposit, evidently by erosion from the veins and stringers in the schist of the surrounding hills. Practically all of the gold is found in the bottom layer, which ranges in thickness from a few inches to several feet. The percentage of black sand is large; about one ton to the thousand yards. The sand is found in varying quantities throughout the deposit. It assays $100 per ton and might prove valuable if economical means of saving it could be evolved.

At present there is only one dredge operating in the field, the other having been idle for the past year on account of litigation. Both these dredges are of New Zealand design and manufacture and equipped with 5-cu. ft. open-connected buckets and dig on a head-line. They are steam-driven and of low power, consuming about 3 cords of wood daily. As a matter of fact, neither of these was designed to handle the ground being dredged and their efficiency is less than 50% of the proper working capacity of 2000 cu. yd. per 24-hour day.

The total area of ground excavated by the Paracale Gold Dredging Co. dredge has been about 6 acres, from which has been won some $200,000. The depth has averaged about 45 ft., which would give a total yardage handled of about 450,000, showing an approximate saving of 45c. gold per cu. yd. The extraction has been low, certainly less than 80%. Those familiar with the operation of the dredge place it at about 50%, but the probabilities are that 75% would be more nearly correct. This would give an average gold content of 60c. per cubic yard for the area excavated, the high average being due to the fact that a rich pocket of considerable area was found a year or more ago. It is hardly to be expected that the entire district will average nearly so well, but as yet sufficient data are lacking to determine this point. However, there is every reason to believe that the entire district will prove profitable if handled by one or two large companies with sufficient capital to enable the joint equipment with several large capacity modern dredges, preferably with close-connected bucket-lines and a large table area with water under high pressure. No single operation with its attendant extra expenses, which might be divided among three or more boats, can work under the conditions obtaining in that section of the Islands, for a per cubic yard cost of much less than 10c. gold, but a consolidation operating three or more dredges should cut the expenses of operation to 7 and possibly to 5c. per cu. yd. The greatest obstacle at present is poor transportation and terminal facilities, the next is the large quantity of sand and other disintegrated material to be washed over the tables, and the third worthy of mention is the labor problem, which is always an important factor to be considered here in the Philippines. The first adverse condition could be readily improved should sufficient dredges be put in operation to warrant the service; the second could be remedied by the adoption of suitable machinery, and the third by less stringent alien laws.

Oilfields of the Trans-Pecos Region in Texas

By H. Vincent Wallace

The Trans-Pecos lies between Long. 103°40′W. to 104° 40′W. and Lat. 31 and 32°N., and more particularly includes those lands lying to the north of the Texas & Pacific railroad from Van Horn station on the west (which lies at the south end of the Sierra Diablo and Salt basin), the Texas and New Mexico boundary on the north, and Rustler springs, Maverick springs, and Toyah on the north and east; all embraced in parts of El Paso and Reeves counties. Toyah lies about 190 miles by rail from El Paso, and Van Horn some 60 miles nearer. On leaving Van Horn (elevation 4039 ft.), the south end of Salt basin, which at its lowest point lies some 500 ft. below Van Horn, is crossed, then the road gradually rises until at Mann's ranch, in Sec. 40, of Block 94, T. 5, an altitude of 4400 ft. is reached, or 361 ft. higher than Van Horn, and 861 ft. higher than that portion of Salt basin referred to.

According to G. B. Richardson, the age of the formation, around the base of the mountain to the north of Van Horn, is pre-Cambrian overlain by the Van Horn formation of the Ordovician; the base of the latter being marked by calcareous sandstones. On the eastern side of Salt basin lie the Delaware mountains (the southern extension of the Guadalupe range), which attain an altitude of 4600 ft. in Block 92, T. 5. They present a bold scarp to the west, and constitute the top of a gently sloping monocline, which dips east at a very slight angle, or a trifle south of east.

From Salt basin up over the escarpment of the Delaware mountains, one passes successively from the older to the more recent geological formations, and the Delaware range, embracing rocks of Permian age, is made of rocks locally known as the Delaware mountain formation. At the base of this formation, which is composed essentially of sandstones and limestones, is a bed of blue-black highly bituminous non-magnesian limestone, of which some 200 ft. is exposed, and is worthy of particular notice. As already stated, Permian rocks include the entire Delaware mountain formation, and for the present what is known as the Capitan limestone, which generally conformably overlies it, and the Castile gypsum and Rustler hills formation. All these are grouped together, though their ages are not definitely known. On the top of the Capitan peak of the Guadalupes, the limestone from which it is named is an almost pure dolomite, but the general distribution of the magnesian contents has not yet been accurately determined.

The Castile gypsum occupies a large belt and outcrops between the Delawares and the Rustler hills, and Mr. Richardson refers to the unconformity of the gypsum, as evidenced by the absence of the Capitan limestone, which should, according to him, lie directly under the Gypsum and over the Delaware mountain formation proper. I am inclined to believe that the Capitan limestone and the Castile gypsum really belong to the same period, the former having been converted by chemical agencies from the carbonate to sulphate. My reason for this assumption is that occasional layers or beds of what I consider the original limestone occur intercalated with beds of gypsum. The limestone is banded, is gray in color, and both it and the gypsum in most localities, on being struck or rubbed, give a characteristic bituminous odor. I am therefore inclined to think that, as the result of the action of sulphurous and sulphuric acid solutions, gasses, or vapors, the original carbonates have been converted more or less into sulphates. I fully realize that this is in opposition to theories of the deposition of gypsum from sea water, or almost land-locked estuaries, as suggested by Ochsenius, and as set forth by J. F. Kemp, in his 'Handbook of Rocks.' This theory requires the presence of layers of rock-salt alternating with gypsum. In the field under notice the northern portion of Salt basin is, I believe, the only region where sodium chloride is found in any considerable quantity.

The origin of the sulphur which is found in and adjacent to certain portions of the gypsum, may be the result of the absorption of sulphur by certain bacteria, a discussion of which may be found as a footnote to pages 37 and 38, of the 'University of Texas Mineral Survey Bulletin No. 2.' Assuming that certain bacteria or algae first took up the sulphur, and in turn set it free to form sulphuretted hydrogen, there is a basis for the formation of the gypsum and free sulphur, as set forth by Bischof. This theory dispenses with the necessity for volcanic agencies for the formation of the sulphurous gas and its consequently sulphuric condition. This, I appreciate, is in distinct opposition to Eugene Coste, both on the theory of the origin of the sulphur, and according to him, of petroleum, which he maintains is absolutely of volcanic origin.

Caves in the gypsum are numerous and indicate a line of weakness, where the acid gases or vapors or waters probably found outlets. Accompanying such gases, under considerable pressure, more or less bituminous matter was conveyed along the lines of least resistance, and deposited throughout the limestone beds simultaneously with the chemical activity which, I assume, was converting the carbonates to sulphates of lime. Where the limestone is shaly in character the concentration of the bituminous matter seems more in evidence, hence the finely banded limestone (with more or less sulphate), which did not afford a ready escape or vent, is more highly impregnated with bitumen than the more pervious portions of the formation.

zons.

Robert T. Hill in his paper entitled 'The Beaumont and Other Oil Fields of Texas,'[*] says:

"Capt. Lucas, who, in his explorations of the coastal plain seeking successively salt, sulphur, and oil, has observed the association of oil, sulphur, sulphuretted hydrogen gas, gypsum, dolomite, and salt, constituting collectively what might be termed the 'oil phenomena,' representing a group of secondary products, as distinguished from the mother-strata or sediments out of which they have been produced."

Strictly speaking, the origin of petroleum is as yet unknown. From the knowledge of known fields, it appears that commercial oil is found in rocks of almost all ages, the oil itself being usually found in more or less porous receptacles of sandstone, overlying highly impregnated shale or lime beds. These latter were presumably the original depository, but pressure, either hydrostatic or gaseous, or both, may have caused the transposition of some of this oil from the underlying strata to the overlying and more pervious sandstone. In order, however, that this transposed oil may retain its best qualities it is important that it be capped or sealed by a stratum which is impervious. Such a cap or seal may consist of chemical deposits, as magnesian-calcareous, silicious-calcareous, or possibly resedimented gypseous material, stiff clays, or, when more hardened, shales. The finer the texture of the overlying material the more impervious it would be to volatile matter. Now in the processes of nature, the folding of strata, caused by lateral or upward pressure, or through shrinkage, if carried to the point of fracture, would doubtless have permitted the travel of portions of the lower oils from lower strata, all probably aided by hydrostatic pressure, until they reached other porous receptacles at higher hori-

In addition to the favorable conditions discussed by M. L. Requa in the January number of *The Mining Magazine*, in 'Oil Resources of California,' I would add an extract from W. Topley, in a paper read before the British Association in 1891, entitled 'Geology of Petroleum and Natural Gas,' in which he in part sums up his views as follows: First, the most productive areas for oil in great quantity are where the strata [illegible]. Oil has [illegible] [illegible] found, [illegible] gas in [illegible] Seamy, the gas [illegible] gas is [illegible], etc. [illegible] pervious cover. [illegible] and [illegible] favors the accumulation of oil and gas in the [illegible] of the arches. Faults, [illegible] accompaniment of oil and gas.

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[*] *Trans.* Amer. Inst. Min. Eng., Vol. XXXIII.

Referring to Mr. Topley's paper, it may be noted that in the region under discussion the strata are generally undisturbed, though thrown into a long and almost monotonous monocline continuing eastward from the western scarp of the Delawares. There is a low anticline running east between T. 5 and 6, and on Block 97 in Paint Horse draw there is an outcrop of fine yellow sandstone showing a section of 80 ft. in thickness, which dips southeast. This may be the southeast limb of a local fold, the exposure of the strata being caused by erosion in the Paint Horse draw. I was informed that many years ago a well drilled on Sec. 22 in the adjoining Block 101 reached a depth of 300 ft., all in sandstone. No water was found, but a small quantity of oil, which was used for lubrication of the drilling outfit. This statement could not be verified, but it is highly probable, as overlying shales in the same block, and in Blocks 91, 92, and 93 there are many exposures of bituminous shales, presumably overlying the sandstone. These shales grade from sandy to finely foliated.

In a well put down to a depth of 300 ft. on Sec. 21, Block 92, T. 6, the formation passed through, as given me by the driller, consisted of 90 ft. of soft earthy gypsum; from 90 to 100 ft., banded calcareous shale; from 100 to 175 ft., the same but softer; from 175 to 300 ft., sandy limestone. At a depth of 90 ft. a smell of gas was noticed, increasing with depth. The hole was dry at time of drilling, and when the gas-bearing stratum had been perforated some distance, the driller, out of curiosity, dropped some lighted waste into the hole, with an explosion of gas as the result. This could not be verified, as rain-water had filled the well to within 50 ft. of the surface, and although the drillings had a characteristic bituminous odor no gas was escaping.

Lone Man mountain, on Sec. 1, Block 92, appears to be capped with fine gray dolomite, and the same is true of a line of hills to the northeast of C. Tinnin's ranch on Sec. 12 in Block 93. All of these hills are surrounded and underlain by gypsum, and there appears to be a regular line of caves along this belt, indicating a line of probable structural weakness, which afforded vents for the gases and solutions already mentioned. As shown by the accompanying figure, these hills have the appearance of islands in a gypsum lake or sea, and in going into one of the largest caves, on Sec. 17, in Block 96, a lateral distance of about 1000 ft., the descent amounted to about 225 ft. (barometric reading). I noticed in this cave more or less subsidence of the strata, so that the apparent course and dip could not be depended upon, although the rock appeared to be massive and solid. I partly account for this by the fact that there seems to have been a general degradation of all these gypsum areas, as evidenced by the fact that the mouths of the caves, now lower than the surrounding ground (permitting the inflow of torrential rain-water, which is characteristic of the Southwest) were undoubtedly originally higher, as indicated by the grade of the arroyos leading therefrom, permitting any water issuing therefrom to travel away from the cave, down the slope. At this time, owing to subsidence of the cave mouths (in some instances) fresh waters are finding their way into the caves, and blocking them with all kinds of débris.

I am drawing particular attention to this point to emphasize the fact that many [illegible] of the [illegible] may be [illegible] of the [illegible] gypsum, [illegible] the [illegible] indicated by the caves. Such depressions should be carefully studied so as to avoid [illegible] anticlinal [illegible] and taken for anticlinal folds, and the corresponding depressions for synclines.

It is unnecessary in this paper to outline the various folds in the field. One long anticline runs between Townships 5 and 6, and another about due south from San Martine on the T. & P. railroad. The latter has been carefully studied and worked out by a Mr. Everest of Oklahoma City. A particularly prominent exposure of an anticline exists in a place known as Hackberry Mott, to the southeast of Rustler draw, about on the line of Block 110 and 42. This is overlain by fine gray magnesian limestone, and underlain by sandstone. Another general line of folding is indicated by the main course of Cottonwood draw, and about in the middle of Block 59, T. 5, it turns to the southeast. It is quite possible that portions of Cottonwood draw indicate a line of structural weakness, which may have gone to the extent of faulting, but this will have to be determined by systematic drilling.

DOLOMITE-CAPPED HILLS SURROUNDED AND UNDERLAIN BY GYPSUM NEAR C. TINNIN'S RANCH.

Throughout this region wells have been sunk for the purpose of finding water, and almost invariably the owners declare that more or less oil was found at a short distance from the surface. From my personal observation I am only able to say that shallow oil of excellent quality for lubricating purposes has been opened on and near Sec. 16 and 17, Block 59, the oil-sand having been found at depths varying from 130 to 325 ft. On or about Sec. 17, in this block, the Texas company has put down two or three wells, but profound secrecy is maintained by this concern, and no logs could be procured. One well which has been capped and plugged showed a good pressure of gas, escaping from the sleeve. The derrick over this well was burned some time since, but the cause of the conflagration can only be surmised. It is commonly reported that it was burning gas. The drilling tools were warped and much bent, and it is hardly possible that the burning derrick material would have caused such heat. On the S.W. ¼ of Sec. 44, Block 55, the Corsicana company is sinking a well and is now down over 1100 ft. At a depth of 243 ft. a 3-ft. streak of oil-sand was found, and from that depth onward it has been drilling through blue clay and shale, showing occasional streaks with globules of oil in the sludge.

Attention should be called to the large beds of sulphur adjacent to the Texas company's wells, Rustler springs, and particularly at Maverick springs, where it is a well known fact that inflammable gas was found, and was used for domestic and other purposes while the sulphur deposit was being worked some years ago.

The enormous area of this field which shows outcrops of bituminous shales and limerock, with underlying beds of sandstone, leads me to believe there are vast reservoirs favorable to the accumulation of oil, a portion of which has escaped and impregnated the overlying strata, as indicated in shallow wells, such oil in certain favorable places constituting an actual commercial supply (for lubrication). I understand that the oil so far brought to the surface has a paraffine base, and seems to have undergone a natural distillation, thereby losing the bulk of the lighter and highly inflammable constituents.

Surface water highly charged with gypsum can be found almost anywhere in the district, in the gypsum belt, at comparatively shallow depths, ranging from 30 to 80 ft., and artesian water has been proved around the town of Toyah at depths of 625 to 750 ft. One of the wells on the north side of this town penetrated a strata which gave off a large volume of inflammable gas, under high pressure, but unfortunately the well was continued into the artesian strata, with the result that as a source of gas the well is a failure. This water is charged with sulphuretted hydrogen, which on reaching the surface deposits sulphur.

Throughout the gypsum belt there is a strong growth of juniper (locally called cedar), the cost of which need not exceed $2.50 per cord delivered at the rig, including stumpage to land owners. In portions of the country under review, away from this timbered zone, oil will have to be imported for fuel, unless wells now being drilled are in a position to furnish it. The price of this commodity will of course be governed by distance from railroad, wagon haul, etc. The indications are that oil in small quantities can be developed from a depth of 140 ft. and deeper, with a probability of gas and deeper oil at depth of from 1600 to 2500 ft., according to locality. The purpose is to reach either the upper Carboniferous strata, underlying the Delaware mountain formation, or a strata overlying same favorable to the accumulation of oil.

Should oil be developed in this field in commercial quantity there is an extensive and ready market for its disposal. The nearest producing fields are situated at distances of from 800 to 1000 miles, north, east, and west, so that with Toyah as a centre, it would dominate a region of that diameter, requiring probably a supply of 1,000,000 to to 150,000,000 bbl. per annum. At a price of even $1 to $1.25 per barrel this crude oil would be in great demand by all classes of industry. I believe the field offers excellent opportunities for legitimate drilling operations, with every indication of proving a large and profitable business.

Rainfall in Nicaragua

The amount and distribution of rainfall bear so directly upon mining, that the following figures, presented through the courtesy of Henry B. Kaeding, general manager for the Siempre Viva Mining Co., will be read with interest. They give the rainfall at the Siempre Viva mine in eastern Nicaragua since 1904. They may be compared with the average rainfall at Panama, which in the Chagres valley is 100 inches per year, according to Col. G. W. Goethals. Figures below are in inches:

	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.
January	....	5.70	4.20	8.27	7.08	4.86	8.73	13.71
February	....	3.30	3.18	3.63	11.58	3.60	8.21	3.33
March	....	2.50	4.89	2.55	6.87	2.62	3.98	1.89
April	....	3.50	6.53	0.46	2.78	3.29	5.87	4.60
May	....	14.37	14.74	5.18	12.22	3.96	8.85	15.10
June	....	20.27	14.70	15.31	16.12	12.33	17.45	26.40
July	....	24.56	18.29	20.95	19.58	24.40	20.56	....
August	....	15.79	13.61	22.70	14.88	11.85	14.08	....
September	11.18	14.56	8.47	17.77	13.03	16.27	14.06	....
October	7.21	11.19	15.57	17.32	19.16	18.05	12.79	....
November	8.92	7.97	9.15	8.63	10.24	15.67	9.19	....
December	8.50	6.31	11.15	11.50	12.07	5.93	10.46	....
Totals	35.81	130.02	124.48	134.27	145.61	122.83	134.23	....

Copper Production

Below is given a summary of the production of copper by the properties under the control of Phelps, Dodge & Co., for the first seven months of 1910 and 1911.

COPPER QUEEN MINE

	1911. Lb.	1910. Lb.
January	6,033,853	6,355,000
February	5,989,122	5,348,693
March	6,233,656	6,166,782
April	5,663,676	5,690,000
May	5,719,187	5,732,000
June	5,972,268	6,195,162
July	5,878,490	6,757,867
Total	36,490,252	40,245,504

CUSTOM ORE

January	1,264,374	1,533,000
February	1,125,156	1,760,351
March	1,100,073	2,271,257
April	1,269,646	2,445,000
May	1,421,009	2,278,000
June	1,116,594	2,318,315
July	494,572	2,013,868
Total	7,791,424	14,619,791

MOCTEZUMA MINE

January	1,738,429	2,113,000
February	1,950,475	1,818,159
March	2,049,150	1,921,449
April	2,315,392	1,785,000
May	2,403,583	2,274,000
June	2,071,960	1,706,210
July	2,340,404	1,958,637
Total	14,869,393	13,576,455

DOUGLAS SMELTER

January	9,036,656	10,001,000
February	9,064,753	8,927,203
March	9,382,879	10,809,488
April	9,248,714	9,920,000
May	9,543,779	10,284,000
June	9,160,822	10,219,687
July	8,713,466	10,730,732
Total	64,151,066	70,891,750

DETROIT COPPER CO.

January	2,017,357	2,164,000
February	1,918,365	1,485,400
March	1,914,710	1,698,975
April	1,814,749	1,930,000
May	1,709,530	2,037,000
June	1,732,829	2,017,000
July	1,590,357	1,800,000

Kildonan Placers in Scotland

Once every ten years the gold placers of Kildonan, in the wild northwest of Scotland, come before the public and the daily papers revel in sensational or sentimental paragraphs. For the last three or four months a Mr. Heath, who gained his experience at Klondyke, has been thoroughly sampling the gravels in various streams tributing to Helmsdale in Sutherland estate, of which the Kildonan is the most important, and the papers of London have made frequent reference to these fields. Tradition has it that gold was discovered as early as the year 1245, but no authentic record is extant of any work being done. In 1840, it is stated, a nugget weighing 1½ oz. was found in the Kildonan stream. A rush was made to the district in November 1868, and for a year or so 400 men were occupied. During this time the production of gold worth £3000 was reported officially, but as the law imposed a 10% royalty there is good reason to believe that the production was really much greater. A competent authority put the actual figures at £12,000. At about the same time gold gravel was found some ten miles to the southwest in two streams that run into Loch Brora; the work, however, interfered so much with sheep farming that the licenses were suspended in 1870.

The Kildonan district consists of moorland and heather-clad hills, with extensive bogs at the sources of the streams. The valleys are mostly narrow and straight, so that there are few alluvial flats of any notable size. The rocks are granites and metamorphic schists of varying character, and over them are thick deposits of glacial drift which are overlain in their turn by peat beds. The gold is found as small grains in the beds of the streams and in the gravel banks. It is most abundant in the coarse gravel and in the crevices of the upturned edges of the schists, across the strike of which the streams run, but it appears to be also disseminated throughout the drift. The heaviest nugget ever found weighed 2 oz. 17 dwt. The richest deposits so far known were in Goldburn, where several specks may still be obtained from every pan. The source of the gold has not been identified; it is doubtless to be sought in the quartz veins which are found in the schists and in the granite at the contact with the schist. Several such veins are known, but apparently no indication of the presence of gold has been recorded.

Prince William Sound Copper Mines

The latest reports from various copper properties in Prince William Sound indicate that mining is active. Mining operations at Latouche are well under way, 70 men being employed; the Beatson is shipping at the rate of 1000 tons of ore per month. Plans for building a concentrator are being discussed. Diamond-drills are being used in testing the ground below present workings and are said to be developing copper ore averaging over 6%. The Barrack property adjoining the Beatson has been bonded by the Alaska Syndicate and a crew of men is at work there. On Fidalgo bay, 17 miles south of Ellamar, two orebodies have been found. Over 1000 ft. of tunnel has been completed, and this property will soon join the others as a steady shipper of high-grade copper ore to Tacoma. It is said it will rival the Beatson in total tonnage. W. H. Dickey, of the Three Man Mining Co. on Landlock bay, is said to have 20,000 tons of 10% ore. Mr. Dickey has just opened the Mason-Gleason property, also on Fidalgo bay. Knight's Island Copper Co. is developing a large body of concentrating ore. The orebody at present developed is 700 ft. along the strike of the lens and over 120 ft. wide.

During the past year development on Prince William Sound has been somewhat backward, owing to the discovery of gold quartz in the Copper River country which has attracted all the prospectors and miners from that section to the interior. Mines on tide-water, however, are sure to develop in time.

Quicksilver in the United States in 1910

Of the 19 mines producing quicksilver in the United States in 1910, 15 are in California, 2 in Nevada, and 2 in Texas, according to H. D. McCaskey, of the U. S. Geological Survey. The production in 1910 was 20,601 flasks of 75 lb. each. At the average domestic price at San Francisco, $46.51 a flask, the value was $958,153. As compared with the production of 1909, which was 21,075 flasks, valued at $957,859, this shows a decrease in quantity of 474 flasks, but an increase in value of $294. Although the production of California increased in 1910, the output from Oregon decreased to nothing, as that of Arizona did in 1909, the small Nevada production fell off considerably, and the output from Texas decreased. In no State, except possibly in Nevada, can an increased output be expected for 1911, the present outlook being for a total production for the United States not exceeding 20,000 flasks.

A good domestic demand for quicksilver was noted throughout 1910. The principal uses are for gold milling and placer mining, for the manufacture of vermilion, fulminates, physical instruments, and drugs, and for lighting. The use of quicksilver in making the fulminate of percussion caps for igniting powder is increasing in importance probably more than any other use. The consumption for all purposes in 1910 was somewhat greater than the domestic production, stocks decreased to a small supply, and the condition of the trade within the United States was generally good.

Producers reported the mining of 132,813 tons of new ore available for treatment in the United States in 1910 and the treatment during the year of 123,562 tons of ore, including small amounts of crude ore concentrated before reduction.

In California 115,306 short tons of crude ore was treated, producing 15,825 flasks of quicksilver, indicating an average recovery in metal of 0.5% of the ore treated, or 10.3 lb. per ton. In addition, old material treated produced 1386 flasks of quicksilver. In 1909 a total of 144,989 tons of ore treated in California yielded an average recovery of metal of 0.4%, or 8 lb. of quicksilver per ton. These figures indicate average gross returns per ton of $6.39 in 1910 and of $4.85 in 1909, and show that in quicksilver production on a considerable scale the total costs are low. In Texas 8221 tons of ore was treated in 1910, yielding an average of 1.5% of metal, or 30.3 lb. of quicksilver per ton, against 9107 tons in 1909, yielding 1.7% or 34.5 lb. of metal per ton. In Nevada, about 35 tons of ore was treated in 1910, yielding 7.5%, or 150 lb. of quicksilver per ton. In the entire United States, 123,562 short tons of crude ore was treated in 1910, yielding an average of 0.6% of quicksilver, or 11.7 lb. per ton, with a gross value of $7.26. In the preceding year, 154,502 tons yielded an average recovery of 0.5%, or 10 lb. of metal per ton, valued at $6.09.

The production in California is almost wholly from shaft furnaces of Scott, Litchfield, and related types. The Texas ores are all treated in Scott furnaces. The Nevada production has so far been entirely from retorts, these being less expensive than shaft furnaces, better suited for high-grade ores, and frequently used at new mines where there is usually some rich ore. These retorts, however, are a menace to the health of the workmen. As is well known, cinnabar, the sulphide of mercury, is the chief ore of the metal, and recovery is accomplished by volatilization of the quicksilver from the ore by heat and condensation of the mercury vapors and condensers. Fluxes are not required, as in the metallurgical treatment by smelting of most other metals, and frequently the ore itself carries the equivalent of fuel in the form of pyrite which gives off considerable heat in oxidation.

The world's production of quicksilver in 1910 was 3399 metric tons of 2204.6 lb. each, against 3304 tons in 1909, 3296 tons in 1908, and 3307 tons in 1907. Spain is the largest producer, furnishing nearly a third of the total world's supply from the famous Almaden mines. The

United States, Austria-Hungary, and Italy have in turn held second-place, this country ranking third in 1910. The imports of quicksilver for domestic production are now nominal, having been in 1910 only 667 lb., valued at $381, although the values of the imports in the preceding three years varied from $6000 to $8000. The exports of quicksilver in 1910 were 144,237 lb., valued at $91,077, against 510,141 lb., valued at $266,243, in 1909. The chief market is now Canada, followed by Mexico. Prices of quicksilver in 1910 averaged $46.51 a flask of 75 lb. in San Francisco for domestic use, and $44.51 for export.

Copper and Pig Iron

The following tabulation shows the yearly production and prices of copper and pig iron since 1890, the percentages of increase in production and prices for the first decade being given in five-year periods. They were compiled by I. M. Taylor & Co. of New York, whose circular says:

"While no absolute relation can be proved between production of copper and copper prices and pig iron production and prices, figures showing comparisons between the two metals present possibilities of interesting deductions. In a general way the use of both metals will without doubt tend to increase conformably to the growth of the country. Sporadic changes in the ratio of supply and demand in the case of either would at any time naturally affect individually the price of either metal. Iron is now being used so generally in all industries that it is difficult to foresee any new uses which would create an unusual demand for it, while, on the other hand, new uses for copper are being found daily, and at the same time the probability that the electrification of the railroads will proceed rapidly within the next few years opens up an enormous new demand for the red metal. Again, while ore reserves for pig iron are practically unlimited, no supplies of copper ore other than those now being worked or developed are known to exist in the United States.

During the two decades the average annual increase in the production of copper was 8.4%, as against 7.8% increase in pig iron. The fluctuation in the amount of pig iron produced is much the more irregular of the two, the readier response to demand being due to the greater facility with which production may be curtailed.

It will be noted by a glance at the price columns that in the main the relation between the two has been close. The high and low for each were made in the same year, and since 1904 the fluctuation in each has been almost identical. The fact that the prices of both have remained at a comparatively low average level since the panic of 1907 indicates that the country's producing capacity, which had been expanded to meet the boom demands of 1906 and 1907 has never been tested during the past three and a half years. Since that boom capacity was attained the country has grown 10%, and if our industries were operating at normal now, the demand would undoubtedly exceed the capacity. We believe that fundamental conditions have been restored by the past three years of economy and that next year should be one of general business expansion with consequent advancing metal prices."

Chichagof District, Alaska

By V. H. Wilhelm

In the last few years many small but high-grade quartz mining districts have been developed in Alaska, and men at Nome, Seward, Dawson, Valdez, and Fairbanks are all turning their attention in that direction. This form of mining follows naturally in the wake of the placers, which in many cases have led directly to the discovery of the quartz. One of the most remarkable of the newer districts is the Chichagof, where a camp has been established on Klag bay, Chichagof island, sixty-five miles northwest of Sitka. The original discovery was made by Indians in 1906. Active operations began with the gathering of high-grade boulders and float from the bed of the creek below the vein. Enough ore was collected in this way to pay for the first mill, which consisted of two Hendy 2-stamp triple-discharge batteries. The vein is in graywacke and slate, in a shear zone, and runs southeasterly, with an 80-degree dip to the south. The ore occurs in shoots averaging from 8 to 14 ft. wide, the quartz being ribboned with slate. Pyrite and much free gold are found, with a great deal of graphite and a little arsenopyrite.

At present there are two mills operating in the district. The original location is occupied by the Chichagof Mining Co., which has a 10-stamp mill with Wilfley tables. The company includes Messrs. Rust, Bratnober, and DeGraff, and the Jarvis estate. Much high-grade ore from the upper levels has been shipped to Tacoma. The average value of the mill ore is stated to be $17 per ton, and 60% of the gold is caught on the plates. Outside amalgamation only is attempted. The vein is tapped at the mill level by a 900-ft. adit giving 230 ft. of backs.

The other mill is operated by the Golden Gate Co., controlled by W. P. Mills. It is on the extension of the shear-zone, and includes 10 stamps, with Pindar tables. Ore is supplied by a 2500-ft. aerial gravity tramway, and comes from a shoot averaging 4 ft. in width. A second shoot which averages 7 ft., occurs 200 ft. beyond the first, and a drift is now being driven to tap this second shoot at a depth of 160 ft. The mine ore averages $17 per ton.

In both mills salt water is used during the dry season, and is found to possess both advantages and disadvantages. It keeps the amalgam soft and makes amalgamation easy for the heavy sulphide ore, but it also increases the wear on screens, boss-heads, and stems. Both mills are driven by electricity supplied by a hydro-electric power-plant five miles distant. Water for this plant is drawn through a 200-ft. tunnel from a lake which is tapped below the frost level and supplies power all the year round. The district has many promising prospects. Many small but high-grade stringers have been discovered, and high-grade float on the beach is of common occurrence. Most of the orebodies are in slate. Prospecting is generally done by boat along the shores or by exploring the creek beds, the heavy underbrush making travel difficult on the hillsides. Alaska suffers from lack of trails, and, except when accessible by water, few veins have been opened. Discovery of a few rich veins such as these will open the country rapidly.

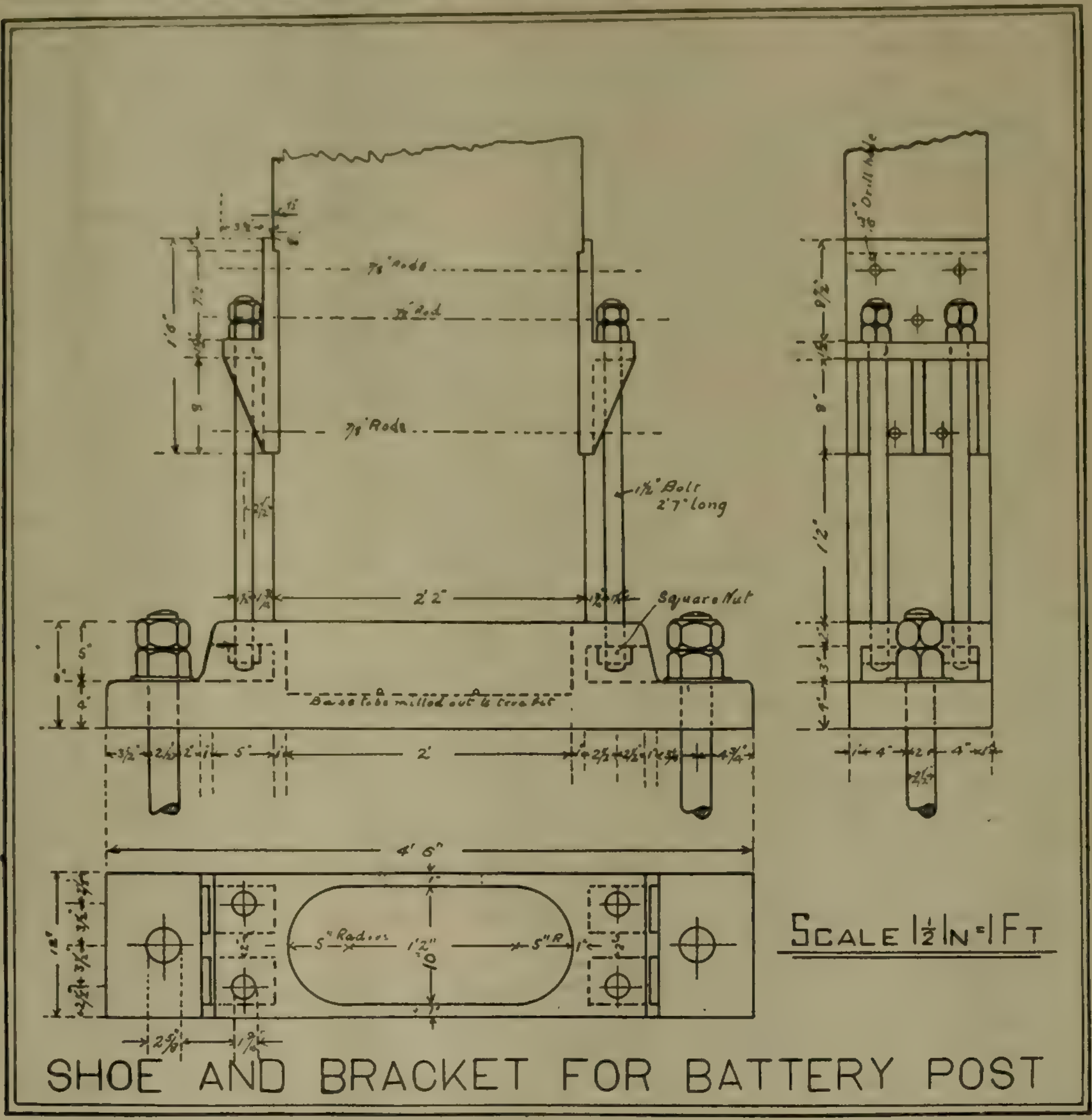
Year.	Prod. copper, tons.	Increase, per cent.	Prod. pig iron, tons.	Increase, per cent.	Copper prices, cents per lb.	Pig iron prices,† dollars per ton.
1880	115,966	...	9,202,703	..	15.60	15.78
1895	169,917	46.5	9,446,308	2.6	10.73	10.94
1900	270,588	59.3	13,789,243	56.5	16.65	16.90
1901	268,782	0.6*	15,878,354	15.1	16.72	14.20
1902	294,423	9.5	17,821,307	12.2	12.16	19.49
1903	311,627	5.8	18,009,252	1.0	13.07	17.52
1904	362,739	16.4	16,497,033	8.3*	13.27	12.89
1905	402,637	10.9	22,992,380	35.7	16.03	15.62
1906	409,735	1.7	25,307,191	10.0	19.78	18.19
1907	400,134	2.3*	25,781,361	1.8	20.67	21.52
1908	421,141	5.2	15,937,018	37.7*	13.58	15.23
1909	501,167	19.0	25,795,471	61.8	13.48	15.55
1910	492,492	1.7*	27,298,545	5.8	13.40	15.24

*Decrease. †Gray forge lake ore at Pittsburg.

Securing Battery Posts

By Francis W. Sewell.

Of the many different contrivances for securing battery posts to the concrete foundation block, the method, described below, will commend itself to constructing engineers, on account of its solidity, simplicity, and strength. The arrangement was designed for use in the battery of the Guanajuato Cons. M. & M. Co. and has proved to possess material advantages over many other contrivances. It has been used in the construction of the Zacatecas M. & M. Co.'s mill, where the author had through the courtesy of Parrish McDonald, an opportunity to obtain the following details.



SHOE AND BRACKET FOR BATTERY POST

The shoe is of cast iron and weighs 860 lb. It has a bearing surface on the concrete 4 ft. 6 in. by 1 ft., thus distributing the strain of the frame over a considerable area. The shoe is secured to the foundation block by two 2½-in. rods, each 5 ft. long, threaded at both ends. The threaded portions are of enlarged cross-section, so the diameter of the base of the thread is not less than that of the remainder of the rod. The lower ends of the rod pass through broad square cast-iron washers, embedded in concrete, and are secured thereto by square nuts. Hexagonal nuts are used at the top end to hold down the shoe; lock nuts are shown in the accompanying sketch, but these are not necessary.

The shoe has a cavity cast in it, 2 ft. long by 10 in. wide by 6 in. deep, with rounded ends, into which the foot of the battery post fits. The bottom of this cavity is milled so as to give an even bearing surface to the post. At each end of this shoe are cast suitable projections, bored vertically with 1⅝-in. holes to receive the ends of 1½-in. bolts. Iron brackets, which weigh about 100 lb. each, are recessed into 12-in. faces of the posts, and secured in place by five ⅞-in. rods, which pass through the post from one bracket to the other. These rods are threaded at both ends and nuts hold the brackets firmly in position. Passing vertically downward from each bracket to its respective end of the shoe are two rods, already mentioned, with square nuts to attach them to the shoe and hexagonal nuts to attach them to the bracket. The lowest part of the bracket is 1 ft. 2 in. above the top of the shoe, so it will be seen that once the post is set in position, with all the nuts tightly screwed down, there is very little chance for any movement. With the exception of lower nuts of the 2½-in. rods holding down the shoe, all the nuts are readily accessible.

In the erection of the battery the cavity is half filled with oil and the foot of the post is cut slightly larger than the cavity, the point being cut to just enter. Some specially long rods are passed up through the brackets from the shoe, and fitted with nuts, which on being screwed down, force the post into the cavity. This action is aided by blows with heavy hammers on the top of the post. The oil is forced into the end of the grain of the wood.—*Inf. y Mem. del Inst. Mexicano de Min. y Metalurgia.*

A Park City Merger

One of the important recent developments at Park City, Utah, was the announcement that stockholders' meetings of the Ontario company will be held October 10 and of the Daly September 20 to consider a merger proposal. The ownership of these two companies has always been to a large extent identical, and economy in operation is urged as the principal reason for combining. As a matter of fact, however, the combination of these two companies is generally regarded as the first step in a far more comprehensive consolidation. The Ontario is the pioneer mine in Park City, with a record of having paid $13,692,500 dividends. While its orebodies have greatly diminished in value, it still holds a strategic position on account of its ownership with the Daly, of the Ontario drain adits, without which some of the leading mines of the district cannot be operated at depth. It is proposed to form a new company of 300,000 shares, par $5, incorporated under the Nevada law. This company will exchange share for share Ontario stock, and two shares of Daly for one of the new corporation. This will leave 75,000 shares and over $135,000 cash in the treasury, available for use in systematic development work of virgin ground, of which the two companies possess a large acreage. They also own a coal mine, a light and power company, a water company, and other properties. They now have large holdings of stock in the Thompson-Quincy and Naildriver companies, which own adjoining properties needing the extension of the drainage system for deep development. It would not surprise Park City people to see these two included in a later merger, as well as the Daly West, with which there is a close connection. For a long time the Daly West, Ontario, and Daly employed the same general manager, and the Ontario drainage adit extends into Daly West ground, affording also an outlet for ore. Whether Daly-Judge could be drawn into a great merger later is a question, although this company needs the drainage adit for deep development. It recently entered into a contract whereby the adit will be extended to its ground, on a rental and royalty basis, drawing off the water and affording an outlet. This accomplished, and with the Snake Creek adit approaching the other end of its holdings, the Daly-Judge is now in a comparatively independent position. Nevertheless, advances made to this company and to the Silver King Coalition not long ago looking toward a consolidation of all the big producers in the district will probably be soon renewed. The plan, which has been under consideration by leading interests in the district for some time, has its basis in the fact that Park City is a deep-mine camp, in which operations are expensive, and that a consolidation would mean economy of operation and far greater possibilities in the way of new development. The Daly-Judge, as a result of its contract for the extension of the Ontario adit, is now beginning the development of its lower levels. The water is fairly well drained, and the main adit is now within 300 ft. of the Daly-Judge lines. Though the Daly West, connection with the 2300-ft. level was made, and the main adit will open the 2500-ft. level. The shaft is down 1600 feet.

Fire-Damp in Gold Mines

At the Simmer Deep gold mine several natives were recently burned by an explosion 3000 ft. from the surface. The place was examined two days later by the shift boss with a naked light, when on putting the light well up in the hanging wall a second explosion took place by which he also was burned about the face. Every indication points to fire-damp (CH_4) as having been the cause of the explosion, but this has been so rare an occurrence in the annals of Rand mining that some doubt existed at first whether the explosion could possibly be attributed to fire-damp. There cannot possibly be now any doubt as to the identity of the gas. It seems that a drift at over 3000 ft. from the surface had reached a break in the strata and being unventilated, afforded every facility for the accumulation of gas. It may be also pointed out that at the Anglo Deep gold mine in the same neighborhood a bore-hole put down in the foot-wall of the reef at 4000-ft. depth from the surface produced considerable quantities of gas, so much so that the bore-hole had to be plugged to put a stop to its further escape. The explanation for the generation of this gas is the fact that below the Main Reef series there occurs a huge thickness of shale, which on being tapped, gives off this gas. The break at the Simmer Deep extending down into this shale would act in a similar manner to the bore-hole at the Anglo Deep, and thus provide a means for the escape of the gas which, occurring as it did at the face of an idle unventilated drift, would present the precise condition necessary for such an accumulation of fire-damp. These are the only two reliable instances recorded of the occurrence of fire-damp on the Rand, but in the lead mines of the Derbyshire where similar beds of shale occur, the presence of fire-damp has been frequently noted.

July Petroleum Production

Petroleum production in California in July, according to the *California Oil World,* amounted to 6,663,325 bbl., an increase of 261,021 over June. This is at the rate of 79,959,900 bbl. per annum. Not included in this estimate are 429,200 bbl. burned in the fields as fuel, which would bring the total production for July up to 7,092,525. The following table shows the production by districts:

San Joaquin:	July Production.	Daily Average.
Coalinga	1,577,131	50,875.19
Kern River	1,044,379	33,689.64
McKittrick	450,062	14,518.13
Maricopa	426,366	13,753.74
Midway	1,773,105	57,196.93
Totals	5,271,043	170,033.64
Coast:		
Santa Maria-Lompoc	429,112	13,842.26
Summerland	5,850	188.71
Totals	434,962	14,030.97
Southern:		
Salt Lake-Sherman	228,680	7,376.77
Fullerton	566,796	18,283.74
Whittier-Coyote	77,390	2,496.45
Los Angeles City	36,800	1,187.09
Ventura county	34,714	1,119.80
Newhall	12,940	417.41
Totals	957,320	30,881.26

During the month 55 wells were completed; producing wells active, 5114; idle, 301; drilling, 891; new rigs, 42; abandoned, 3.

Queensland's gold yield for June, according to the *Queensland Government Mining Journal,* was 34,018 oz. fine, of the value of £144,499. For the corresponding month of last year the return was 41,637, of the value of £176,863; so that there was for June of this year a comparative decline of 7619 oz. in weight and £32,364 in value. The largest decrease was at Charters Towers, where there was a falling off amounting to 4244 oz. There were also decreases—at Gympie, of 1226 oz.; at Mount Morgan, of 2700 oz.; at Ravenswood, of 261 oz.; and at Croydon, of 240 oz. From copper ores at Cloncurry, however, 1223 oz. of gold was obtained, as against nothing for the corresponding month of 1910; while there were also small improvements in the outputs from the Gladstone and Rockhampton fields. The return for the first six months of this year was 184,641 oz., of the value of £784,305, a decrease of 33,798 oz. in weight and £143,564 in value compared with the yield for the corresponding period of last year. The dividends declared by gold mining companies for the month of June totaled £77,596.

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Life of the Rand

The Editor:

Sir—The statement made by the Minister of Finance in introducing the budget for the current year, that the gold resources of the Rand were estimated at £2,000,000,000, has attracted some attention, owing principally to the fact that it is far in excess of any estimate made by any other qualified authority. It is to be assumed that this estimate was made by the Mines Department, in which case its reliability ought not to be doubted in the face of the facilities possessed by that department for the framing of such an estimate.

Even in the present stage of the Rand's existence, after a duration of 25 years, the task of arriving at an approximate estimate of its life is by no means an easy one, owing to the number of unknown and uncertain factors, but in the face of previous estimates, that of the Minister of Finance appears to be liberal. For instance, John Hays Hammond many years ago made an estimate that the future resources amounted to £800,000,000. In 1902 Hatch & Leggett estimated the future yield as £1,000,000,000, fixing the depth limit as at 6000 ft., so that even today, nine years later, the Mines Department apparently doubles the estimate, but nothing is stated as to the depth limit upon which the latest estimate is founded.

Supposing that the latest estimate made by the Minister of Finance is approximately correct, then comes the difficulty of reducing the estimate to the number of years' output it may be calculated to represent. In some quarters it is often represented that the Rand has reached its zenith and may soon be expected to show a declining output. A little reflection will show that there is still an additional area of the Rand, more particularly in the Far East section, to be made producing before the maximum producing capabilities of the Rand may be considered as attained, and several years must elapse before this position is approximately reached. Even when the zenith has been reached, it will be many years before a decline sets in, and the later years of its life will be somewhat like its former, so that any attempt to calculate the future life of the Rand based on the latest figures must fix it at a minimum of 80 years at least.

Considering that the latest estimate is made under Government auspices, it will carry with it the conviction of erring on the conservative side, so that there is every justification for regarding the future life of the Rand as a long one. Of late several of the deeper mines have shown an improving grade in the lower levels, and this has tended to dissipate the view so long held that as greater depths were reached the grade would consistently decline. Probably the more correct view is that even beyond the greatest depth yet attained, there will be varying grades of value in the ore just as there has been in the first mile from the outcrop, and that the limits to deep mining will be governed by the value of the reefs more than by the usual difficulties attendant on deep mining in other parts of the world. It will therefore be seen that there are many elements of uncertainty entering into the question of calculating the future life of the Rand and that as time goes on the estimate will have to be frequently revised, just the same as is found necessary in estimating the life of individual mines on the Rand. It is always found that gold mines on the Rand last for a much longer period than previous estimates of their life would seem to indicate, and, seeing that the Rand consists of an agglomeration of small mining properties, no doubt a similar experience will await it, so that its life may also be expected to continue long after it has reached the estimated period allowed it. According to the Minister of Finance, even with the present output continuing throughout its existence, its life must be calculated at nearly seventy years, but mining areas here have a habit of far exceeding their estimates, and the resources of the Rand south of the outcrop are so large and difficult to determine that it is probable that the Rand will continue to produce quite a respectable output of the precious metal long after the two thousand millions sterling resources as estimated have been mined and crushed.

ROWLAND GASCOYNE.

Johannesburg, July 1.

Inadequacy of Language

The Editor:

Sir—On returning from an examination, with more than one reference to 'values' in the rough copy of my report, I find in your issue of July 15 that this convenient word has again been censured by an editor's pen. The chief objection to it appears to be that it is applied in some cases where the cost of extraction at the time of writing equals or exceeds the worth of the contained metals. An ore, therefore, with gold and silver worth $10 per ton has no value if it costs $10 to extract; in other words, values are non-existent if they cannot be taken out at a profit. But as in a mine report, description of the deposit precedes the question of treatment methods and costs, some word or expression is needed to denote the theoretic value of the ore at different points and without immediate reference to extraction possibilities. The ore must be considered first and its difficulties later.

In the following typical sentence, "From this point to the end of the level the values are low and would not pay to treat unless the mill capacity is increased.", I beg to suggest that the word 'values' is used correctly, as, although the vein material cannot be treated profitably at the time of writing, it can be when the costs are lowered by treatment of a larger tonnage, and nothing alters the fact that metals with a market value occur in the vein. The sentence might be written, "From this point the ore is low grade and would not pay", etc., but if an ore is the profitable part of a deposit, the word is incorrectly used, as the ore, according to this definition, does not exist until it is made profitable by enlarging the mill. In some cases an alternative might be, "From this point the gold, silver, and copper contents of the vein are too small to treat," etc., but this forms one of the awkwardly long expressions to which you refer in your editorial as the result of an attempt to be accurate.

A term to denote the content of a deposit at different points must, of necessity, recur constantly in the average mining report. That it does so to the detriment of a literary style is certain, but the subject matter does not lend itself to faultless rhetoric, and when an engineer has stated his case plainly and without grammatical errors, he may be pardoned for the occasional reiteration of an expression. If the word 'values' conveys its meaning to the reader, it can be assumed to be suitable, and can therefore be accepted in the same way that many other words have been accepted by the profession and standardized by use. As no practical substitute has been suggested, 'values', when referring to an ore deposit, might be standardized to mean the worth of the marketable contents for a given weight or measurement and without consideration of the possible profit or loss resulting from mining, treatment, or shipping costs.

E. A. SMITH.

Mexico City, July 31.

For the first six months of 1911 the cost of making copper by the Old Dominion was 8½c., excluding construction, and 9c. flat, including construction, everything having been charged against copper costs. The Old Dominion Co. received an average of 12.17c. for the six months on a production of about 14,000,000 lb., which would indicate that the Old Dominion Co. of New Jersey earned about $450,000 net, and the United Globe earned $60,000 net, or a total of $510,000.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

MANILA ROPE of 2-in. diameter has an ultimate strength of 28,500 lb. For hoisting, the working load should be 1600 lb., and the hoisting sheave should have a diameter of 20 inches.

LACK OF CAPITAL to carry good plans to a conclusion often causes the failure of mining operations, but poor management is quite as often the cause. Only the best mines pay with poor management.

WHITE ARSENIC, the oxide, is the only form in which arsenic is produced in the United States. Most of the arsenic imported, however, comes as the sulphide. It is brought from Canada, Europe, and Mexico in considerable quantities.

CONCENTRATES can not undertake to express an opinion as to the probable presence or absence of an orebody in a given situation, even when sketches and details of the occurrence are submitted. Such matters require personal examination by a competent engineer, and any other expression of opinion would be guesswork.

ANNUAL LABOR must be done within the calendar year succeeding that in which the location was made. Thus a claim located at 1 a.m. on the morning of January 1, 1910, needs no annual labor during 1910, but does require $100 worth of work before expiration of 1911. It should not be forgotten, however, that in some States location work is required within a limited time.

WATER-POWER costs for development from $34 to $287 per horse-power, depending on many different conditions. For example, 15,500 net horse-power, with complete electric equipment and transmission, cost $225.80 per unit on the Chicago drainage canal, where the fall is 28 ft. The canal itself cost many millions. At Delta, Pennsylvania, 550 hp. cost at the rate of $54, the fall being 42 ft. and the transmission 5 miles. No general figure can be safely quoted.

STEEL AND PIG IRON production has been rapidly increasing in the United States, but still amounts to considerably less than half the total of the world's production. This in 1909 ws 53,499,974 metric tons steel, that of the United States being 24,338,302. In pig iron the corresponding figures were 61,217,064 and 26,108,199 tons, respectively. Pennsylvania is much the largest producer among the States, having 10,918,824 tons of pig and 12,245,889 of steel to its credit. Alabama produced 1,763,617 tons of pig iron and much less steel.

WHITEWASH is a preparation of slacked lime or of whiting, and some sizing material. Common whitewash may be prepared according to the following recipe: Slake lime with boiling water in a tight vessel, stirring briskly. Add 2 lb. sulphate of zinc and one of common salt for every $\frac{1}{2}$ bushel of lime. If a pint of linseed oil be added to each gallon of whitewash after slacking, it will add to the durability, especially for exterior work. Flaking can not be entirely prevented, but the sulphate of zinc and salt help. Use two coats and don't expect the job to last forever.

TUNGSTITE is tungsten trioxide and contains 79.3% of tungsten. It occurs usually as a pulverulent yellow or yellowish green earth and rarely in sulphur-yellow crystals which are orthorhombic. It is found with wolframite, the more common source of tungsten, and has been known from Cumberland and Cornwall in England, from Limoges in France, from Monroe, Connecticut, and from North Carolina. Recently it has been found in California at the Burlington mine, Forbestown. Here it occurs with black sand in vein matter next gold-bearing quartz. The commercial importance of the find has not been determined.

ORDINARY AIR consists chiefly of a mixture of two gases, oxygen and nitrogen. Oxygen is life supporting; in the lungs it combines with substances in the blood and forms carbon dioxide, a suffocating gas, which is exhaled in the breath. This union produces heat and maintains the temperature of the body. The nitrogen in the air is not absorbed nor changed in the lungs, and may be breathed over and over again. Ordinary air contains oxygen, nitrogen, and carbon dioxide, in the following proportions by volume: oxygen, 20.94%; nitrogen (and argon), 79.03; carbon dioxide, 0.03.

SECOND-FEET or sec.-ft. is a term much used in discussing the 'run-off' of an area. It is an abbreviation for cubic foot per second, and is the rate of discharge of water flowing in a stream one foot wide, one foot deep, at the rate of one foot per second. It equals 7.48 United States gallons per second. In making calculations, one second-foot falling 8.8 ft. equals 1 hp., and $1\frac{1}{3}$ hp. equals one kilowatt. To determine the horse-power on a wheel realizing 80% of its theoretical power, the following formula is used:

$$\frac{\text{Second-feet} \times \text{fall in feet}}{11} \quad \text{net horse-power}$$

MANGANESE ORE is sold on a sliding scale, the price per unit being proportional to the richness. For example, recent London quotations on 50% Indian or Brazilian ore were $9\frac{1}{4}$ to $9\frac{1}{2}$d. per unit, while for 45% ore the quotation was $8\frac{1}{2}$d. Caucasian ore sells for less, the 50% being quoted the same day at $7\frac{3}{4}$d. London prices are based on 8 to 10% silica, with a penalty for excess. Ores are bought in Chicago on a similar basis, 49% ore and over being paid for at 30c. per unit, 8% silica being allowed and 0.25% phosphorus. Iron is paid for in addition at 6c. per unit. In both cases prices are based on tons of 2240 pounds.

IN BREATHING ORDINARY air a man consumes from 10 to 35% of the oxygen that passes into his lungs: the rest he exhales with the nitrogen he inhaled and the carbon dioxide produced in his lungs. The exhaled breath contains 2.6 to 6.6% of the suffocating gas carbon dioxide, or an average of about 4%. The percentage does not change much, whether the air breathed contains a high or a low percentage of oxygen, so long as a man breathes freely. But when a man breathes air that contains as much as 5% of carbon dioxide, even if it contains a high percentage of oxygen also, he begins to breathe with effort, his head aches, he feels dizzy, and he may have pains in the chest. The same difficulty in breathing may be felt when a man breathes air containing as little as 14% of oxygen. Air that contains 10% of oxygen is extremely dangerous, for it will quickly suffocate anyone breathing it.

ELECTRIC POWER is usually contracted for by the kilowatt-hour or horse-power month, the latter being based on peak load. The terms of the contract naturally vary greatly. In western Nevada the price paid now averages probably $6.50 per month. Along the Mother Lode in California it is much less, perhaps an average of $4.50. In determining the rate to be charged, the power company must take into account the continuity of service and the probable life of the contract, in order to make an equitable distribution of fixed charges. A retail store that only wants extra lights Christmas week must naturally pay a high rate, since the fixed charge for the year for the investment necessary, must all be charged to the current used in the one week. On the other hand, a stamp-mill running steadily 24 hours per day and all the year around may expect to secure a low rate. In any event, the fixed charge for interest and depreciation is a high element of the cost. In a specific case a company selling 6000 hp. has an investment of approximately $400,000.

Special Correspondence

NEW YORK

Market Depression—Copper News—Lake Merger

It has been the pessimist's hour in Wall Street, the pessimist's week, in fact. A wave of liquidation has engulfed the market, and so far there has been no check, and no support offered to stay the course of the decline. Perhaps the most gloomy incident of the week was the return of J. P. Morgan, who came home playing solitaire and who evidently continues to be engrossed in the game. When Wall Street's duly appointed life saver has no comment beyond a grim, "Nothing to say," the strain becomes much more acute. It is quite evident that the business depression has become now a matter of national adjustment. The prevailing impression in Eastern financial centres now is that there is to be a period of dividend reductions, general retrenchment, and, probably, of stagnation of investment business, during which no new constructive enterprises can be launched. To be sure, this is a gloomy view, but the powers in Wall Street are beginning to realize that the movement against the too intense centralization of the country's principal industries has more behind it than political claptrap, the latter being a theory which the Street has developed and aired on all occasions. In the general slump prevailing, there has been no demoralization more complete than that which has overtaken the list of Canadian gold-mining shares. All of the classic utterances anent the Porcupine have been made to do yeoman service. His fretfulness, his loss of quills, etc., have been played upon in a running fire of comment on the disastrous setback to the market in the issues of the new Ontario gold district. Support seems to have been wholly withdrawn, and while news from the field of operations is fully as encouraging as could be asked or expected, market interest has been almost completely extinguished. Shrinkages are quite commensurate with the inflation which was insisted upon by the enthusiasts in the earliest days of the district, and if the blame lies anywhere, it is with those who would be satisfied with nothing short of doubly discounting the fullest possibilities of the future. The flotation of new enterprises, for a time a matter of daily occurrence, has ceased altogether, and as a natural, inevitable consequence, interest in mining circles generally is at a low ebb.

The acute condition of the coal strike in British Columbia has caused the British Columbia Copper Co. to suspend dividends, at least for the current quarter. There was a period when the company was somewhat discredited, just following the throwing up of the option held by the General Development Co. Now, however, the rehabilitation of the concern seems quite complete, and the board, which includes Colgate Hoyt, Edwin Hawley, Wm. B. Thompson, Anthony N. Brady, Newman Erb, is so strong as to stand out among mining companies in a most enviable light. British Columbia is producing about one million pounds of copper monthly and is keeping close to a cost of 9 cents per pound. Negotiations have been begun looking to the purchase of coal properties to forestall any possibility of future difficulty such as that in which the company now finds itself involved. The copper now being treated by the Tacoma smelter is looked upon as a threatening factor in the situation. The initial output from the Bonanza mine is given out as about 2,000,000 lb. per month. Curtailment at the other Guggenheim properties will hardly save the situation if an increasing supply of cheap copper is sent down from Alaska. The fact that the Guggenheims have put the Tacoma smelter into commission to handle these ores is looked upon as evidence of intended regular and probably increased shipments. The plain attempt to make much of the last copper statement failed to have the least stimulating effect, and from the present outlook it is quite safe to prophesy that the ground apparently gained during the past sixty days will be lost, or more than lost, during the next ninety.

R. C. Allen, State geologist of Michigan, has gone on record as favoring the merger of the Lake mines. Mr. Allen estimates the average copper content of the Michigan lodes at 1%, or 20 lb of copper per short ton, which at prevailing prices means $2.50 to cover all costs from the bottom of the mine to the consumer's stock pile. The deduction is that a large percentage of Lake copper is produced at an actual loss, and unless operating costs can be reduced the mines cannot continue to successfully compete with the low cost producers now turning out copper, or those developing whose cost sheets may possibly show some record figures in cheap production. There are some shareholders in the Lake properties who are much averse to saving other people's chestnuts from the fire. The Ahmeek stockholders seem to be strong on refusing to ratify the merger. John S. Jackson, an Ahmeek shareholder, has brought suit at Marquette, Michigan, asking a permanent injunction against the merger on the grounds of undervaluation of the Ahmeek. There seems to be an impression that this mine has a great independent future and a strong objection to its being used to 'sweeten' the big consolidation. The Jackson suit makes four actions now pending, seeking to prohibit the consummation of the proposed merger.

HOUGHTON, MICHIGAN

College of Mines Reunion Celebration.

The reunion at Houghton in celebration of the quarter-centennial of the Michigan College of Mines was such a decided success that at the suggestion of William Kelly, chairman of the Board of Control, it is proposed to hold a similar celebration every five years. Several hundred graduates, with their wives and families, the people of the copper country in a body, the students, faculty, and Board of Control of the college, participated in four days of carefully planned festivities. A desirable feature of the occasion was the enthusiasm with which the people of the copper country turned out for the occasion. The Copper Country M. C. M. Club appeared dressed in white canvas suits such as the Cornish mining men used to don for underground; the 'Iron Country' men displayed a broad hematite-red ribbon, with a railroad spike thrust through it; the M. C. M. Club of Chicago had elaborate badges of quartz and gold; quite a delegation was present from Porcupine and Cobalt; Mexico and Arizona were well represented; while telegrams poured in from South America, Japan, Australia, and other foreign countries, expressing best wishes for the success of the celebration. To William Kelley and F. W. McNair are due the idea and the execution of what was a huge undertaking. The speakers included Charles Nagel, secretary of the Department of Commerce and Labor; Charles Osborn, Governor of Michigan, whose son was a graduate of the college, class of 1910; and H. S. Drinker, president of Lehigh University; J. Parke Channing, who first suggested the founding of the college; and George Otis Smith, director of the U. S. Geological Survey. George W. Perkins, who was to speak on 'Wanted, a Constructive Business Policy', could not get away from the committee who is investigating the Steel Corporation, but his paper was read in his absence. Mr. Nagel made a profound impression. He discussed the large corporation in business, as a necessity to compete with European products. Of competition, Mr. Nagel said: "The people cry for competition in business, when in reality competition is to blame for most of the ills of the labor systems, namely, low wages, highest costs, and child labor." Further, "the American people are wont to feel a little sorry for themselves, and to complain of hard times when the times are good." He then cited instances of real hard times and mentioned the conditions in France just previous to the Revolution. Against the initiative, referendum and recall, Mr. Nagel spoke most eloquently. "Most of the people who support these measures," said he, "do so because they don't understand them." Although the different speakers did not know the topics upon which the others were to talk, nor indeed who the other speakers were to be, there was a noted coincidence in the opinions expressed concerning the necessity and desirability of the large corporation in modern business life.

BLACK HILLS, SOUTH DAKOTA

Golden Reward.—Mogul.—Wasp No. 2.—Dredging.

At the annual meeting of the Golden Reward Con. G. M. Co., held at Deadwood, the following directors were elected: A. G. Hackstaff, C. C. Tegethoff, O. H. Kahn, Harris Franklin, Robert W. Goelet, George G. DeWitt, Henry W. DeForest, W. B. Devereux, and Walter Luttgen. There were two changes, Mr. Hackstaff succeeding Charles A. Peabody and Mr. Luttgen succeeding August Belmont. Work of preparing plans and selecting equipment for the new roaster and cyanide plant is in the hands of Henry Schnitzel, general manager, and Frank Cazin, of Denver. Plans for the plants are practically completed, and it is expected that work will commence at an early date. The mines of the company, aside from the Astoria, where the new sulphide orebody was opened, are in good shape, and reports of officers submitted at the annual meeting showed a successful year just closed.

By the death on July 28 of William L. McLaughlin, the Black Hills lost one of its successful operators and best-known men. At the time of his death, which occurred at the age of fifty years, Mr. McLaughlin was general manager for the Mogul Mining Co., secretary of the Wasp No. 2, and a director and officer in a number of corporations of lesser importance. By profession and education he was a lawyer, and had made his home in Deadwood for thirty years. No appointment was made by the Mogul company to fill the position made vacant. Two of the officials from the Pittsburg office were in the Hills and considered the matter quite fully, but definite action was postponed until October 1. As at present operated, the property is in splendid hands, Edward Manion being mine superintendent, John V. N. Dorr, consulting metallurgist, and Charles E. Ellis, mill superintendent. The Wasp No. 2 officials are figuring on a steam-shovel, to be used in stripping the overburden on the north end of the property. At this point the stripping is considerably heavier than at other places. Total costs of mining and milling for June were 97 cents per ton, and during this month 15,000 tons were handled. Regular dividends of one cent per share per month and occasional dividends of an equal amount are being distributed. At the Bismarck, adjoining the Wasp No. 2, the work of tearing down the old mill and excavating for the foundations of the new plant is well under way, and simultaneously mining work is being carried forward. In the mine an adit is being driven to give direct connection with a raise where glory-hole mining will be undertaken. A gasoline-engine for haulage is being considered. W. W. Granger is in charge of construction; F. B. Hitchings is general manager.

OPEN PIT OF THE WASP NO. 2 MINE.

The Evans Consolidated company is figuring on the purchase of the Lexington Hill mill, a plant that is close to the workings, and which with the millsite would make a good addition to the acreage. The glory-hole workings are showing some good orebodies, carload samples of which have been shipped to the Lundberg, Dorr & Wilson mill at Terry. During July the Castle Creek dredge, at Mystic, handled 70,000 cu. yd. of gravel at a cost of 5 cents per yard. Results of clean-ups are not stated. Preparations are being made for winter work, the heating boiler being connected up with several hundred feet of coils.

N. Treweek, formerly State Mine Inspector, resigned his position with the Gilt Edge-Maid company to accept a place with the Homestake. Richard Tamblyn is now superintendent of the Gilt Edge-Maid. C. W. Merrill was in the Black Hills, and on his westward journey to San Francisco was accompanied by T. J. Grier, superintendent of the Homestake, who will remain away about one month.

CHITINA, ALASKA

Gold-Quartz Discoveries.—Copper Shipments.

This place is steadily becoming headquarters for prospectors, scattered up and down the Copper river and its various tributaries. Samples of gold quartz continue to be brought in, and now that the railroad is in operation, next spring will see one of the greatest quartz-mining movements ever known to Alaska. Near Mile 192 on Porphyry mountain, Bloomquist & Iverson have a fine lead of molybdenite that assays high in gold. They are now building a road from the railroad to the mine and expect soon to be making some high-grade shipments. John Barrett has returned to McCarthy creek from the Nizina with the news of a new find of free-milling gold quartz ore on Dan Creek mountain. The samples have been pronounced by geologists better than any of the surface ore taken from the Cliff mine. Mr. Barrett reported that Mr. Krum has started an adit that will give him considerable depth on his gold-bearing stibnite ore. He discovered this rich float two years ago and last year made his location. The Esterly hydraulic plant has been moved from Chititu creek to Rex gulch, and one or two clean-ups have already been made. The railroad company has made surveys for a spur from the main line into the McKinley Lake district near Agalanik, where the Alaska Syndicate and J. H. Lukach, among others, have bonded gold quartz properties.

Copper, however, continues to hold the attention of the public. Ed. Young, the contractor at the Nikolai mine, has just brought into McCarthy Creek camp some fine samples of bornite ore. Herman Keller, consulting mining engineer of New York, has completed his examination of the Mother Lode mine, which adjoins the Bonanza of the Kennicott Mines Co. The development has shown large deposits of chalcocite ore averaging over 60% copper. L. A. Lavensaler has active charge of this property. It is expected that high-grade ore will be shipped to the Tacoma smelter this fall, the shipments to be taken over the snow. The railroad survey for a spur to this property has been completed. The orebody is believed to be an extension of the Kennicott deposits. Mr. Keller is now at the Copper Mountain property of E. F. Gray, making an examination. Mr. Gray has developed a body of high-grade copper ore at Copper Mountain on the Kuskulana river, Mile 146 on the railroad. Mr. Gray's last adit is over 1000 ft. long and intersects the orebody 1100 ft. below the outcrop. He has also developed his Porphyry property, which promises to become a steam-shovel mine, rivaling the Nevada Consolidated property, with which Mr. Gray was connected during its development. He plans to erect this fall a 100-ton leaching plant for this ore, and the railroad has just completed a survey for a spur to the mine. This property is controlled by James Phillips, Jr., and associates of New York. Men formerly associated with the London Exploration Co. are developing a copper property four miles east of Mr. Gray's mine on the Kuskulana. The American Mining Co., a corporation formed for acquiring and developing properties, is also working on claims two miles from Gray's property. This company is composed of Alaska miners and railroad men, who have been in the country for years.

MEXICO

Sale of Tiro General. El Oro Strike. -English after Lucky Tiger.- Oil and Power.

The A. S. & R. Co. has just closed one of the most important deals of the year, taking over the Tiro General mines, in the Charcos district of San Luis Potosi, for ₱1,600,000. The purchase includes the Potosi Central railway, 10 kilometres long, extending from the mines to Los Charcos station, on the National Railways. The Tiro General Mining Co., composed principally of Aguascalientes and Mexico City men, has owned the mines for a number of years, and has shipped from 1000 to 4500 tons of ore per month to the Aguascalientes smelter of the A. S. & R. Co. The ore contains sulphides of silver and copper, with lead, zinc, and iron. A few years ago the company bought equipment for dry-concentration, but the treatment was not successful. The mines are *antiguas*, extensively developed, and are credited with a production of ₱20,000,000 in silver in the quarter of a century ending with 1895.

Strikes of workmen have continued in Mexico, and mining operations in several districts have been interrupted during the last few weeks. A strike of miners employed by some of the big foreign companies of the El Oro district, and the Dos Estrellas Co., a Mexican concern controlled in France, had tragic results, several strikers having been killed and a number wounded when the jail was stormed with the object of releasing the prisoners. The strike followed the organization of a *Liga Minera* (miners' league), one result of which was the distribution of anti-foreign circulars. Prices were placed on the heads of some of the foreign officials of El Oro companies. Leaders in the anti-foreign agitation were arrested, and as a direct result of this, strikes were declared. At one time several thousand men were out. The majority of the men returned to work within a few days. Operations in the Santa Eulalia district of Chihuahua were interrupted recently by a general strike of miners there. Strikes have been reported recently from the Inde and other districts of Durango.

English interests are endeavoring to make a deal for 90% of the stock of the Lucky Tiger Combination Gold Mining Co., owning the Lucky Tiger mine in Sonora, for $5,590,000. In connection with the deal, three London brokers recently made a trip to Kansas City, Mo., the headquarters of the company, and deposited $98,000 option money. They asked the privilege of buying, within six months, 370,000 shares at $7 per share, and within nine months 275,000 shares at $8 per share. The par value of the stock is $10 per share, but the present market price is but $6 per share. The stock outstanding totals 715,000 shares. The company looks for greatly increased earnings immediately, due to the completion of the 250-ton cyanide plant and the cutting of operating costs by the use of electric power, transmitted from the Copper Queen smelter at Douglas, Ariz. The Pacific S. & M. Co. expects to blow-in the lead smelter at Guaymas, Sonora, early in the fall. The plans of this company, which owns, through subsidiaries, the smelters at Guaymas and Fundición, have been delayed by disturbed conditions in Mexico. The production of the Moctezuma Copper Co., the Phelps-Dodge concern of Sonora, in the first seven months of this year, was 14,869,294 lb of copper, as against 13,576,450 lb in the corresponding period of 1910.

The Texas Oil Co. has purchased 80 acres of land at the Gulf port of Tampico, and will erect storage tanks there preparatory to purchasing Mexican crude oil for export to the United States. Due to the heavy production of the Huasteca Petroleum Co., a Doheny concern, the National Railways of Mexico are increasing the use of fuel oil for locomotives. Oil burners have been placed in service on the Mexican Southern and Interoceanic lines, and later the service will be extended to the Veracruz & Isthmus, Tehuantepec National, and Pan American roads. Huasteca oil is shipped to Ebano and there mixed with the Ebano product of the Mexican Petroleum Co. of California, another Doheny concern, which has the contract with the merger system. The annual report of the Mexican Light & Power Co., the Canadian concern that has the big hydro-electric installation at Necaxa, State of Puebla, and that supplies power to the Pachuca and El Oro mining districts as well as to Mexico City, shows gross earnings in 1910 of ₱5,021,625. The present generating capacity of Necaxa is given as 94,000 hp., and contracts recently let will result in increasing this capacity.

WABUSKA, NEVADA

Rapid Progress in Smelter Construction.—Farmers' Injunction Refused.—Tramway Construction.—Large Reserves.—Progress at Nevada-Douglas.

Rapid progress is being made on the smelter, now being built at Thompson, on the east side of the valley, about a mile and a half from Wabuska. This plant is being built by the Mason Valley Mines Co. to treat the ore from that mine and the Nevada-Douglas, and also to do a general custom smelting business. The plant is to have a capacity of 800 tons per day, and Jules Labarthe, the superintendent, who has general charge both of the smelter and the Mason Valley mine, expects that the smelter will furnish an outlet for the ores of the surrounding region, both to the north and south. The ores from the Nevada-Douglas and Mason Valley will give a smelting mixture that will contain 4 to 5% copper and only about 6% sulphur. It was to be expected that the action of Miller & Lux, who own large areas of grazing land near the smelter, little of which is of any value for agricultural purposes, in praying for an injunction to prevent the operation of the smelter, would be refused. In Shasta county, California, where damage from smelter fume has been alleged, the smelting mixture carries 30 to 36% sulphur, and in addition the climate is damp and the valley narrow. The climate at Thompson is dry, the valley is wide and open, and, in addition, observations extending over a period of two years have shown that the wind usually blows in such a direction as to carry the smelter gases only over barren land, very rarely blowing in the direction of the agricultural land in the Mason valley. Good progress is being made in the smelter construction. The stack is completed and most of the other brickwork is finished. The steel is arriving rapidly, and the construction of the blast-furnace building will be started soon. It is expected to blow-in the plant in November. A 45% matte will be made and shipped to the Garfield smelter. It is planned to use Utah coke for smelting.

At the Mason Valley mine, 1¼ miles west of the town of Mason, J. J. Welch, the superintendent, reports that the material for the 6600-ft. wire-rope tramway, furnished by A. Leschen & Sons Rope Co., is being delivered; actual construction should begin by September 1, and it is hoped to have the tramway ready within 60 days after that. The loading station will be at the mouth of the adit on the fourth level, and the discharge terminal will be at a siding on the railroad some 600 ft. below. The dump at the mouth of the third-level adit contains 30,000 tons of ore averaging 4½% copper, which can be drawn through raises from the fourth level, 140 ft. below, and loaded directly upon the tramway. The stopes in the mine are also in shape to produce at the rate of 300 to 500 tons per day when called upon to do so. Both the ore from the Nevada-Douglas and the Mason Valley, while nearly self-fluxing, has a slight excess of silica and needs the addition of lime. For convenience in handling, it was decided to use a limestone lying above the orebodies in the Mason Valley, rather than open a quarry in the hills east of the smelter. When this was done it was found that the limestone at that place carries 1½% copper, which will more than pay for the cost of handling it. The limestone will be milled down through chutes to the fourth level, where, together with all the ore from the levels above, it will be hauled by horses to the loading terminal of the tramway. The Nevada Copper Belt railroad is now in regular operation to Hudson, and the steel has been laid to the dump of the Ludwig mine of the Nevada-Douglas company. A surface tramway is being built from the Nevada-Douglas mine to the railroad. When the smelter is in operation these two mines expect to ship 200 tons or more daily of ore averaging 5½% copper.

JOHANNESBURG, TRANSVAAL

Grade of Ore in Depth.—Big-Mill Policy.

For 55 companies working on the Rand the average value of gold recovered per ton milled during the month of May was 27s. 6d. per ton, the Robinson mine being the highest, with 44s. 8d. per ton, while the Ferreira Deep comes next, with an average recovery value of 41s. 10d. per ton. This question of the average yield continues to crop up in different forms on the Rand, and just now has again come to the front somewhat prominently in connection with the general maintenance of grade in depth. Undoubtedly many mines on the Rand have yielded near the outcrop much better ore than lately, and in a few good instances the improved yield has been undoubtedly due to the reefs carrying more gold at and near the outcrop. Sufficient work has now, however, been done on the Rand to show that with depth there is not, as urged in some quarters, a general deterioration in value, as throughout the Rand there are numerous instances where down the dip there is a marked increase in grade as compared with the outcrop mines. If regard be had, however, only to the figures published by the local Chamber of Mines they would seem to indicate that a serious depreciation has actually taken place, but it is well known that recovery values per ton can be made to vary according to circumstances and conditions, and this is just what has happened on the Rand. In the early days when working costs were much higher than today only high-grade rock could be treated at a profit, but the adoption of the big-mill policy brought working costs down with a rush, and likewise the required grade to enable the mines to work at a satisfactory profit. Hugh Marriott and others have urged that this big-mill policy has been carried to excess and have pulled up several mines under their control with the request that more attention be paid to profit than to low-working costs. The Village Main Reef and Robinson Deep mines are two notable instances where this new policy has been adopted, and there is no doubt that the results obtained at these mines have had an influence on the policy at other mines.

Perhaps at one time too much attention in some cases was being paid to the question of low costs and too little to that of profits, but in the majority of cases on the Rand the big-mill policy, with its larger output and accompanying low working costs, has undoubtedly saved the situation. The Glencairn mine, for instance, has now a recovery value of only 15s. 1d. per ton, while the working costs amount to 13s. 4d. Still the profit for the month was £2517; a result entirely due to the big-mill policy. With a mill of 155 stamps, everything showing a trace of gold is treated, and any other policy pursued would soon end in disaster. Knights Deep is in a somewhat similar position, and by adopting a similar policy with a working cost of 11s. 6d. per ton, and a five pennyweight rock to treat a working profit of £24,325 per month is being earned, an achievement which many of the local mines cannot attain with seven and eight pennyweight rock to mill. Numerous other instances might be quoted where the big-mill policy is absolutely necessary for success, and in many of those cases where selective mining is and has been carried on with conspicuous success for a long time, it has in the end been necessary to adopt the big-mill policy so as to maintain the reputation of the mine.

While this question of yield is under discussion, it might be of some interest to compare those of today with Rand results of 21 years ago. In April 1890 there were only 950 stamps at work on the Rand and in the Heidelberg district, the total tonnage crushed being 49,860 tons, of which 3979 tons belonged to the Black Reef series. The duty per stamp per day was in the neighborhood of two tons. In those pre-cyanide days the whole of the yield was obtained from the plates, but it nevertheless averaged 13.89 dwt. per ton, the value per ton being £2 13s. 7d., as against £1 7s. 6d. per day. Since those days work on the Black Reef has ceased because the yield was too low to enable operations to be conducted at a profit, although it was 2s. per ton over the plates higher than the present-day total average yield. Even the Battery Reef in those days yielded over the plates alone the equivalent of today's yield from all sources, while the reefs belonging to the Main Reef series yielded no less than 14.24 dwt. over the plates at an average value per ton of £2 8s. 5d. It will therefore be seen that during the last 21 years, while the duty per stamp has been practically quadrupled; the yield per ton has declined by one half. Put into tabulated form for comparison the result would be as below:

Date.	Stamps at work.	Total tons.	Duty per month.	Yield per ton, dwt.	Value per ton.
April 1890	790	43,120	54	13.89	£2 13s. 7d.
April 1911	9,360	1,934,664	207	6.58	1 6s. 3d.

SALT LAKE CITY, UTAH

Competition for Lead Ores Makes Mining Active.

A great impetus is being given to lead mining in this region by more favorable smelter rates. While the International is rushing its lead smelter to completion, the American and United States companies are active in securing contracts. As a consequence, the mine manager with a desirable lead ore can now secure a far more favorable contract than has been possible for many a day. This is making possible the marketing of a large tonnage of low-grade ores which hitherto have been left in the mines or thrown over the dumps. For example, the May Day mine at Tintic has just closed a contract that will enable it to ship profitably ores running 5 to 7% lead, 7 to 8 oz. silver, and $3 to $5 gold, of which it has a large quantity. The company will also ship slime from the mill-dump. While the profits per ton on all this will be small, the shipments will be large. Other Tintic mines, in view of May Day's example, are beginning to figure on shipping largely from their dumps and from orebodies heretofore untouched because mining would not be profitable. Among them are Beck Tunnel, Colorado, Sioux, Iron Blossom, and Uncle Sam. Park City mines will also be benefited. The United States S. R. & M. Co. is active in its field work. It is reported to be considering purchasing the Grand Central at Tintic. The company is also making an examination of the Iron King mine, with a view to securing fluxing iron. The Dragon iron mine, adjoining, has been furnishing the company with this material for several years.

The Green River Gold Dredging Co., capitalized at $100,000, has been incorporated to work the placer claims along Green river from Clansman bar, near Jensen, to Horseshoe bend. Its principal place of business will be Vernal. C. Dudley Dean, of San Francisco, is president; Orren Allen, Denver, vice-president; J. R. Henderson, Denver, treasurer; Richard Leigh, Denver, secretary; and T. W. O'Donnell of Vernal additional director and counsel. The rest of the season will be devoted to preliminary work, as it is the intention to thoroughly prospect the claims before building a dredge.

General Mining News

ALASKA

Copper River

Messrs. Kearney, Berresford, Cokewell, Crosette, Gilmore, Laird, and Andrus, members of the Pearson syndicate party which investigated the Seward district, left Cordova early this month. One is quoted anonymously in the newspapers as stating that the country was promising and had prospective mines, but had not reached the stage necessary for development on a large scale. He stated that the syndicate sought developed and producing mines rather than prospects.

Juneau

The Treadwell company is making experiments in direct concentration of the ore without passing it over amalgamating plates. Twenty stamps have been arranged to deliver direct to vanners. The test will be continued one year. It is hoped that all free gold and concentrate by this method will be carried to the cyanide plant.

The monthly report of the Alaska United G. M. Co. states that the total production of the Ready Bullion claim in the month ended July 15 was $41,009, realizable value $40,342. The figures for the 700 claim are respectively $33,007 and $32,509. Operating expenses for the respective claims were $26,236 and $22,466, leaving the net operating profit as $14,105 and $10,042. The machinery bills for the new central hoist and crushers brought the construction expense for the R. B. claim to $2523 and for the 700 claim to $21,512. The yield per ton of ore milled was for the R. B. claim $2.36 and for the 700 claim $1.97

The Alaska Treadwell G. M. Co. has declared dividend No. 94, of 50c. per share, payable August 28.

Prince William Sound

D. M. Stewart has made the final payment taken on the option for mining property on Gulch creek, owned by W. H. Hammer. The option was taken last November, and, according to report, was for $25,000. After the option was taken the Dunfranwald G. M. Co. was formed and took over the property, which is free from debt and has mining machinery valued at $20,000. Much work has been done in constructing ditches and flumes, building the plant, and erecting cabins for the workmen. About 2000 cu. yd. of gravel is being handled per day. The deal is said to be the first in the district which has been effected according to the original contract terms.

Daniel Kain, manager for the Vancouver-Valdez M. Co., has made the final payment of $4000 to Charles Crawford and A. Y. Tuttle for their property adjoining the Cliff. An adit is being driven on the property. It is affirmed here that $20,000 already has been expended by the company.

Mrs. L. B. Kerwood of Minneapolis has arranged with the owners of the Beaver Dam claims, state press reports, to take over a 55% interest for $50,000. Mrs. Kerwood is said to represent a syndicate of Minneapolis capitalists. With D. H. Williams she also is arranging to take a half interest in the placer claims on Young creek owned by Joseph Murray, an attorney of Valdez, and Fred Stephenson and A. J. Diamond.

A large body of low-grade ore has been discovered on the Valdez-Bonanza property at the head of Mineral creek, according to report. A 5½-ft. vein of oxidized quartz is part of the find.

The Guthrie Belloli M. Co. has been incorporated to develop properties on Shoup bay. It is capitalized at $750,000, divided into $1 shares. The board of directors includes G. F. Guthrie, A. E. Belloli, L. Archibald, H. O. Henderson, and Edmund Smith.

Fearful of losing the stamp-mill for Valdez planned by C. R. Crawford, who believed he was not given proper support in his undertaking, the citizens of that city have set on foot a movement to secure funds for its establishment.

Excitement continues over claims located on the glacier, the latest discovery being made by Jack Curley and William Coleman. They have brought ore glistening with gold to Valdez, and assert that they found a 100-lb. specimen on the east side of the glacier which contained fully 2 lb. of gold.

The Tanana

Tom Aitken and a man named Cummings, representing the Guggenheim interests, according to press reports, are securing options on claims along Ruby creek, and will place drills on the property in a short while.

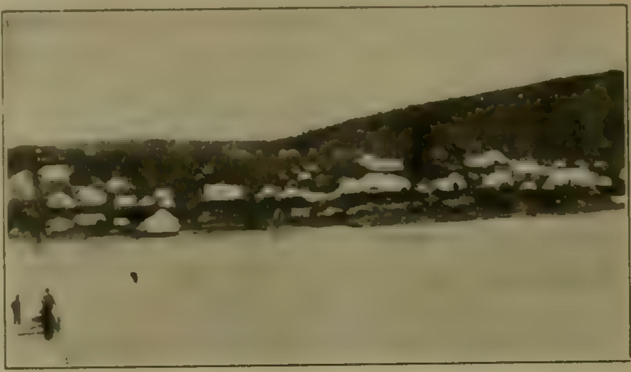
The English syndicate, which has the first dredge at Fairbanks, is transporting another for use on Fairbanks creeks. It is reported that still others will follow this dredge.

ARIZONA

Cochise County

It has been reported that work will be started soon on the foundations for the Paradise M. & M. Co.'s concentrator, and that the machinery will be received in the near future. The capacity is to be 100 tons per day.

Grover and Walter Reed, east Paradise, have completed the assessment work on the Homestake property. G. A. Walker had the contract for the work.



RUBY CITY, ALASKA, FROM THE YUKON.

Gila County

Miami Copper Co. will have produced 15,000,000 lb. of blister copper at the end of the year, according to report. The amount for the market in refined form by that date is estimated at 9,000,000 lb. By that time the placing in commission of all eight sections of its mill will give it a capacity of 30,000,000 lb. per year, possibly more. No agency contract for handling the copper has been made.

Maricopa County

(Special Correspondence.)—The Monarch M. & M. Co., which has been idle for the last three years, has contracted for a smelting plant, although the smelter site has not been selected. Custom ore may be treated as well as its own ore. A large amount of ore is reported on the surface where the vein has broken over. The vein is said to be 20 ft. wide and of good quality. C. W. Platt, of Wickenburg, is manager of the mine. A. D. Akin, of Macon, Ga., consulting engineer for the company, is making an inspection.

Wickenburg, August 21.

Pinal County

Ray Con. Copper Co., within two weeks, will be running four units of what eventually will be an eight-unit smelter, according to announcements coming from Boston. It is estimated that by 1912 the smelter will be producing 100,000,000 lb. of copper from its eight sections. The three now in operation, although planned for an output of 1000 lb. per day each, have exceeded that amount, and it is believed that soon each will be producing 1250 lb. of copper per day.

PIMA COUNTY

Press reports state that the Gundaker M. Co. has purchased the Mohawk property, which is adjacent to the Mammoth, about 45 miles from Tucson. The mine contains a low-grade gold ore, with some silver. S. W. Gundaker is president of the purchasing company, and John B. Wright is counsel and director for the company.

YAVAPAI COUNTY

(Special Correspondence.)—Grading has been started for the cyanide plant to be built by the Venezia G. M. Co. in Crook cañon. The machinery is on the way from the East. The plant will be the first of its kind in that district. E. L. Tomlinson is superintendent of the mine.

Prescott, August 19.

CALIFORNIA

AMADOR COUNTY

(Special Correspondence.)—The assay office of the Kennedy has been equipped with a rock crusher, sampler, and other apparatus. An ice-plant also has been established at the mine. The mill is treating approximately 500 tons per 24 hours, with a fair percentage of high-grade quartz coming from the rich vein on the 2800-ft. level. The Bunker Hill declared its regular monthly dividend on August 15, amounting to $10,000. Most of the ore continues to come from the massive vein on the 1950-ft. level. Repairs to the pipe-line and mill of the Zeila have been completed, and developments are again in full swing. Within a few weeks it is expected to have the mill running at full capacity. A new engine has been purchased, and there are rumors that a new shaft may be sunk by the company. The South Eureka company is unwatering the Oneida shaft. It is understood that underground connections will be made between the Oneida and South Eureka shafts as soon as the former is in working shape.

Jackson, August 19.

KERN COUNTY

The Associated Oil Co. of California has filed complaint in Washington against its former co-owner, the Southern Pacific Co., to recover $13,468 claimed to be overcharge for carrying oil from McKittrick and Olig through Bakersfield to Prescott and Selig, Arizona. At the time of the hauling the Southern Pacific owned 51% of the stock of the Associated.

It has been affirmed that the Government has succeeded in obtaining evidence through the Secret Service that $500,000 worth of oil lands has been secured fraudulently as non-mineral land and that indictments may be brought against men and organizations prominent in the oil market. James M. Sheridan, chief of the field division of the United States general land office, will have charge of the civil and criminal cases.

At a meeting of the executive committee of the Independent Producers' Agency next month a plan will be considered for issuing certificates on storage oil on a basis of 25c. per bbl., to bear interest at 6% per annum. The plan has been formed to enable producers to operate without curtailing production. A guaranty will be given that oil will not be sold for less than 25c. per bbl. Interest will be taken from monthly sales. After taking out interest, operating expenses, etc., providing a sinking fund for retiring bonds, it is stated the storage plant will be paid for in ten years. There would be storage for 20,000,000 bbl. of oil.

In the refining of oil the Union and Associated may compete with the Standard Oil Co., as they have undertaken refining as a side line. While crude-oil prices fluctuate, the price for the refined product remains at about the same figure.

English capitalists are reported negotiating with Con. Midway for 100 acres, sections 30 and 32, 12-23, Maricopa district, for $200,000. The income from the property is reported to be $10,000 per month. Engineers for the Guaranty Oil Co. state that it will cost $966,920 to construct the proposed pipe-line from Maricopa to Ventura.

NEVADA COUNTY

The 75-hp. hoist at the Golden Gate mine has just been placed in commission. It has a capacity of 6000 lb. and is one of the largest electric hoists in this district. The hoist was constructed by the Taylor Foundry & Engineering Co. of Grass Valley. W. P. Martin is superintendent of the mine. As soon as the mine is unwatered to the bottom, at the 600-ft. level, the shaft will be sunk farther, a station will be constructed at the 600-ft. level, and driving will be commenced.

SIERRA COUNTY

A new company has recently been organized under the name of the Black Sand Leasing Co., with a capitalization of $50,000, for the handling and treating of the black sand concentrate and tailing to be taken from the undercurrents of sluices at the E. L. Goldstein hydraulic mine near Brandy City. The Brandy City Mining Co. has been operating since the year 1857 and owns 800 acres of placer claims with a face of over 180 ft. It has given a three-year lease on the tailing to the Black Sand Leasing Co., and it is reported that the tailing assays high in gold and platinum. Tests have been made with the separator manufactured by the Automatic Gold Separator Ltd. of Los Angeles, and these are reported to have shown recoveries of all the platinum and all but a trace of the gold. The Separator company has taken an interest with the Black Sand Leasing Co. in the handling and treating of the tailing. A plant will be erected at once and will be in operation in September. The officers and directors of the Black Sand Leasing Co. are Lew Robertson, president and general manager; J. A. Bothwell, vice-president; C. H. Gowman, secretary-treasurer; with W. E. Bechtelheimer and L. W. Partridge on the list as directors. All are of Los Angeles except L. W. Partridge, who is of Detroit, Michigan.

TUOLUMNE COUNTY

(Special Correspondence.)—The cross-cut on the twenty-second level of the Black Oak mine has penetrated 3½ ft. into the vein, but has not passed through it. The ore from the entire face is reported to assay as high as $91 per ton. Driving continues on the fourteenth and fifteenth levels.

Soulsbyville, August 21.

(Special Correspondence.)—Work in the Kanaka shaft was stopped suddenly a few days ago as a result of a large increase in the flow of water, which cannot be handled by the pump. This will not interfere with the driving of the adit, where good progress is being made. A larger compressor and a new pump will probably be purchased at once.

There is great activity at the Rio Tagus, formerly known as the Contention mine, about 30 men being employed in erecting buildings and putting in a complete equipment. The company, whose general manager is L. B. Dodd, recently completed a sawmill and is now at work on a 10-stamp mill and a large compressor. The plant will be operated by water-power, but it is the intention to put in electric motors and connect with the power-plant situated nearby. The property has been developed by a shaft and an adit several hundred feet long. Much of the ore assays $18 per ton.

The Fair Oaks mine, on Mount Provo, near Confidence, has been bonded to the Alta Investment Co. of Los Angeles, for $15,000. The property has a 5-stamp mill and has been opened by a long adit and a shaft 100 ft. deep. The ore, from a 2-ft. vein, mills from $6 to $12 per ton.

J. C. Gordon and J. L. Brooks are working on a 30-in. vein near the Densmore mine which assays from $50 to $200 per ton. A shaft has been sunk 80 ft. and 36 tons of ore taken out in development has just been milled.

At the Empire, operated by L. H. Jansen, work has been resumed in the winze on the 200-ft. level. Preparations are under way for resuming work at the Duffield, near Arastraville. The owners of that property will soon commence development of the Little Sonora mine, in the same district.

It is understood that the Central Mother Lode Mining Co., at its recent meeting held in Sacramento, decided to resume operation at the Mangante mine, near Jamestown, in the near future. It is said that the shaft will be sunk an additional 100 feet.

The North Star mine, one mile north of Tuolumne, owned by J. M. Aston, of Oregon, and associates, is being retimbered preparatory to the resumption of operation.

The Philbert G. M. Co. has filed articles of incorporation in this county. The capital stock is $100,000, shares $100 each. The directors are George H. Walker, Maggie Walker, O. J. Johnson, Philip Nicoll, and Flor G. Galusha, all of Los Angeles.

Tuolumne, August 11.

COLORADO

Clear Creek County

(Special Correspondence.)—A body of solid smelting ore from 8 to 9 ft. wide is showing between the eighth and ninth levels on the Shaffer mine. The product mills $35 per ton in gold. Shaffer Bros. are operating under lease. A streak of ore 14 in. wide has been uncovered on the adit-level of the Ben Harrison mine. Tests show ore assaying as high as 700 oz. silver. J. D. Armstrong and W. H. Williams are owners. Charles Fuller and others have taken a lease on the fifteenth level of the Gem mine, 1000 ft. of ground being controlled. A plant of machinery has been purchased for the Metropolitan adit. Thomas Coppard is manager.

Idaho Springs, August 10.

Dolores County

Press reports state that the United Rico M. Co. will resume operations on a large scale. H. Gedet, president and general manager for the company, is in New York to attend a reorganization meeting.

Hinsdale County

Great interest is being shown in experiments with the Rankin process, now being used in a new mill at Lake City. It is claimed that this method, in which nitric acid is the principal chemical, will greatly reduce the cost of extraction.

La Plata County

Ore assaying $460 per ton, according to report, has been found two miles from Durango by O. N. Kee, a prospector sent out by the grubstake committee of the Denver Chamber of Commerce.

Ouray County

It is believed that the Red Mt. R. R., M. & S. Co. will resume operations in its groups of the Crawford properties. Judgments amounting to $12,000 have been paid by A. Thompson, the receiver for the company.

The Atlas M. & M. Co., Sneffels district, has put in an additional 10-stamp battery.

San Juan County

Ore producers here have been assured of the construction in the near future of a custom cyanide plant near Silverton. John T. Milliken, of the Golden Cycle company, has been investigating the field for such a plant. A test made by Silverton assayers of $11 ore from Ice Lake basin showed a recovery of 92% of the gold and 66% of the silver. Tests of ore from the Eastern range gave encouraging results.

Teller County

The C. K. & N. mine at Cripple Creek after lying idle for about three years, has been reopened with a force of 20 men, according to press reports. This step was possible through the drainage afforded by the Roosevelt deep drainage tunnel, which lowered the water-level to the bottom of the shaft, 835 ft. deep.

IDAHO

Kootenai County

Construction of a main working adit 6000 ft. in length, on the Hercules property in the Coeur d'Alene, was reported assured when stockholders of the Humming Bird M. Co. confirmed the action of the directors in leasing their No. 5 adit to the Hercules people. It was decided to renew development on the upper workings of the Humming Bird property, where the showings are encouraging. Driving on the No. 5 adit was suspended two years ago, after 2000 ft. had been completed. The new directors of the Humming Bird company are: president, Harry L. Day; vice-president, Eugene R. Day; secretary and treasurer, F. M. Rothrock; L. W. Hutton and August Paulsen.

Announcement is made that work will be resumed on the Snowstorm Apex property in the Coeur d'Alene district in September. One hundred feet of tunnel will be driven. At the annual meeting a few days ago the board of directors was re-elected, with A. B. Babb president and general manager.

Lemhi County

Directors of the Pittsburg Idaho mines at Gilmore have just declared a second dividend of 3c. per share. The new compressor which was ordered some time ago and the pneumatic drill are now being placed.

Shoshone County

At the Stewart mine, near Wardner, work has been started on a 2000 ft. adit to tap the orebody at a lower level. It commences opposite the Caledonia's adit mouth and will be on the same level.

MICHIGAN

Houghton County

The report of the Wolverine Copper M. Co. for the year ended June 30 shows the total receipts were $1,209,747. Other figures from the report are: total expenses, $723,123; mining profits, $487,896; construction, $2191; net profit, $485,705; dividends, $600,000; total surplus, $673,340. The figure for receipts has been slowly descending since 1909, when it was $1,342,382. The average price received for 9,167,618 lb. of copper was 12.58c. and the cost of production was 7.542c. The average recovery was 24.75 lb. of copper per ton. The mineral production was 12,227,500 lb., of which 78.65% was copper.

The Old Colony M. Co., since starting diamond-drill operations three weeks ago, has taken out a rich core from hole No. 8 which shows nearly a foot of ore well filled with shot-copper. The ore in character is almost identical with that found by the Mayflower, north, and by the St. Louis, south of the Old Colony property. Old Colony's first drill was sunk 650 ft. northwest of the southeast corner of the property, to meet the eastern sandstone. This was found more quickly than expected and is believed to have a roll toward the west in that direction. Hole No. 8 was the second undertaken and is 650 ft. northwest of the first hole. The present drilling is about 2000 ft. northeast of where the St. Louis is sinking a three-compartment shaft.

Iron County

(Special Correspondence.)—The Lake Superior Mining Institute held its sixteenth annual meeting on the Menominee range, August 22, 23, and 24, with W. J. Richards, of Crystal Falls, general superintendent for the Corrigan-McKinney interests, as president. Attention was paid to developments in the Crystal Falls and Iron River districts where diamond-drilling is greatly enlarging the known area of iron-ore formation; to the matter of electric power for the operation of mines which is attracting notice on the Marquette and Menominee ranges; to the recent advance in safety appliances and prevention of accidents that the Oliver Iron Mining Co. and the Cleveland-Cliffs Iron Co. have instigated; and to certain underground mining methods of which the Menominee range practice offers excellent examples. The last meeting on the Menominee range was in 1905, since which date meetings have been held in the copper country in 1906, on the Mesaba and Vermillion ranges in Minnesota in 1908, at Ishpeming in 1909, and at Ironwood and Chicago in 1910. The Institute has about 600 members, including nearly all men prominent in the iron and copper mining industry of the Lake Superior district.

Iron River, August 24.

MONTANA

Lincoln County

(Special Correspondence.)—Joseph A. Coram, owner of the water-power site at the Kootenai falls, twelve miles west of Libby, is planning to form a company to develop the water-power there. The water in the Kootenai river, which is the largest in Montana, according to government reports, goes through the Purcell mountain gorge in Lincoln county in a succession of falls and rapids. The horse-power capable of being controlled is estimated at 200,000 at low-water mark, and as high as 357,000 during high water. There are no great engineering difficulties to overcome in connection with the work.

Libby, August 20.

(Special Correspondence.)—Peter Sorrenson has returned to Libby from his mining claim on Great Northern mountain, bringing out with him some samples of ore which, when pounded up and panned, yield considerable free gold. The vein on his claim is about 3 ft. wide, the stringer carrying the most gold being about 3 in. wide.

Libby, August 13.

SILVERBOW COUNTY

(Special Correspondence.)—The Never Sweat mine has resumed operations. It is rumored that in the course of time the Never Sweat shaft will be abandoned and that the ore will be hoisted through the Anaconda shaft.

The strike of section hands on the Butte, Anaconda & Pacific railroad did not interfere with the operation of ore trains. The men have returned to work.

Good progress is being made in surface improvements at the East Butte, and it is thought that the work will be completed by the first of December. The improvements include the erection of a large dust-chamber, a plant for sintering flue-dust, and a dam for impounding tailing. Ore assaying from 7 to 10% copper is being blocked out. Development work is being pushed on the 800, 1000, and 1200-ft. levels.

In two months the cross-cut from the Black Rock of the Butte & Superior mine to the Pilot Butte ground, at a depth of 1300 ft., should be completed. It is half done at the present time.

Butte, August 21.

NEVADA

ESMERALDA COUNTY

(Special Correspondence.)—The Mexican mine made a new record for itself in last week's production, which was the largest in its history, $34,417, or nearly $6000 per working day. The last record, made two months ago, was $26,000. The Mexican's production brings the record weekly yield of the north-end properties, the Mexican, Ophir, and Union Con., to $42,972, and with $2163 from Crown Point makes the total yield, as recorded in the reports of superintendents, $45,135. The Mexican's output is 76% of the whole Comstock Lode. Whitman Symmes, superintendent of the Mexican, reports that grading is being done for the mill foundation. Jointly with the Sierra Nevada and Union Con., construction work on the new store-house has been done, together with repairs on the main hoisting shaft.

Virginia City, August 22.

NYE COUNTY

(Special Correspondence.)—In a general report to the stockholders of the Dexter subsidiary companies, submitted by Percival Nash, secretary, there is a recommendation that the Manhattan Union Ext. M. Co. absorb the Dexter Crown, Dexter Prince, Dexter Queen, Dexter King, and Manhattan Dexter Extension mining companies. The Union is in the producing class and has the same stockholders, and holds the same amount of stock in each of the five companies proposed for the deal. Excepting for 300,000 shares placed in the treasury of each of the eight Dexter companies, the stocks were pro-rated to the Manhattan Dexter M. Co. stockholders, the stocks being placed in pool in the Tonopah Banking Corporation. It was intended to secure funds for development work by selling treasury stock before dissolving the pool. The continued depression in southern Nevada, and particularly Manhattan stocks, checked the plan. Lessees on the Dexter White Caps No. 1 claim have proved an orebody of considerable size and the two shafts and workings, 300 ft. apart, are reported on the same body. As there has been considerable trading in assignments in the White Caps company, objection has been raised to having it absorb the other companies. At present the producing companies are carrying the burdens of the non-productive ones, and stockholders have been asked to signify their approval or disapproval of the Union Extension company's absorbing the other Dexter subsidiaries excepting the Dexter White Caps and the Dexter Merger. A. G. Raycroft, of San Francisco, is president of the subsidiary companies; R. C. Moore, of Los Angeles, treasurer; and the Tonopah Banking Corporation is the depository. Hugh H. Brown, Tonopah, vice-president of the company, is counsel.

While the inactivity in stocks has affected the Litigation Hill Merger M. Co., some revenue has been received through lessees, who incidentally have prospected parts of the various claims without cost to the company. The leases are considered a temporary expedient, and the longest one is for a term of 18 months. A well defined dike of limestone traverses the full length of Litigation hill, its average width being over 200 ft. The dike is a coarsely crystalline pure carbonate, soluble in surface waters, and has in the deposition of the orebodies been replaced by silica and changed into quartz. The Litigation Hill Merger Co. is a compromise settlement between the Manhattan Union M. Co. and the Liberty & Justice G. M. Co. The title is a U. S. patent with two small exceptions.

Manhattan, August 20.

WHITE PINE COUNTY

(Telegraphic Correspondence.)—Six miners are dead and four are at the point of death through fire breaking out in the 5-compartment shaft of the Giroux Con. mine Wednesday night. While on the 1400-ft. level they saw the flames above in the shaft and signaled to be drawn up. Of five that stayed in the cage one was dead and four were near death on reaching the top. Five others who attempted to reach the old Alpha shaft from the 1200-ft. level perished. T. J. Gilmore, shift boss, is one of the head.

Ely, August 24.

(Special Correspondence.)—By a series of changes the capacity of the reverberatories at McGill have been doubled during the past few months. Formerly the capacity of the reverberatories was about 250 tons of calcine daily, but this was steadily raised until 500 is now the general average of No. 1, and during one day of the present week 622 tons of calcine was put through, which stands as the world's record. The best record of the furnaces at Anaconda for 24 hours was less than 500 tons. No. 1 at McGill is 121 ft. in length, and is said to be the largest in the world at the present time. All reverberatories there are now burning oil for fuel, which greatly increases their capacity, and lessens the cost of smelting.

The new Liberty pit of the Nevada Con. is nearing production. Two steam-shovels are used in stripping away the overburden. An ore railway is being built into the pit on a lower line than those that remove the overburden, and will be in operation within a few weeks, when the new pit will be called upon for an average of 2500 tons of ore daily. For months past the Copper pit has been supplying 10,000 tons of ore daily, and apparently could stand the drain indefinitely.

In the Zack mine of the Ely Con., a drift is being run on the 500-ft. level to connect with the old workings of the American mine, a distance of 3000 feet.

Ely, August 19.

NEW MEXICO

GRANT COUNTY

It is announced that the Chino Copper Co. will commence shipments of copper concentrate to the El Paso smelter in the middle of September, when the first of the three 1000-ton unites of the new mill will be in commission. The Chino concentrating plant will consist of crushers, rolls, jigs, tables, and vanners, and will be operated by electric power generated by steam-engines. It is stated that within two years its capacity will be increased to 3000 tons per day. Hurley, where the mill is under construction, is on the Deming-Whitewater branch of the A. T. & S. F. railroad, and the Santa Rita mines, whence the supply ore for the mill, are 10 miles north-east of Hurley. Five steam shovels are at work at the mines, and a large supply of ore will be ready for the mill. The camp has long been noted for its supply of copper and mines have been worked here for over a century.

WASHINGTON

Spokane County

L. K. Armstrong, superintendent of the mining department of the Spokane Interstate Fair, is making preparations for a convention of mining men from all parts of Washington, Oregon, Idaho, Montana, and the province of British Columbia at the fair in Spokane the week of October 2. The Spokane Mining Men's Club and the Spokane Chamber of Commerce will co-operate with Mr. Armstrong in making the meeting the most important of its kind in this part of the country.

ROMERO OPEN-CUT AND OLD MINE WORKINGS, CHINO COPPER MINE.

WYOMING

Crook County

(Special Correspondence.)—Pegmatite forming the Bear Lodge laccolith, eight miles west of Sundance, is reported by Edwin Hall, late State Geologist of Wyoming, to assay $5 per ton in gold, outside the small veins containing fluorite that traverse the mass. A company called the Bear Lodge Gold Mining Co. has been formed to work the property. The manager is P. W. Shafer and the offices are at Sundance.

Sundance, August 19.

CANADA

British Columbia

(Special Correspondence.)—The Granby company will close its smelter on the exhaustion of its supply of Connellsville coke, on account of the coal miners' strike, which has affected western Canada for the last three months. Coal strikes have taken place at frequent intervals in British Columbia for the past few years, and the purchase by the Granby company of the minority interest in the Crow's Nest Pass Coal Co. was to circumvent such troubles. The latest strike, however, included the miners employed by that company. The cost of transportation prevented the use of Pennsylvania coke, although the British Columbia Copper Co., at an added cost of $25,000 per month, used the Pennsylvania fuel in the same district.

[illegible], August 1.

Yukon

Exceptionally rich placer deposits have been found on McClintock creek, entering Marsh lake about ten miles from Tagish post, Yukon Territory, according to telegraphic despatches from Skagway. Carcross is being deserted, and from other towns great numbers are leaving for the field. The ground is not frozen, and the gold, which is coarse, appears to be plentiful.

Ontario

(Special Correspondence.)—The North Dome M. Co. has found a spectacular showing of free gold in the new vein, according to C. W. Nelson, superintendent for the company. The vein is 6 ft. wide and the free gold is scattered through 5 ft. of it. An assay from 22 in. across the free-gold pay-streak showed $2900 per ton. The discovery is said to be the best made in the camp. A new drill-hole is being sunk 280 ft. northeast of No. 1 shaft. Two shifts are being worked in the cross-cut adit toward the Dome Extension vein.

Porcupine, August 20.

MEXICO

Jalisco

The El Tajo M. Co. will increase largely the tonnage of the ores handled in its reduction-plant, as the machinery recently added is now in operation. It is reported that soon at least 100 tons per day will be treated. The plant consists of 20 stamps, two tube-mills, concentrators, and a complete cyanide equipment. Edwin Shapely, assistant general manager of the mines, recently shipped bullion worth $10,000, the result of the last clean-up, to the refinery in Mexico City.

San Luis Potosi

The American S. & R. Co. has purchased the Tiro General mines and the Central Potosi railroad, 10 km. long, which connects the mines at Charcos with the Los Charcos station of the National Railways of Mexico. The price is reported as ₱1,600,000.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

[illegible] has been in town.

[illegible] is at Ely, Nevada.

[illegible] has gone to [illegible].

[illegible] has gone to New York.

[illegible] is at [illegible], Utah.

[illegible] has gone to Ely, Nevada.

[illegible] is visiting the State of Washington.

[illegible] is in [illegible], Chihuahua, Mexico.

[illegible] is at [illegible] Valley, making a mine examination.

[illegible] Roberts, director of the Mint, is in San Francisco.

W. S. [illegible] has been at Salt Lake City, and has gone West.

[illegible] S. King has returned to San Francisco from [illegible].

W. [illegible] has returned to Mason, Nevada, from a trip to San Francisco.

[illegible] has returned to Montana and is now in Kingman, Arizona.

[illegible] has gone to Salt Lake City from Tonopah, Nevada.

[illegible] is on examination work in Mexico for New York interests.

S. F. Shaw has resigned as manager of the Montezuma mines of Costa Rica.

J. W. Hutchinson has gone to Denver, where a son was born to him last week.

W. H. [illegible] is making mine examination on the Mother Lode in Mariposa county.

[illegible] was in San Francisco, returning from [illegible] to New York.

R. P. [illegible] has left Battle Creek, Michigan, and is in Los Angeles on a business trip.

Francis A. Thomson has returned from examination work in the Ten-Mile district of [illegible].

[illegible] and [illegible] have been at Ely, Nevada, and have gone to Salt Lake City.

[illegible] has gone to Copper Center, Alaska, to examine placers. He will be gone six weeks.

F. C. [illegible] is manager for the A. S. & R. Co., which is to reopen the Silver Lake mine at Silverton.

[illegible] E. Brown has left Medellin, Colombia, for London, and will be in Dumbartonshire, Scotland.

C. H. [illegible] left London for Buenos Aires on August 4, to resume charge of the [illegible] mine in Chile.

[illegible] is in Plumas county on a professional trip. He expects to return to Sacramento in about two weeks.

[illegible] H. Kay has resigned from the service of the Southern Pacific to become a member of the State Geological Survey of Illinois.

[illegible], a young mining engineer, disappeared from his camp on Feather river in Plumas county, and it is feared that he has been killed.

J. W. [illegible], for several years mine superintendent for the Consolidated Mines Co. at Goldfield, has resigned owing to the ill health of his wife and will move to Los Angeles.

J. F. [illegible], general superintendent for the Consolidated Mines Co., has returned from a vacation on the Coast, and [illegible], who was acting as manager in Mr. [illegible]'s absence, has returned to San Francisco.

[illegible] J. [illegible], who died at Salt Lake, August [illegible], [illegible], was an Englishman by birth, though he spent his boyhood in [illegible] and his working years in the Western States. He was well known for excellent work in Colorado, Montana, and Utah especially. His attention was devoted mainly to ore dressing, and among the large mills built by him were the [illegible] and that of the Boston Con. at Bingham, Utah.

Market Reports

LOCAL METAL PRICES.

San Francisco, August 24.

Antimony	[illegible]	Quicksilver (flask)	[illegible]
Electrolytic Copper	14—15½c	Tin	[illegible]
Pig Lead	4.75—5.75c	Spelter	[illegible]

Zinc dust, 1400 lb. casks, per 100 lb., small lots [illegible], large [illegible]

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date.	Electrolytic Copper	Lead	Spelter	Silver, per oz.
Aug. 17	12.45	4.50	5.65	52
" 18	12.45	4.50	5.65	52
" 19	12.45	4.50	5.65	52⅝
" 20	Sunday		No market.	
" 21	12.45	4.50	5.75	52⅝
" 22	12.45	4.50	5.85	52⅝
" 23	12.45	4.51	5.85	52⅝

ANGLO-AMERICAN SHARES.

Cabled from London.

	Aug. 17. £ s. d.	Aug. 24. £ s. d.
Camp Bird	1 4 1	1 4 4½
El Oro	1 3 9	1 3 9
Esperanza	2 16 3	2 16 3
Dolores	1 3 9	1 3 9
Oroville Dredging	1 3 9	1 3 9
Mexico Mines	7 2 6	7 2 6
Tomboy	1 13 9	1 13 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

By wire from J. S. Bache & Co., New York.

	Closing prices. Aug. 24.		Closing prices. Aug. 24.
Amalgamated Copper	$ [illegible]	La Rose	$ 3⅝
A. S. & R. Co.	[illegible]	Mason Valley	7⅛
Braden Copper	4½	Miami Copper	18⅝
B. C. Copper Co.	5⅝	Mines Co. of America	4⅛
Butte Coalition	15¼	Nevada Con.	17⅝
Chino	18½	Nevada Utah	⅛
Davis Daly	1	Nipissing	7⅛
Dome	1	Ohio Copper	1⅜
Dolores	4⅛	Ray Central	1⅝
First National	1	Ray Con.	14½
Foley O'Brien	1	South Utah	⅛
Giroux	4½	Superior & Pittsburg	15
Goldfield Con.	5⅛	Tenn. Copper	32½
Greene-Cananea	6	Trinity	3⅝
Guanajuato Con.	⅝	Tuolumne Copper	4
Hollinger	11	United Copper	1¼
Inspiration	8¼	Utah Copper	45
Kerr Lake	4¼	Yukon Gold	3⅝

COPPER SHARES—BOSTON.

	Closing prices. Aug. 24.		Closing prices. Aug. 24.
Adventure	$ 4	Mohawk	$ 57½
Allouez	35¼	North Butte	28
Calumet & Arizona	48½	Old Dominion	35½
Calumet & Hecla	410	Osceola	97
Centennial	8	Parrot	8
Copper Range	53½	Santa Fe	⅛
Daly West	5¼	Shannon	8½
Franklin	6½	Tamarack	20½
Granby	37	Trinity	3½
Greene Cananea, ctf	6	Utah Con.	12⅝
Isle Royale	12	Victoria	2
La Salle	3⅝	Winona	4½
Mass Copper	4½	Wolverine	99

(By courtesy of J. C. Wilson, Mills Building.)

NEVADA STOCKS.

San Francisco, August 24.

Atlanta	$ .15	Mayflower	$ .04
Belcher	.55	Mexican	4.00
Belmont	6.47	Midway	.22
B & B	.14	Montana Tonopah	.70
Booth	.08	Nevada Hills	3.40
Chollar	.13	Ophir	1.70
Combination Fraction	.09	Pittsburg Silver Peak	.50
Con. Virginia	.73	Round Mountain	.69
Florence	1.35	Sandstorm Kendall	.04
Goldfield Con	5.65	Savage	.21
Gould & Curry	.12	Tonopah Extension	[illegible]
Jim Butler	.36	Tonopah of Nevada	[illegible]
Jumbo Extension	.25	Union	1.15
MacNamara	.18	West End	[illegible]

(By courtesy of San Francisco Stock Exchange.)

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EDITORIAL

JAPANESE shipments of copper to the United States are expected to amount to 20,000,000 pounds this year, an increase of 3,000,000 pounds over those for 1910. The metal comes mainly in the form of blister copper and is refined on the Atlantic coast.

TANGANYIKA Concessions is now producing about 28,000 pounds of copper per day. During July 830,000 pounds of blister copper was shipped from the Kansanshi mine. At this rate the yearly production would amount to about 8,000,000 pounds. This is the first return on the large investment made by Mr. Robert Williams and his associates.

MEXICAN bandits continue to make trouble at outlying mines. Last week they raided the Pedrazzini mine at Chispas, Sonora, and carried away money and stores. The *rurales* are after the bandits, but in the meantime Mr. Edward L. Dufourcq has before him the difficult problem of operating without sufficient supplies; a problem apt to confront other managers before matters become altogether normal again.

SUMMER as well as winter trails in Alaska have their perils. In July this year Mr. R. S. Tarr and Mr. Lawrence Martin, experienced Alaskan travelers, lost their equipment and narrowly escaped losing their lives while crossing the Delta river on the Chitina-Fairbanks trail. That highway into the interior is being rapidly improved for all year service, but at present a summer trip over it involves much more risk than the journey when the rivers and the ground are frozen.

ZINC has been mined in increasing quantities in northeastern Oklahoma since old Indian Territory days. The mineral has also been frequently reported in the southeastern part of the State. Apparently deposits have now been found in the Arbuckle mountains that show real promise, though Mr. L. C. Snider of the Oklahoma Geological Survey finds it necessary to suggest a bit of caution regarding some of the claims. It is but natural that in a region where metal mining has been unimportant even a good find be over-rated. Such things occur, to the sorrow of many, in well established districts. The promptness with which the officers of the Survey have investigated the new district testifies to their interest and activity.

AMONG the new porphyry copper mines now coming into production the Ray Consolidated promises the largest immediate output. Within a couple of weeks it is expected that 5000 tons per day will be mined, this corresponding to one-half the ultimate capacity. We present this week a full description of the property written by Mr. Charles A. Dinsmore, and at the same time our New York correspondent notes the sale of the partly complete smelter at Hayden to the Guggenheim interests, and moralizes a little over the probable outcome. Ray Consolidated has been much in the public eye in the last two years. Evidently foundations have been well laid and Ray is to continue a centre of interest to both technical men and financiers.

PHOTO-LITHOGRAPHED copies of original plats are permitted to be used in place of the duplicate, triplicate, and quadruplicate drawings heretofore required in patent proceedings. These copies will be prepared in the General Land Office from the original, traced and white drawing prepared as hitherto. Extra copies will be furnished at cost, including one on tracing paper from which blue prints may be made. The effect of this change will be to reduce the cost of patent proceedings, perhaps as much as $10. The only criticism of the new order that has been made is to the effect that its late announcement may have caused those not going to patent enough to require an additional year's assessment work.

APPRAISAL of the mines of a whole State has seldom been attempted, but such an inventory for Michigan has just been completed by Mr. J. R. Finlay, acting for the State Tax Commission. We print this week a brief abstract of his report and will present the details later. It is clear that in fixing the value of mines for taxation purposes only present value is properly taken into account, and valuations of present value of mines are so rarely made in the United States that Mr. Finlay's report has been eagerly considered. A mine may have excellent possibilities for the future, but these are hardly to be taken into account in taxation. Comparisons of taxation values and stock-market appraisals are apt to show wide differences. That the method used by Mr. Finlay, one well known to all practising engineers, rests on well grounded principles is indicated by the general agreement between his figures and those reached by Mr. J. Parke Channing when valuing some of the same properties for consolidation. Mr. Finlay values the Calumet & Hecla at $51,000,000, Mr. Channing at $[illegible]. Both agree that the Tamarack has no present value, and Mr. Channing is more generous to the Ahmeek, whose stockholders have been fighting the proposed consolidation, than is Mr. Finlay; the one placing a value of $[illegible] on the property, and the other $7,200,000. There are minor differences, but a general agreement throughout. One matter that will interest many is that Mr. Finlay bases his valuations on a 14-cent price of copper. His reasons for this are interesting, but too long to quote in this place. The whole report is worthy of detailed study by engineers.

The Cottrell Process

Smelter-fume problems have received much attention in the Western States in the last few years. Not all the money has been spent in litigation, and substantial advances in efficiency have resulted. Probably none have been more interesting than those centering around the electrical precipitation of suspended particles. Mr. F. G. Cottrell, to whom is chiefly due the success of this invention, described his methods and apparatus last June at the meeting of the American Chemical Society, as we noted at the time. His full account of the matter has since recently been published in the Journal of that society. We print this week the concluding part of an extensive abstract of his paper. Prior to this publication by Mr. Cottrell no authentic account of his work has been so issued, and only a meagre description of the apparatus, together with general accounts of results, was available. Mr. Cottrell has until recently occupied a position in the department of chemistry of the University of California. This he has resigned to devote his whole time to research under the direction of the United States Bureau of Mines, and further solution of smelter-fume problems are to be his first work. At present, while final results are still in the future, there is a satisfactory record of accomplished results. The process is in daily use at one of the acid plants on San Francisco bay. Another type of apparatus is in successful operation in the oilfield separating water and oil. A third plant, erected at the Selby Smelting & Lead Company, proved entirely successful. At the Coram works of the Balaklala Consolidated Copper Company, a measurable success was achieved, despite the necessity for hurried erection of a plant many times larger than the experimental unit. At times 80 per cent of the suspended matter was precipitated, and there is little reason to doubt that the whole plant could have been ultimately brought up to that degree of efficiency. The smelter, however, is closed, and into the closing entered a variety of matters aside from the efficiency of the precipitating plant. Experimental work is to be continued at Garfield, Utah, with the object of making a better saving of flue-dust. Following months of work with a small unit, the complete plant of the Riverside Portland Cement Company is being equipped with the Cottrell apparatus. On the whole this is a cheerful record of progress; with some disappointments, it is true, but none the less with some things substantially accomplished.

The Lesson of the Giroux Fire

The trite saying that it is always the unexpected which happens, was never better illustrated than by the news despatches of last week, bringing the information that a fire had occurred in the Giroux shaft of the Giroux Consolidated Mines Company, and that a number of men had lost their lives. Nothing more unexpected could have occurred. The Giroux shaft is now 1400 feet deep; it was raised from workings connected with the 1000-foot level of the older Alpha shaft some 750 feet farther north. The 1200-foot level is also connected with the Alpha shaft. The Giroux is now being sunk below the 1400-foot level. At the 1200-foot level is the concrete pump station. The five-compartment shaft is timbered throughout and just below the collar it is encircled by a three-inch pipe, bored with quarter-inch holes every six inches, and connected with a 20,000-gallon tank so that 600 gallons of water per minute may be discharged into the shaft. This may be continued indefinitely, as the tank is connected with the pump discharge. It will be seen that unusual precautions had been taken to guard against fire in the shaft.

On Thursday of last week the men at work in the shaft heard a noise, and looking up, discovered that the shaft was on fire above the 1200-foot level. Ascending in the cage to that level, they disagreed as to procedure, and five decided to walk through to the Alpha shaft, intending to climb out the ladder way. Five others decided to try to pass through the fire in the cage. They reached the surface all badly burned, one being already dead, and one dying later in the hospital. None of those who went to the Alpha shaft escaped. With the data at hand it is impossible to fully explain the accident, but probably the water was turned on in the main shaft before the men were out, changing the Alpha from a down-cast to an up-cast shaft, driving the smoke into the Alpha workings and killing the men who were seeking safety. What is the lesson? Here apparently every reasonable precaution had been taken, yet a disastrous accident occurred. Much might be said—that the presence of safeguards induces a too great feeling of safety, that systems for fire protection will not always work, and many other platitudes. The essential point after all is that men lose their heads in emergencies and nothing can prevent an otherwise careful man from doing, under stress, exactly what he should not do. Training in rescue work will do much to inculcate in miners what may be designated as an emergency habit of mind and prevent the occurrence of accidents such as this. Not only must appliances be furnished, but plans laid and men trained.

Are Veins Richer in Depth?

Whether gold bearing veins become consistently richer or poorer in depth is a question still much debated. There can be little doubt that mines generally yield their richest ore at or near the surface. On the average there is undoubtedly more ore in the first thousand feet from the surface downward than in the second, and down to depths so far mined, probably each succeeding thousand contains less than the one above. It is also true that in nearly every district the average grade of the ore now mined is less than the average of earlier years, and, as each mine gets older, poorer and poorer ore is sent to the mill. All this may be said without altogether settling the main question. These easy appeals to experience somehow fail to carry complete conviction and rules deduced from them receive rude shocks from time to time.

In the annual report of the Alaska United Gold Mining Company, reviewed on another page, it is shown that in the Ready Bullion mine the average value of the ore reserves as reported from year to year since 1901 has been \$2.527 per ton and the average value of the ore actually milled has been \$2.061, while the average value of the present ore reserve is \$3.02. For the 700-Foot mine of the same company the corresponding figures are \$2.328, \$2.335, and \$2.51, while for the Alaska Mexican they are \$3.26, \$3.10, and \$3.41. Taking the whole group of mines on Treadwell Island, the average of the ore milled has been about \$2.40 per ton, while the average value of the ore now in reserve is probably over \$3. These figures are the more significant since gold alone enters into account and there is no question of fluctuating prices of other metals. At present work in these mines is deep; roughly, 1200 to 1500 feet. The ore is coming mainly from the second thousand feet of depth, and yet it now averages better in grade than that mined during the whole history of mining on the island. In the *Mining and Scientific Press* for February 25, Mr. Oscar Hershey presented detailed assays showing that 38 samples from the 1450-foot level of the Treadwell mine averaged \$2.50 in gold, 29 from the 1210-foot level of the Mexican, \$3.67, and 26 from the 1350-foot level of the Ready Bullion, \$6.11. In Mr. Robert A. Kinzie's annual reports there are tables presenting similar averages of assays level by level. These show that variation in gold content occurs in depth as along the strike, but there is no consistent evidence of decrease in amount of gold in depth. Indeed what is now available would point slightly in the opposite direction.

In South Africa the matter has been much studied, though details have never been made public. Geological work on the Rand has heretofore been done mainly by men employed by the individual companies, and the observations of any one man were necessarily, therefore, restricted. A systematic public survey of the district similar to that made in Western America by officers of the United States Geological Survey has only recently been undertaken. Evidence from the Rand therefore rests on *obiter dicta* of men presumably basing their statements on adequate information, or upon analysis of output figures. That the latter afford insufficient data for such an investigation has been pointed out by several in the discussion of Mr. C. O. Schmitt's paper recently read before the Chemical, Metallurgical and Mining Society of South Africa. The ore mined is determined by the cost of mining and as the scale of operations increases and practice becomes settled, lower grades of ore become available. Incidentally the mines become deeper, and so there is an appearance, perhaps false, of decrease in gold content with depth. Years ago Mr. Hennen Jennings investigated the matter and is understood to have come to the conclusion that, allowing for all variables, there was on the Rand an actual decrease in gold content with increasing depth. To confirm his conclusions Mr. Ross E. Browne spent two years studying the problem. Mr Browne, we believe, came to the same result as had Mr. Jennings. On the other hand, Mr. H. F. Marriott has recently asserted that on the evidence "of assay values of samples of actual reef widths taken throughout all the mines," of the group controlled by his house, there is "no substantial evidence today to prove a general deterioration in the richness of the ore." Mr. F. H. Hatch stated in his 'James Forrest Lecture,' printed in the *Mining and Scientific Press*, July 22 and 29, "I have not been able, with the material at my disposal, to come to any definite conclusion on this point, but I am inclined to the view that a gradual impoverishment with depth does exist." Mr. Hatch's views have been misinterpreted in South Africa, as is shown by our own Johannesburg letter in this issue. His estimates of the gold content of the Rand bankets were carried to the depth of 6000 feet only, because only the data to that depth were available. His own statement is: "For practical purposes the whole question turns on gold content; and what that may be at a vertical depth of 7000 or 8000 feet no one can tell. This much, however, may be said: the geological structure clearly indicates the continuance of the conglomerate or banket beds to still greater depths than even 7000 or 8000 feet before the bottom of the great synclinal basin of the Witwatersrand is reached; and, beyond that point, the beds must still continue until they rise to form the southern lip of the basin, known to exist beyond the Vaal river."

Evidently competent authorities differ in their interpretation of the facts shown on the Rand, and, in the absence of access to full data, the opinion of an outsider is of little value. It would seem, however, that it is to some extent a matter of interpretation as well as observation, and intelligent interpretation requires formulation of theory. It will not do to decry hypotheses and attempt to rely exclusively upon bare facts. No man can hold in mind enough facts to answer such a question as here proposed and the minute generalization of facts is attempted, theory creeps in. It is a common observation that the 'practical' man who scorns theory has a head most full of wild hypotheses which, however, he mistakes for facts of observation. To answer intelligently the intensely practical question as to impoverishment or enrichment in depth, consistent theory must be used. If the data now available in all the Rand mines be placed in the hands of a competent corps of geologists there should be no great uncertainty as to results.

Geologists have learned of recent years to discriminate sharply between primary and secondary ore deposits. The value of the discrimination has been shown repeatedly, perhaps most strikingly in the aid afforded in development of the porphyry copper deposits of the United States. Secondary ore deposits stand in definite genetic relations to the surface or to some other local phenomenon. The relation may be obscure, but once determined, a flood of light is thrown upon the peculiarities of the orebody. A primary ore deposit, formed before the present surface was sculptured, cannot well be dependent upon that surface, though the latter may still show relations to it. Silicification of a limestone bed occurring in connection with the introduction of ore-bearing solutions when the whole was deep below the surface, may, because of the hardening of the bed, later cause the latter to stand above the general level. This may give rise to an easy but erroneous generalization as to the influence of the surface on the ore. Many similar cases might be cited. To unravel such matters, to discriminate between the coincidental and the genetic, is the province of the trained geologist. With his help it should be entirely possible to reach sure conclusions about probable impoverishment in depth wherever sufficient ground is open to observation.

The Ray Consolidated Copper Company

By Charles A. Dinsmore

The Ray Consolidated Copper Co. owns properties at Ray, Pinal county, Arizona, and a 10,000-ton concentrator at Hayden, 20 miles away. The mine is the largest porphyry copper, in the Southwest at least; and within the 180 acres thoroughly prospected and developed there is 80,000,000 tons of 2.17% copper ore, equivalent to an average of almost 500,000 tons per acre. Development was first by churn-drilling, and later by regular underground methods, and at this time there are more than 36 miles of underground work. This is progressing at the rate of a mile and a half per month. It is interesting to note that the real opening of the mine by underground methods was begun but a little more than a year ago, since when development has been rapid. The ore is generally disseminated throughout an area known to be 7300 ft. in extent east and west and 3000 ft. north and south. The mineral belt considerably exceeds this in length, though it has not been systematically drilled beyond these limits. The average depth of the capping is 315 ft.; the average thickness of the orebody is 171 ft. The western orebody is thicker than the eastern, so that probably 60% of the total will come from the former area. To win 85% of the ore will necessitate hoisting approximately 300 ft., though for a great many years the lift will be only about 170 ft., or to the first level. The property will produce when in full operation about 80,000,000 lb. of copper annually, and the management estimates that this will be done at a cost not exceeding 9 cents per pound of commercial copper. The elevation is about 2000 ft. above sea-level. The caving system of mining is being employed, on the most elaborate scale, and an estimate of 9 to 10 tons of ore per man per shift is conservative. In the successful operation of the present-day low-grade copper properties, the mining costs spell profit or loss absolutely; so, if these be reduced the fraction of a cent per ton, it puts the figures on the right side of the ledger. With the Ray Consolidated the mining costs will be minimized almost beyond belief. The 10,000-ton mill at Hayden is admirably designed and built, so that with both mining and milling costs low, there is no doubt that this property will within another twelvemonth be one of the most important of the copper mines of the United States. At this time the concentrate from the mill is going to Aguascalientes, Mexico; but as soon as the new furnaces are completed at El Paso they will be sent there. The officers of the company include D. C. Jackling, general manager; David Cole, for many years at the head of affairs at Cananea, manager; Louis Cates, who had charge for many years of the Boston Con., mine superintendent; W. S. Boyd, who was with Mr. Cates in Utah, assistant; R. C. Nowland, who for many years has represented Henry Krumb, and who had charge of all the sampling and assaying at Ray during the churn-drilling period, engineer; George O. Bradley, superintendent of construction; A. J. MacLain, cashier; J. H. Brown, purchasing agent; E. J. Franklin, general superintendent of power plants for the Ray Con. and affiliated companies. Hayden is headquarters for the Ray Consolidated.

RAY, APRIL, 1910, SHOWING CENTRAL PORTION OF ORE-ZONE.

The determination of the value of the holding was the work primarily of the churn-drills, of which 13 were employed, including both Star and Keystone machines. Drill-holes were made on the corners of 200-ft. blocks, and 353 holes were drilled. Starting with an 8¼-in. casing, this was tapered first to 6¼, then to 4¼. In sampling, every precaution was made to secure exactness. Every 5 ft. each hole was completely cleaned and the sludge sampled, passing through an automatic sampler invented by Mr. Nowland. To check the work of the local chemist, a composite sample was taken, 20 samples for every 100 ft. These were thoroughly mixed, reduced to proper size, and assay samples sent to outside chemists. In the underground development and exploration, over 1000 ft. of drill-holes have been checked, giving the most wonderful results. The first checking underground was accomplished by driving to and under a drill-hole, [illegible] [illegible] the hole, taking out any bad. Two sets of samples were taken every 5 ft to correspond with the samples during drilling. The results of a comparison of the two checked within a small fraction of a per cent. In the churn-drilling work a grab sample was taken from the top of each bucket of sludge and sampled at once, to give constant knowledge of what the hole was doing. The balance of the sample was sacked, sealed, labeled, and sent to the laboratory for assaying. The regular sample for the 5 ft weighed about 60 lb. Some 25 miles of road was necessary for the transport of the drill machines to the different portions of the property, but much of this road building consisted only of cutting out underbrush and rolling away boulders. Water lines to the drills were of 1-in. pipe and were laid on the surface. The drilling and sampling were done on the most elaborate and careful scale, and this, with the results positived by underground developments, made it feasible to go ahead on the large scale the company has adopted for the mining and reduction of the ore.

The orebody is disseminated in Pinal schist. The schist has been fractured by many faults, and first diabase and then granite porphyry were intruded. Outside the belt of these intrusions, on the north is the Pinal schist, unmineralized; on the south, some schist and some granitic rocks; on the east, sedimentaries, which are intruded by different eruptives; on the west, schist and some eruptives. The orebody is at quite a uniform elevation, lying flat. Some of the drill-holes showed ore in the eastern section at 100 ft. deep, and in the western section sometimes 450 ft. of capping would be drilled before the ore was reached; the difference being due to the fact that in the western section the general elevation is greater than in the eastern, while the orebody lies at the same elevation in each district. The greater bulk of the ore shows copper disseminated in Pinal schist, generally in the form of chalcocite, sometimes chalcocite accompanied by cupriferous pyrite. Locally, there has been found but little cuprite or native copper, and practically no carbonate or silicate. The capping even is practically free from carbonates. The line of demarcation between the ore and the capping is very abrupt. In drilling, the bit often went from oxidized material having no value into good ore within 5 ft. A few acres of good ore has been found in the No. 1 mine in a laccolith of granite porphyry. This laccolith is entirely surrounded by ore-bearing schist. Considerably smaller areas of diabase in the form of dikes have also been found to contain good ore. The highest point of drilling so far was near the crest of Humboldt hill, where 450 ft. of capping was pierced. Under this hill is an orebody of approximately 1,000,000 tons per acre. The mineral belt is easily traceable on the surface, due to its high color, the red stain of hematite, together with the kaolin and the sericite, both of which are the results of decomposition of the muscovite mica. The mineralized belt differs, too, from the non-mineralized, in that the latter is a dark grayish rock, much harder and more compact than the former.

Operations will be conducted through working openings in what are called the No. 1 and No. 2 mines. At each of these there is a long adit arranged for transportation of ore. No. 1 is at this time 1300 ft. and No. 2 approximately one mile in length. The location of all work is at this property designated by sea-level elevation—thus, No. 2 is called 2090, No. 1, 2020, these figures representing actual elevation. At each of these points there is a vertical shaft, through which all ore is handled. From each adit-level there is an incline at about 36° to the main underground traction level. Down these inclines wide stairways have been constructed, these being used by the men, no employees riding. The head-frames are steel, each hoist is identical, the daily normal capacity of each being 6000 tons, handled in $12\frac{1}{2}$-ton skips. These are probably the two largest electrically-driven hoists in the country. They are described in detail on another page. No. 1 equipment is complete and in operation, while at No. 2 the machinery is being erected. The No. 1 mine has the greater amount of development, and work identical to it is going forward at the No. 2. Each level is developed exactly as the one above. Except in the traction ways no timbers are used. The method of handling the ore is interesting. The underground ore trains are of 12 cars, each having 5 tons capacity. The electric engine brings the train to the tipple and through it, leaving the last three cars. These are automatically fastened in the tipple, and the tipple turns, dumping the loads into a bin over an incline. The cars are then shunted out, and three more run in, and so on until the entire train of ore has been dumped. The ore-bin beneath the tipple is of concrete. The cars have no doors, nor openings at the side or end, but are simply steel boxes containing 5 tons. They are equipped exactly as are the freight cars on transcontinental railways, with straight air brakes and M. C. B. couplers. From the bin, by means of air-operated steel gates, the ore is dumped into gauge hoppers containing a full load for the skip. The skip is lowered below the gauge, when the bottom of the hopper is pulled out and the load instantly drops into the skip. The skip is brought to the surface and dumped into a receiving bin. Here, also by means of air-operated steel gates, the ore is sent over grizzlies and into No. 8 Gates gyratory crushers by gravity. From the gyratories the oversize goes to two sets of Garfield rolls, 72 by 20, these two processes dressing to 1 inch. Below the rolls there is a traveling belt which takes the ore to a carrier belt, which distributes the material into the bins, the latter having a total capacity of 20,000 tons. There are three railway tracks beneath these bins, the trains being run under and loaded by means of hand-operated gates. The dressing of the ore to proper size for milling is somewhat unique for this region, and the plan adopted is very economical. No handling is necessary at the mill, better and quicker work is done, and the cars receive the maximum load with no unfilled spaces. Power for all this, for the machines, for the haulage-engines in the mines, for lighting, and other purposes, is generated in the power-plant at Hayden. The power-transmission line is excellently built, steel towers being used.

At Ray may be seen the most advanced application of the caving system, on a large scale. The essential points here are to cave in such manner that the capping will not crumble and thus become mixed with the ore, and to win large quantities of ore constantly. Every move is exactly determined before it is undertaken; and throughout the mine all tracks are laid to grade, the same as on transcontinental railways. The initial point is numbered zero, and all operations numbered from that point, the same as the laying out of the streets in many cities. Thus the first opening off the tramway will be 1 S., 1 E., or 100 ft. south and east of zero, and so on. The sill-floor of each stope is 25 ft. above the traction level, and each stope is given a figure showing its position with reference to a central point. The thing is simple, but the practice here is to simplify this simplicity. In the laterals, manways are driven upward every 100 ft. to the capping, and through these the miners pass into the stopes at convenient points. The stopes are 30 ft. wide, leaving pillars of 20 ft. of ore. The miners strip the sides of the stope, and after blasting, the backs come down without further work. The ore is seamed and friable. The stope is carried to the capping, and the pillar holds the capping. Large areas are so stoped, only a small portion of the ore being drawn. This is removed in order to assist in the breaking down of the backs with the shoothing of the side holes, the weight of the ore aiding this process materially. When the time comes for drawing the ore from the stopes, small stopes are driven upward in the pillars 20 ft., and on either side a great many holes are drilled. These are shot in rotation during one shift, the result being that the base of the pillar is undermined completely. Then the car-men are put to work drawing ore, there being two chutes from each stope, one on either side of the track, and a chute for the pillar stope. The quantity of ore in the ground being caved is known almost exactly, so there is no guesswork about drawing out the supply. In drawing the ore a smaller portion is taken from the rear end of the stope than from the front. This permits the ore and the capping to settle uniformly and in conformity with the contour of the ground originally, and thus the capping is kept entirely free from the ore. To be certain that the ore is drawn as it should be, a central station is maintained, which every car must pass. Here the checker takes the number of the car, whence it was filled, and the name of the man in charge, thus keeping all records. An idea of the small quantity of waste may be learned from the fact that there are two bins, one for the ore and one for the waste, the former of 20,000 tons capacity, the latter 500 tons. In order to see exactly what this method was doing, an engineer watching the stoping operations crawled to the top of the stope from which the pillars had been released, and he found that the capping was from two to many feet above the ore the entire space of the stope—that, in fact, practice followed theory closely. By this caving system the amount of ore possible of extraction per man is enormous as compared with lode mining. The economy is here enhanced also by the fact that the ground is solid, the pillars holding well, and thus not a stick of timber is needed in the stopes, except for the chutes.

The surface equipment at Ray includes a complete machine-shop, with appliances for all ordinary work; carpenter-shop, warehouse, and other buildings. The sub-station where is received the electric voltage from the Hayden power-plant is very complete. The power comes over at 45,000 volts, and the high-voltage plant is on a balcony of the plant, completely isolated. The voltage is stepped down to 440 for power and 110 for lights. There is a 300-hp. motor generator set 440 A.C., 250 D.C. The switchboard serves the entire plant. There are two Allis-Chalmers motors, each of 500 hp., driving two Nordberg high-efficiency compressors, 3000-cu. ft. capacity each.

The concentrator at Hayden is now operating three units of what is to be a 10,000-ton plant of eight units. Other units are being built as fast as a large force can accomplish it. The building is steel frame, 378 by 400 ft. over all, and it is arranged for efficiency and convenience. I shall describe the flow of the material through but one of the units. The others are duplicates. The ore from Ray comes down in 60-ton Ingoldsby steel cars, and is dumped directly into steel bins of 25,000 tons total capacity. From bin it goes to a conveyor-belt, bringing it to a 30-in. 15-bucket elevator, which takes it to six impact screens of 7 and 8 mesh. The reject goes to two 16 by 42 Garfield rolls (dry crushing), regrinding it till it passes through the screens. The undersize goes to six Garfield roughing tables. Heads from the tables go back to an elevator and are discharged to a 4-compartment Janney classifier, the primary, where it is classified and returned to Garfield Chilean mills, grinding through two No. 77 screens. The overflow from the primary classifier goes to 10 cone-tanks, this feed going to Isbell vanners. The second compartment of the classifiers discharges to second classifiers, 4-compartment, and this feed goes to Isbell vanners with corrugated belts. The feed from Chilean mills goes to 3-compartment improved Janney classifiers, which feeds to four Garfield roughing tables and to Wilfley tables; on the Wilfleys the first concentrate and tailing are made. The overflow from secondary classifiers goes to 10 cone-tanks, and this feed to Isbell vanners with smooth belts. The overflow from mill classifiers goes to 10 cone-tanks, is syphoned off, and the pulp taken for the different vanners. The tailing goes to the tailrace, being automatically sampled every 30 minutes. The concentrate goes to receiving tanks under the mill, is elevated by centrifugal pumps, passes through automatic samplers, and so to the concentrate bins. There is a filter in each bin and a vacuum-pump takes the water out and puts it again into circulation. Concentrate is loaded into cars by a Morgan 10-ton Gentry crane. The ratio of concentration is 20 to 1. The overflow from all the cone-tanks is purified and pumped back to circulation, being used on classifiers and roughing tables for wash and feed water.

The line-shaft actuating the crushers and Chilean mills is beneath these machines and extends the entire width of the building. Rolls are on one side of the shaft on the floor above, and mills on the other side. Clutches, operated by air, start or stop any portion of this section of the mill. There is a 30-in. belt and a double row of 15 by 8-in. buckets. The sampling plant is at one side of the mill and is complete. Here all samples are taken and the pulps sent to the laboratory, a short distance away. The milling plant is very complete, well lighted, and is doing excellent work.

The pumping station is situated just below the confluence of the San Pedro and Gila rivers, about one mile from the mill. Wells have been sunk supplying clear water, which would not be the case were the water taken from the rivers or from ditches. There are three Aldrich quintuple special pumps, directly operating by induction motors, this equipment having a capacity of 10,500 gallons per minute per unit. The service reservoir for the plant holds 8,000,000 gallons, and the pumps are connected with 26-in. wooden pipes. The pumps are sunk to natural water-level.

The power-plant is one of the finest in the country. E. J. Franklin is general superintendent of power-plants for the affiliated companies; Henry Ruark is chief engineer at Hayden, and W. B. Clement, assistant. The normal capacity of the plant is 7000 kw., but it is capable of heavy overload. The equipment includes four Allis-Chalmers type E, 4-cylinder, triple-expansion engines of 1750 kw. each. There are a high-pressure and a low-pressure cylinder on one side, an intermediate pressure and a low pressure on the other side. The engines run 100 r.p.m.; steam pressure is 175 lb.; superheat between 50° and 75°; size of cylinders, high-pressure, 28 by 48 in.; intermediate, 52 by 48; low, 54 by 48. Alberger surface-condensers, two on each engine, on account of the low-pressure cylinder, one for each side. These are the largest engines of the kind, though there are many larger of the cross-compound type. The steel fly-wheel is made in four parts, weighs 55 tons, and is 26 ft. in diameter, with a rim speed of 8168 ft. per minute, or, at this rate, it would roll more than a mile and a half per minute. Each engine generates about 3000 maximum horsepower, and when it is stated that the ordinary locomotive running 60 miles an hour uses about 1700 hp., the size of these engines may be better understood. Each engine operates an alternating-current generator. The diameter of the roter over all is 23 ft. When I visited the plant the engine operating was pulling a 50% overload without trouble.

There are also two Nordberg tandem compound-exciter engines; cylinders 13 by 23 and 36; 100 r.p.m.; one Allis-Chalmers generator set; one Nordberg triple-expansion, high-duty pumping-engine; cylinders, 12 by 24, 36 and 36; capacity, 10,000,000 gal. per 24 hours. The water is in part first used for the condensers in the power-plant, and then goes over a set of cooling towers. The big pump takes it from the basin under the towers, pumping into the 8,000,000-gal. reservoir which supplies the mill. There are three cooling towers of Ray Con. design, and several more are to be built.

There are one Nordberg cross-compound, piston, blowing-engine, 8000 cu. ft. capacity; 14 Heine boilers, 513 hp. each, equipped with Foster superheaters; 4 Blake compound, boiler-feed pumps; and 3 Foster feed-water heaters.

The main and auxiliary headers and all valves and fittings are steel. The plant will develop largely in excess of stated capacity, and, in fact, when everything is running smoothly and to full capacity, there will doubtless be an idle engine, ready for emergencies.

The machine-shop equipment at the Hayden plant is exceptionally good. It includes 4 lathes; milling machine; planer; shaper, 2 drill-presses; 3 pipe machines; 2 belt-cutters; 1 grinder. Two additional lathes and a boring machine and press are en route. The blacksmith and boiler-shop is also furnished with every appliance needed. The carpenter-shop is close by and equipped with the necessities. In fact, no detail of this end of the business has been overlooked nor has any been neglected.

The staff house where the manager and heads of departments take their meals, is a handsome building, beautifully furnished, and the meals are excellent. The cost includes no profit to the company, but it is maintained as carefully as a fine hotel. The similar house at Ray is also excellent, and the service equal to that at Hayden. The mill at the Ray Consolidated at Hayden is as handsome a structure as I have ever seen, and the machinery is the best. The fact that the concentration is 20 to 1 proves efficiency. The whole planning of this mill was so correct that practically no changes have been made, and the building itself was exactly what was needed. The construction of additional units goes on with the regular operation of those in commission. This mill building and the first units were put into commission in record time. When, within a few months, the entire plant shall be in operation, with 10,000 tons of ore going through daily, there will certainly be a concentrator worthy more than cursory attention. G. O. Bradley was the designing engineer.

I must express my sincere appreciation of the kindnesses accorded me by the management. I was permitted to go where I would and when I would, ask questions and receive information. These courtesies coupled with others, including entertainment in the handsome and well arranged and furnished guest houses of the company, were all extended so freely and so heartily that I really felt at home, as I am sure was the desire. All this clearly indicates that the Ray Consolidated management has solved its problems, and that there is, and is to be, nothing here but mining on the most scientific and strictly business basis.

Refining Metals

Unless metals are of high purity they are usually of little usefulness, says Joseph W. Richards. Electrolytic methods enable almost perfect purity to be easily attained, and in addition permit the separation at the same time of the valuable gold and silver contained in small amount in the baser metals. Over $100,000,000 worth of copper is electrically refined every year in the United States; it is purer than could be otherwise obtained, giving the electrical engineer the highest grade of conducting metal, while several million dollars' worth of gold and silver are recovered which would otherwise have to be allowed to remain in the copper. Again, the method is so simple that but a few words are necessary to set it forth in principle. The impure copper is used as one electrode—the anode—in a solution of copper sulphate containing some sulphuric acid; the receiving electrode—the cathode—is a thin sheet of pure copper, or of lead, greased. The electric action causes pure copper only to deposit upon the cathode, if a properly regulated current is used, while a corresponding amount of metal is dissolved from the anode. Silver, gold, and platinum are undissolved, and remain as mud or sediment in the bottom of the bath; other impurities may go into the solution, but are not deposited on the cathode if the current is kept low. The cost of this operation is small, and the results are so highly satisfactory that 90% of all the copper produced is thus refined. Similar methods are in use for refining other metals. Silver, gold, and lead are thus refined on a large scale; antimony, bismuth, tin, platinum, zinc, and even iron can be thus refined. The field is very inviting to the experimenter and to the technologist, and is rapidly increasing in industrial importance.

An examination of the Porcupine district was recently made by A. G. Burrows for the Ontario Bureau of Mines. Mr. Burrows effectually disposed of the value of the sensational samples, on which the excitement concerning Porcupine was worked up and fed for a long time, by saying: "The distribution of the gold is generally irregular, occurring along one or both walls, while other portions of the vein may be very low grade. Most spectacular showings occur on many properties, but these are limited to portions of the veins. Considering the irregular character of certain veins and the quantity of the country rock which will need to be mined, the ore must be considered low grade."

Amur Gold Regions

St. Petersburg Correspondence

A Russian mining engineer who has visited the Amur gold regions states that an investigation of the Upper Sei river which rises in the Sei mountains and finds its way into the Amur at Blagoveshtchensk has shown that the gold-bearing region extends only between 55° north latitude and the river. North of this line stretches a mountainous country. Southwest there is low undulating ground on the upper part of which near the Sei have been found remnants of gravel deposits. The northern part of the country is non-auriferous, while in the southern part several concentrations of gold have been found sufficiently rich to make their exploitation profitable. The line of most intensive volcanic activity is found farther to the west on the same latitude and has been followed to the Gilya. But in the western part of the region the difference in character of the country becomes less pronounced; and finally beyond the Dzheltul it disappears almost entirely. South of the line noted gold has been produced in many places. The richest gold region is that of the Ulyagir Sugdzhari. East of this placer gold has been found on the Kinlyandzhak and in several places on the Kupuri where gold occurs in pyrite. This zone should stretch farther east to the limits of the basin of the Uda. If the western part of the zone described may be considered relatively known, the eastern part is practically unknown, which must be ascribed to the difficulty in reaching it, that is, to the absence of roads. The same may be said of the districts west of the Upper Gilya.

To the south the gold-bearing zone is much richer and dotted with mines. It stretches along a high range of mountains from the Dalny Taig and Tukuringra to the Upper Tungir and beyond. Its extension eastward constitutes a high watershed between the Amgun and the Selemdzha on the one hand and the Udom on the other. In close proximity to these ranges, reaching from one slope to the other, are the well known mining districts, the Verchne-Selemdzhinska, Unya-Bomskaya, the Sei, and the Dzhalinsky. The bedrock in the first and the third districts consists of granite and gneiss; in the second and fourth it is granite and metamorphosed schist. The Amgun and Nieman districts and the river Chargi are in the same vicinity. The first of these districts extends over a great length. The second stretches west-northwest and both zones come close together on the Upper Gilya. Between the Upper Sei and the Dalny Taig they are separated by about 100 versts (66 miles), where a great hollow has been formed filled up with relatively recent deposits, among which, in all probability, in many places gold sands will be found. Prospecting here, however, is difficult. In the western part of this depression, that is the Lower Bryanta Utugeaya and Unachi, these deposits are not particularly heavy, thanks to which it has been possible to employ dredges. Within the limits of the lower Sei gold-bearing region, as well as farther east, between it and the Lower Selimdzhinsky, in the basin of the Mamyna, and of the Gari, discoveries may very well be made. Gold, indeed, has been reported near various tributaries on the right bank of the river Gari.

It may be interesting to point out an immense region stretching from the upper Toma through the Bureya into the Upper Gari, the Tyrmi, the Upper Urma, the Karu, and the Amgun through Goryn to the lake district of the Lower Amur. Here, according to report, gold in profitable quantities has been found. The geological conditions are favorable in part; but the most interesting parts of this region must be considered up till now among the most difficult of approach in the whole area and have attracted little attention. With the building of a railway the Upper Solokatcha Tyrmi and the regions south of the right tributaries of the Urma begin to be accessible.

The Electrical Precipitation of Suspended Particles

By F. G. Cottrell

*The next plant in order of size that was undertaken was at the Balaklala smelter at Coram, Shasta county, California. The vast body of low-grade copper ore reaching for many miles across this county and commonly known as the copper crescent has recently been described in detail by L. C. Graton[12] and characterized as the second largest copper deposit which can be considered as a single geological unit in the United States. The first commercially successful smelter in this region was erected at Keswick in 1896 by the Mountain Copper Co., Ltd., under the management of Lewis T. Wright, and was of especial interest as one of the pioneers in pyritic smelting. Extensive heap roasting was also carried on at this plant, with the result of widespread deforestation of the surrounding country and the final closing down of the plant in 1905 through injunction proceedings instituted by the U. S. Forest Service. The company has since built a small smelter and acid phosphate works at Martinez on San Francisco bay and now ships its ore to this point, nearly 250 miles distant, for treatment, but even this latter plant has at various times come in for its share of fume litigation.

In 1901 the Bully Hill smelter at Delamar, with a capacity of 250 tons per day, was started. This was later purchased and is now owned by the General Electric Co., but since last July it has been closed as a result of complaints by the U. S. Forest Service, which insisted, at that time, that the plant either close or at least commence efforts on a practical scale looking toward controlling its fumes. In 1905 the Mammoth Copper Mining Co., a subsidiary of the United States S. R. & M. Co., blew in its present smelter at Kennett. This plant, when running full, has a capacity of some 1200 tons of ore per day. The Balaklala, which belongs to the First National Copper Co., is the most recent of the Shasta county smelters, having blown in its first furnace in 1908.

These smelters are all situated in the narrow, precipitous cañon of the upper Sacramento river and its tributary, the Pit. The region itself is too steep and rocky for agriculture, but was once heavily wooded, although now swept bare of vegetation for miles. As far as the cañon itself is concerned, probably all the damage possible has already been done, unless reforestation were undertaken. This latter even would probably be slow and difficult work, as, since the loss of vegetation, the steep hillsides have been washed bare of soil for miles around. At Redding, however, some 13 miles below Coram and 17 miles below Kennett, the cañon widens out into the fertile Sacramento valley, and from this point southward, for some 12 miles farther, lies the region from which for the past two years have come increasingly insistent complaints against the smelters. These culminated, a little over a year ago, in agreements between the farmers and the smelters under which friendly suits were brought in the Federal courts and injunctions issued by stipulation requiring the smelters to remove the suspended matter from their exit gases and dilute the latter to such an extent that their sulphur dioxide content should not exceed 0.75% by volume as discharged from the stacks, with the further general and sweeping provision that they should do no damage.

To accomplish this the Mammoth smelter built a bag-house which has been in successful operation since July 1910. The gases discharged from the five stacks (each 21 ft. square) are, to all intents and purposes, free from suspended matter and consequently invisible. This represents a notable achievement, being the first time that the bag-house, so efficient in lead smelters, has been successfully applied to copper blast-furnace gases on the large scale. It is made possible in this instance through neutralization of the sulphuric acid in the gases by the zinc oxide carried over in the fume from the zinc content of the ore smelted. The company is also the owner of patents[13] on the introduction of finely divided metallic oxides into the gases for this purpose. In addition it was necessary to provide an extensive system of cooling pipes in front of the bag-house. There are 39 of these pipes, each 4 ft. in diameter and averaging about 200 ft. in length. They represent a large part of the cost of the plant. It was expected that they would be sufficient to cool all the gases of the plant to a safe temperature to protect the $30,000 worth of woollen bags with which the house is filled, but upon starting it was found that only a little over half the full capacity of the plant could thus be treated with safety, and operations were accordingly restricted to this. In the cold weather of winter a considerably larger tonnage can be handled with safety than during the hot summer. Notwithstanding this, however, the bag-house is to be considered a decided success; at least for the particular conditions met with at this plant, and the management deserves great credit for the courage and skill with which it has carried through this new, and after all largely experimental, undertaking, representing as it does the expenditure of over a quarter of a million dollars.

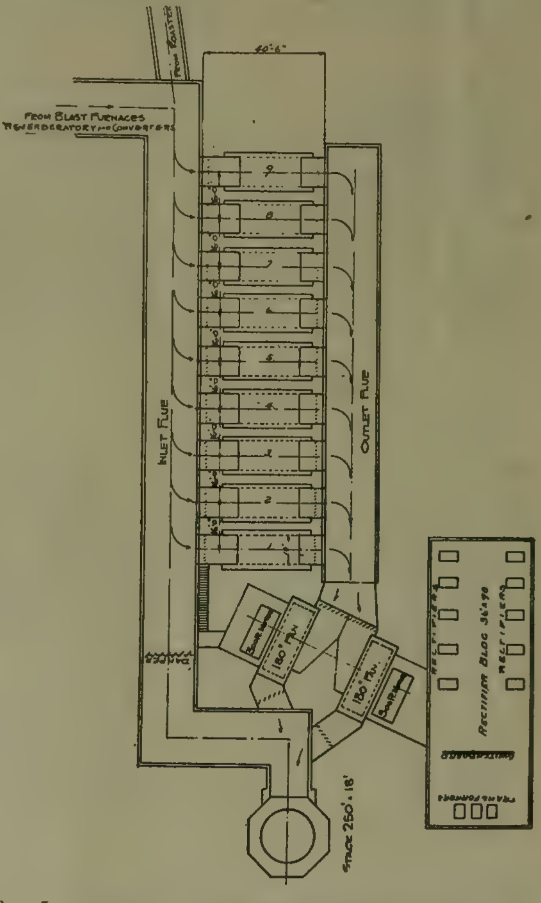

Fig. 5. GENERAL ARRANGEMENT OF PRECIPITATING PLANT, BALAKLALA CON. COPPER CO., CORAM, CALIFORNIA.

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*Abstract from *Jour. Ind. & Eng. Chem.*, August 1911, and continued from *Mining and Scientific Press*, page 255.

[12] U. S. Geol. Surv., Bull. 430b.

[13] Clarence B. Sprague, U. S. Pat. 931,515, Aug. 17, 1909, and 984,498, Feb. 14, 1911.

In the case of the Balaklala smelter, the use of a bag house was also considered, and in fact a small experimental unit containing a few bags was run for some months in comparison with tests made by the electrical process here described, and also a centrifugal apparatus in which the gases passed through a rapidly rotating cylindrical shell equipped with radial baffles to insure the gas being raised to full velocity. As a result of these tests the electrical process was adopted for the full-sized installation.

The smelter treats from 700 to 1000 tons of 2½ to 3% copper ore containing over 40% sulphur with considerable but varying amounts of zinc. The greater proportion of this is handled in blast furnaces, but the fine material, including everything under ¾ in. and amounting to less than 10% of the whole, goes through McDougall roasters and an oil-fired reverberatory. The plant has also two converter stands. The gases from all these departments pass into a common flue, 18 by 20 ft. in cross-section. The volume of gases passing through this flue varies with operating conditions from a quarter to half a million cubic feet per minute, which means, in round numbers, a mean linear velocity in the flue of 10 to 20 ft. per second.

Before attempting to design the full-sized equipment for treating these gases a small precipitation-chamber capable of treating about 1% of the total gases, was erected and an extended set of experiments made with it. With this miniature unit as a guide, the equipment of the whole plant with similar apparatus was undertaken in March 1910. This was completed and first put into operation at the end of the following September, since which time it has been in continuous operation, with the exception of the latter half of December, when changes were decided upon, during completion of which it became necessary, under the terms of the court decree to shut down the plant for a couple of weeks. As was naturally to be expected, many difficulties were encountered, some of which have already been entirely overcome, while others are giving way more gradually before the systematic study of operating conditions. Fig. 5 is a plan of the nine electrical precipitation-units or chambers in their relation to the flue system and stack. It should here be noted that the two large fans indicated in the drawing are not required for the operation of the precipitating system nor to overcome any added resistance due to its introduction, as this latter is slight. The fans were made necessary by that section of the court's decree requiring dilution of the sulphur dioxide to 0.75% or less. When the furnaces are running on a high sulphur charge this feature of the decree necessitates a considerable dilution of the gases with fresh air and corresponding diminution of stack draft. At these times the fans are operated, but during a considerable portion of the time the sulphur dioxide in the gases can be brought low enough without interference with the draft, and during these periods the fans are stopped entirely, although the gases still pass through them.

At the rectifier building the current is received from the companies' three-phase power-circuit at 2300 volts, 60 cycles, and after being transformed up to from 25,000 to 30,000 volts under the control of the operator through the variable resistance and induction regulators, is rectified into an intermittent direct current, as already explained, and distributed to the individual precipitating units. Fig. 6 shows a cross-section through one of these units or precipitating flues as first installed. The double vertical lines represent the collecting or grounded electrodes, each 6 in. wide by 10 ft. high, made of No. 10 sheet iron. The dotted lines represent the discharge electrodes, consisting of two iron wire strands between which is twisted the discharge material, for which both asbestos and mica preparations have been used in this plant. Each unit contains 24 rows of 24 electrodes of each type. The collecting electrodes are carried by bars connected directly to the frame of the chambers themselves, while the discharge electrodes are supported by springs between a system of buss bars carried on externally placed insulators as shown in the figure. To the auxiliary chambers surrounding these insulators a small regulated amount of air is admitted to prevent conductive dust or fume from working back and settling on the insulators. The cam and shaker rod extending across the middle of the unit was originally designed for the purpose of vigorously shaking the electrodes, as it was greatly feared that the removal of precipitate from the electrodes in units of this size might be one of our most serious problems. In actual operation it has been found, however, that the electrodes can easily be shaken entirely free from dust by hand from the top; the whole operation, including cutting the unit in and out of the system and the removal and replacement of its covers, requiring only about ten minutes, and this having to be repeated every six or eight hours, depending on the dust content of the gases. The precipitated dust and fume as it falls from the electrodes is carried by the conveyor in each unit to a common longitudinal conveyor which in turn discharges into cars carrying it away for treatment.

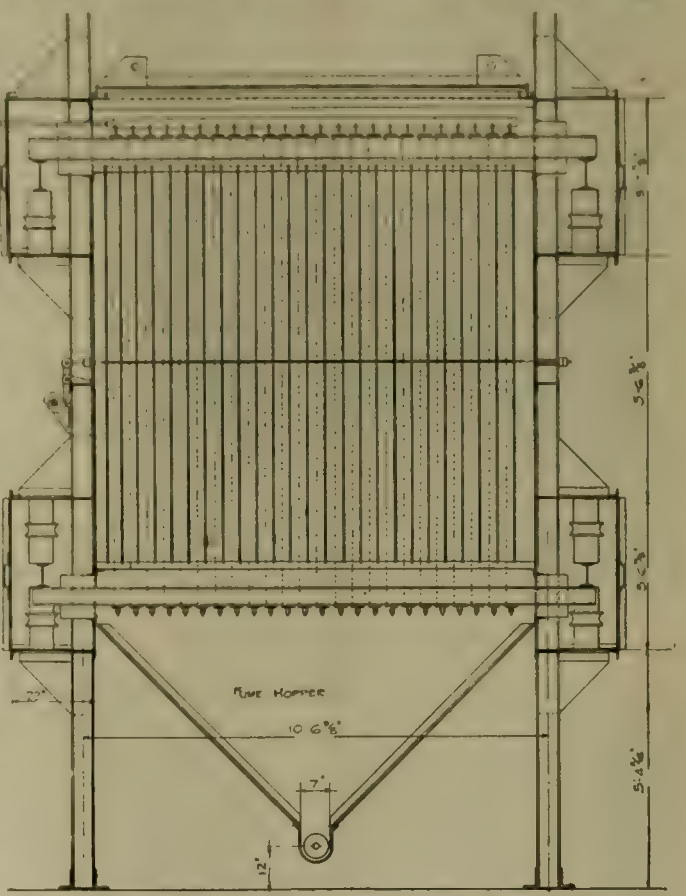

FIG. 6. SECTION THROUGH PRECIPITATING PLANT OF THE BALAKLALA CON. COPPER CO., CORAM, CALIFORNIA.

Filtration tests show that this plant, under favorable working conditions, precipitates between 80 and 90% of the suspended matter in the gas, the average over the whole period of operation to date being somewhat less. Under present operating conditions at the smelter, this represents some 6 to 8 tons of precipitate per 24 hours. The gas-treating plant as a whole, including flues, fans, motors, and electrical apparatus, cost, up to the time it was put in operation, a little less than $110,000. Although many minor changes have since been made, none of the larger or more expensive elements of construction have been greatly altered.

The total average power-consumption for the precipitation-plant when running is in the neighborhood of 120 kw. One man can readily control the whole operation in the rectifier house, although, as a matter of precaution for a new plant under the high tension here used, two have usually been on duty. Two laborers and a foreman are employed on the precipitating units and dust-handling system, although this can probably be reduced somewhat by automatic shaking devices, since as yet the main efforts at improvement have been directed elsewhere. The volume of gases to be treated varies considerably with the conditions at the furnaces, but at present may fairly be taken as averaging between 200,000 and 300,000 cu. ft. per minute, and entering the units at from 100° to 150° Centigrade. Fig. 7 is the interior of the rectifier house or control station, showing the general arrangement of apparatus and wiring.

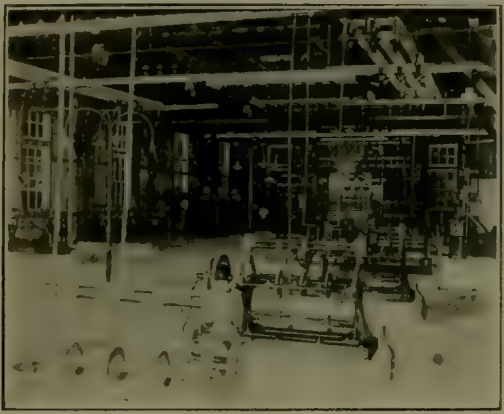

FIG. 7. RECTIFIERS AND WIRING OF DYNAMO ROOM.

One of the greatest difficulties met with at this particular plant has been the maintenance of conductivity in the fine fibres of the asbestos and mica of the discharge electrodes. At ordinary room temperatures these materials readily take on enough moisture from the air to afford sufficient surface leakage for all the discharge necessary, and the same is true at higher temperatures if the gases contain traces of sulphuric acid or other conductive matter, but in the particular gases here met with, the high and variable amount of zinc oxide at times robs them of all conductive matter, thus reducing the conductivity of the fibres of the electrodes and seriously affecting their efficiency. The possible methods of overcoming this and giving the fibres a permanent conductivity of their own, as well as other details of the more purely electro-technical matters underlying the whole process, will be treated more at length elsewhere, as the present article is intended more as an outline sketch of the history and practical development of the work thus far accomplished. Nor is this the place to speculate upon the final outcome of the situation between the farmers and the two great smelting plants which have adopted the remedial measures above described, for this is in the end a question for the botanical and agricultural expert, as to whether or not, or to what extent, actual damage is still being done, no matter whether this comes from suspended matter or from the sulphur dioxide, which neither the bag-house nor the electrical precipitation make any claim to remove. The two smelting companies have done and are doing everything in their power to better the conditions, while, on the other side, the farmers, through the executive committee of their protective association, have earnestly tried to carry out their part in a spirit of fairness to all concerned.

To those who know the circumstances of the many bitter conflicts between farmers and smelters all over this country, with the attendant expense and usual barrenness of results, the present developments in Shasta county present a very suggestive illustration of what may be accomplished in the technical development of our industries by spending the money on experiment and construction instead of all on litigation. Irrespective of the local issues involved, the work done at both of these smelters during the past year has been a real and decided step forward in practical metallurgy. Both plants have already sufficiently demonstrated the applicability to large-scale operation of the principles underlying them to ensure these principles finding a permanent place from now onward in the field of engineering, and each for the particular cases for which it is peculiarly adapted. Before us, of course, still looms the question of the sulphur dioxide, and the solution for this on an equally large scale is, unfortunately, not yet clearly in sight. Before leaving the subject, I cannot but make grateful acknowledgment to those who have worked so earnestly and loyally shoulder to shoulder during the past year and to whose energy and ability such measure of success as has been met with thus far is entirely due. Especially do I wish to express appreciation of the courage, determination, and ability of R. T. White, until recently general manager for the Balaklala company, and now holding the corresponding post with the Braden Copper Co. in Chile, in undertaking and carrying through this new developmental work with all its attendant risks under the most trying of circumstances.

Since the manuscript of the above was sent to the printer, the case of the Balaklala company *versus* the Shasta farmers has come up for formal hearing in the United States Circuit Court in San Francisco, before Judge Morrow, on June 19. The evidence presented from the farmers side consisted of a considerable number of affidavits from individual residents of the district in question, stating that they believed damage was still being done. They naturally made little or no attempt to distinguish between damage from gases and that from suspended matter. Of much more interest in the present connection was the report from Messrs. Gould & Burd, the chemists employed by the Shasta County Farmers' Protective Association, to examine the operating conditions at the smelter itself and determine to what extent the terms of the decree were being fulfilled. Their tests extended over the period from March 10 to April 3, and credit the electrical apparatus with removing during that period an average of 72.8% of the total solids in the gases entering it. In nearly one-third of the individual determinations, the removal of solids reported is over 85%. They report the average concentration of sulphur dioxide as 0.56% by volume, but state that several times during the month the concentration rose slightly above the 0.75% prescribed as maximum by the court. The outcome of the hearing was the entering of a judgment by agreement and stipulation between the contesting parties whereby the plant was allowed 35 days, under existing conditions, in which to run through the ore on hand, but was then required to close completely until such time as it can live up to the letter of the original decree, that is, remove *all* solids, never exceed 0.75% sulphur dioxide, and do no damage. During the time in which the plant still remained in operation, experimentation was carried on as vigorously as ever, with excellent results.

Of the other possible applications of the process, one of the most recent to be actively prosecuted is the collection of dust from portland cement kiln gases. The chief stimulus to this development has again been the nuisance to the surrounding population and its attendant litigation. This has been especially acute in southern California, where several cement plants are situated in the heart of an exceedingly rich orange country. In the case of the Coulton plant, with a capacity of 2500 bbl. per day, an injunction has already been issued by the court which, if sustained, will close the plant, unless they can control their dust, which the court estimates at present at some 20 tons per day. This case differs from that of the smelters in that here there is no question of damage from gases, but merely the deposition of a large tonnage of impalpable dust of lime and clay. From the technical side, a new condition is here met in the high temperature of the gases to be treated, which are 150° C. and upward as they leave the present stacks. The dust itself is, furthermore, entirely devoid of electrical conductivity, but notwithstanding this, it is easily and completely precipitated by the electrodes when these are properly adapted to the new conditions. Experiments on a scale of a few hundred cubic feet per minute were carried on for a few months under the direction of Walter A. Schmidt, at the Riverside portland cement works, and on the basis of these a plant is now being erected to treat the dust from these kilns.

Another extensive field in which it is hoped this process may find useful application is the cleaning of iron blast-furnace gas for use in gas-engines. Outside of the poisonous and combustible nature of these gases, and the consequent necessity for keeping the whole apparatus gas-tight, there would appear to be no new difficulties here to overcome, and steps are being taken to thoroughly test the matter on a practical scale, this work at present being in direct charge of L. L. Johnson, of Indianapolis. A question which naturally presents itself is whether this work has any bearing upon the coal-smoke problem of large cities. In answer, it may be said that for the great majority of cases at present the more logical line of attack would seem to lie in improved methods of combustion, to avoid making smoke in the first place, but in some special instances where such methods may happen to be particularly difficult of application, and the suppression of smoke is especially desirable, electrical precipitation may eventually be found of use, for experiments show that it acts upon ordinary smoke in essentially the same manner as upon the fumes and dust above discussed.

Specifications for Spelter

Standard specifications for spelter were drawn up for the American Society for Testing Materials, by its Committee B-2 on non-ferrous metals and alloys, of which William Campbell, professor in Columbia University, is chairman. These were submitted to the annual meeting of the society, which voted to refer them to a letter ballot. They are as follows:

1. Under these specifications virgin spelter, that is, spelter made from ore or similar raw material by a process of reduction and distillation and not produced from reworked metal, is considered in four grades, as follows: A, High Grade; B, Intermediate; C, Brass Special; D, Prime Western.

2. A brand shall be cast in each slab by which the maker and grade can be identified.

3. The maker shall use care to have carload of as uniform quality as possible.

4. *A. High Grade.*—The spelter shall not contain over 0.07% lead, 0.03 iron, 0.05 cadmium. It shall be free from aluminum. The sum of the lead, iron, and cadmium shall not exceed 0.5 per cent.

B. Intermediate.—The spelter shall not contain over 0.20% lead, 0.03 iron, 0.50 cadmium. It shall be free from aluminum. The sum of the lead, iron, and cadmium shall not exceed 0.5 per cent.

C. Brass Special.—The spelter shall not contain over 0.75% lead, 0.04 iron, 0.75 cadmium. It shall be free from aluminum. The sum of the lead, iron, and cadmium shall not exceed 1.20 per cent.

D. Prime Western.—The spelter shall not contain over 1.50% lead, 0.08 iron.

5. The slabs shall be reasonably free from surface corrosion or adhering foreign matter.

6. Not less than ten slabs shall be taken as a sample from each car; for smaller lots, in the same proportion to the total number, but in no case less than three slabs. In case of dispute, half of the sample is to be taken by the maker and half by the purchaser; and the whole shall be mixed. The slabs selected as samples are to be sawed completely across and the sawdust used as a sample. In case no saw is available for this purpose, the slabs should be drilled completely through, and the drillings cut up into short lengths. The saw or drill used must be thoroughly cleaned. No lubricant shall be used in either sawing or drilling, and the sawdust or drilling must be carefully treated with a magnet to remove any particles of iron derived from the tools.

7. *Lead.* For the determination of lead in High Grade not less than 25 gm., in Intermediate not less than 15, in Brass Special not less than 10, and in Prime Western not less than 5 gm., shall be taken, that is, the sample used for analysis should not contain less than 0.01 gm. lead.

Iron. The sample for iron should contain not less than 25 gm. for the three higher grades and not less than 10 gm. for Prime Western. The entire sample must be dissolved, the iron precipitated as ferric hydroxide, then re-dissolved, reduced, and the iron determined by titration.

Cadmium. Dissolve 25 gm. in 330 c.c. of a solution of one part of hydrochloric acid (specific gravity 1.2) and five parts of water. Let it stand over night; filter and wash; reject filtrate and dissolve the residue, which should be about 5% of the zinc, in nitric acid. Add 10 c.c. of sulphuric acid; evaporate to fumes; dilute and filter out and wash the lead sulphate. Dilute the solution to 500 c.c.; add 5 gm. of ammonium chloride; pass a slow stream of hydrogen sulphide for one hour and let stand for about five hours; filter, wash with hot water; dissolve in 10 c.c. of sulphuric acid and 50 c.c. of water; filter and wash. Dilute to 400 c.c.; precipitate with hydrogen sulphide as before. Weigh as cadmium sulphide or dissolve in hydrochloric acid, and titrate with potassium ferrocyanide.

8. Claims to be considered shall be in writing within thirty days of receipt of material at customer's mill, and the results of customer's test shall be given. The shipper shall be given one week from date of receipt of such claim to investigate his records, and then shall either agree to satisfy the claim or send a representative to the mill.

(*a*) *Analysis by car lots.*—No claims shall be considered unless the minimum samples as specified for the grade in question can be shown to such representative.

(*b*) *Physical defects of individual pieces.*—No claims shall be considered unless the spelter in question, unused, can be shown to such representative.

9. Where the spelter satisfies the chemical and physical requirements of these specifications, it shall not be condemned for defects of alloys in which it is used or for defects in the coating of galvanized products.

10. The maker's representative shall inspect all pieces where physical defects are claimed. If agreement is not reached, the question of fact shall be submitted to a mutually agreeable umpire, whose decision shall be final. On a question of metal contents an adequate sample shall be drawn by the representatives of both parties; the sample shall be prepared from the slabs so selected as described above. The sample shall be mixed and separated into three parts, each of which shall be placed in a sealed package, one for each party and one for the umpire if necessary. Each party shall make an analysis, and if the results do not establish or dismiss the claim to the satisfaction of both parties, the third sample shall be submitted to a mutually agreeable umpire, who shall determine the question of quality and whose determination shall be final.

11. The expenses of the maker's representative and of the umpire shall be paid by the loser or divided in proportion to concession made in case of compromise. In case of rejection being established, damages shall be limited to the payment of freight both ways by the maker for substitution of an equivalent weight of spelter meeting these specifications.

CHEMISTRY is the science which investigates the composition of substances, and studies changes of composition and reactions of substances upon each other. As an applied science, it deals chiefly with the working over of crude natural material, and its conversion into more valuable and more useful substances.

Operating Costs and Mine Management

By Charles Janin

The difficulty of making comparisons between costs of different mines is strikingly apparent to anyone who tries to tabulate the figures found in company reports. The operating costs at a mine are governed, among other things, by the size and character of the vein, hardness of the country rock, depth of mining, amount of water to be handled, cost and efficiency of labor, the metallurgical treatment, magnitude of operation, and the cost of power. A knowledge of these conditions is important in making comparisons of operating costs. It is also necessary to consider the situation of the mine, the transportation facilities, the cost and difficulty of obtaining labor, and the cost of supplies. Mines situated in different localities may be operated under closely similar conditions as regards wages, power, size and character of orebodies, and metallurgical treatment, and comparison of operating costs between such mines will be both interesting and instructive. Comparisons cannot, however, be profitably made between mines unless they are operating under somewhat similar conditions. Comparisons between different mines on the Mother Lode or between different mines in the Grass Valley district of California are profitable, but direct comparison between costs at Mother Lode and Grass Valley mines is valueless because of the widely different conditions and methods employed.

The matter of bookkeeping is often a serious obstacle in comparisons. The not infrequent manipulation of the books, and the preparation of cost sheets that do not represent the actual conditions, but place to capital expenditure, or omit altogether, charges that should rightly go to operating cost, while reflecting apparent glory upon the management adopting such a policy, give but little information of real value and apparently reduce the actual operating cost by the amount so juggled. A wide difference exists between the cost system kept at those mines where a refinement of bookkeeping leads to itemizing the number of candles, and cost per foot of drift run, or the pounds of different sized nails used in building repairs, and those where the management has only a hazy idea of the number of tons mined and milled, or where the superintendent generally 'guesses' at the cost per ton, or takes such figures as he may have over a short period, ignoring the cost of supplies on hand and used, and overlooking other vital expenditures. The operating cost per ton assumed under the latter conditions is generally a low one, in instances coming under my observation, from 75c. to $2 per ton less than the more nearly correct operating cost, as afterward figured from a careful accounting of the total expenditures for supplies, payroll, and contingent expense over as long a period.

Again, there are wide discrepancies in the estimation of the tonnage treated. A car is generally used as a unit, sometimes arbitrarily taken as a ton or a ton and a half measure, and often, if the ore is weighed, no allowance made for excess moisture. The actual amount of ore may be anywhere from 10 to 20% less than the unit taken. At one mine where a system for weighing the ore was put in it was found that the actual tonnage treated was one-third less than what had previously been thought. An estimation from the stopes is not possible when the mine plans are not kept up to date and when the examining engineer has to rely on verbal information as to the extent of ground stoped.

Some fairly well conducted mines do not keep tabulated cost data, the management looking upon such accounting as an unnecessary expense, since it requires additional assistance. The old-time superintendent was not one whose education was along lines leading him to appreciate the desirability of keeping such data, and often though possessed of good underground experience and sufficient ability to carry out construction and operative work, he did not have a thorough knowledge of many of the details of the mining business. Neither had he any accurate idea of the real cost as compared with the apparent cost of operations. Where cost data are carefully and intelligently kept, it generally results in increased efficiency and a lowering of operating costs. Points that would otherwise be overlooked are brought to light, such as a too heavy or suddenly increased expenditure in any department so the steps may be taken to correct the abuse.

Low costs do not always mean large profits. Perhaps capital expenditure for new equipment results in reducing the actual operating cost, while the final accounting and amortization of the new plant would show a profit considerably lower than if the work had continued under the old methods. Nearly every engineer when called in consultation over the future of a mining project desires to make a record in lowering the costs of his predecessor. Often this ambition results in irreparable damage to the mine. For instance, economy in timbering has resulted in disastrous caves. Shutting off development and devoting all attention to extraction of ore already developed, while temporarily pleasing to stockholders and apparently increasing profits, brings an ultimate crash; generally after the engineer has accepted work elsewhere. He afterward points to the record of low working costs that no one following him has been able to reach; thus impressing those who do not know the true situation. In other words, the question of total profit is not always as seriously considered by the ephemeral manager or consulting engineer as is desirable. Too often he loses sight of the ultimate welfare of the mine in the effort to establish a record.

Again, low mining and milling costs per ton may mean a real loss in operations, and efforts in this direction occasionally result in good mines being run at a loss. Sometimes tonnage is attained by mining unnecessary waste, resulting in an apparent reduction in working costs per ton, thus reflecting credit to the management, but resulting in actual ultimate loss to the company. Mining of a smaller tonnage at a greater operating cost per ton could advantageously be made in such cases with an increased profit. A change in the method of ore treatment may sometimes be of great benefit. The great strides in recent years in cyaniding silver ores, and in slime treatment, have, with a reduction of working costs and an increase in percentage of recovery, made possible the economic treatment of ore formerly considered of little value. It would seem that any great reduction in working costs at mines to be made in the future, will be in the metallurgical end through improved methods and more efficient management, though appreciable reductions in cost may be made in every department of a mine that has not now the benefit of an experienced staff.

A field for the reduction of milling costs lies in increasing the efficiency of the stamp duty. It must be said that mill-men generally seem to be behind some of the more progressive men on the Rand, and, aside from their reluctance to try new methods, it is not easy to understand why more efforts have not been made to increase the mill capacity on lines similar to those evolved in South Africa. By using a heavier stamp battery for coarse crushing and following with tube-mills or other regrinding apparatus, it seems possible with most of the ores amenable to the simple method of gold mining, to increase the stamp capacity from the present 3 to 5 tons to two to three times that amount.

A familiar saying of one successful mine operator of early days was 'to the devil with a mine that won't stand bad management,' but there are a number of mines that are in the ranks of the dividend payers today where the balance between success and failure depends upon such a narrow margin that with careless or less experienced management they could not be profitably operated. To illustrate the difference in management, a case may be mentioned where the management of a well known Nevada mine, by devising a different method of ore development and extraction, reduced the operating cost of mining by over $2 per ton. The manager is to be highly commended on his success, which was not only due to a better method of handling the ore, but to a considerable increase in labor efficiency and to the building up of a strong esprit de corps in the staff. In some mines a bonus is offered the foremen in ratio to decreased cost; this has produced wonderful results, and this is a method that could be adopted in many mines.

Low working costs result only from close management, close figuring, and constant supervision by a capable, energetic man familiar with the details of operation. At one mine an average of 80 men were working while operating only 10 stamps. The ore was hard quartz and the vein narrow. Hand-drills were used exclusively. After thoroughly familiarizing himself with the conditions, the new manager put in a compressor, increased the mill to 20 stamps, weeded out the least efficient labor, and put good foremen in charge. He found that a force of 60 men, under these conditions, was sufficient, and work progressed more satisfactorily than before. Under the first manager the number of trammers and shovelers had gradually increased to 12. Under the new regime it was found that 6 men could do this work. The policy of the new manager in shutting off all useless expense and inefficient labor changed the mine from a close or dubious into a profitable enterprise. It is surprising how the number of men on the payroll will gradually increase unless carefully watched. A few extra men are needed perhaps for this or that new work, and the foreman, unless he is on a bonus arrangement, will generally keep them on after the work is finished.

The greatest cost in mining is that of labor, which runs over 50% of the total mining and development cost in all mines on which I have accurate data. The cost of explosives is also important; experiments recently made in one mine demonstrated that by a more careful selection, careful tamping of holes, and the use of considerably less powder, a saving of 20% was made in the powder bill. Miners are nearly always careless and extravagant in the use of powder and candles, and a careful supervision of these supplies will often work a considerable saving.

The overhead cost at mines of small output is sometimes a considerable item per ton treated. Especially will this be noted at mines where, as above mentioned, development has not kept pace with extraction. At such places present operating costs cannot be properly compared with those mines that have not suffered from 'engineering' ambition, or lack of proper development, until the former have again been put in proper shape. At other mines the management cost is higher than necessary, for the reason that the numerical strength of the staff and salaries paid would be sufficient for a concern of several times the size, and are far in excess of what the conditions warrant. Mention must be made here of a small mine in Mexico, where, if it had been in charge of an experienced superintendent instead of being inflicted with a 'staff of incompetents,' a different tale would have been told the stockholders.

An example where increased operating cost, over that of the former manager, was not only legitimate but necessary, may be mentioned. This was a mine being operated through a shaft about 400 ft. deep. When the first manager had blocked out a considerable quantity of ore, this work being charged to development, he then stopped all work in the shaft and at the face of the drifts, and devoted attention to extraction and milling of ore. The working cost while mining and milling was $2.25 per ton. With the advent of a new manager, who faced the necessity of rapidly developing more ore, costs advanced to $2.75 per ton, and later to $3.25. Soon after this the new manager received a stop order from headquarters and explanations were in order. The first manager had established a 'record' that could not be maintained simply because he did not do all the work incident to mining the ore over the period for which figures were quoted. Another example is that of a California mine where the total operating costs for a considerable period, with economical management, were slightly under $4 per ton. The mine changed hands and the costs increased over 70%. The mine is no longer a profitable undertaking.

Block-Caving and Sub-Stoping at Crystal Falls

By Fred C. Roberts

*The systems of mining used at the Tobin mine, Crystal Falls, Michigan, were developed after trial of several methods. Underhand stoping was tried, but soon discontinued on account of the continual falling of the ground from the back of the stope. Back-stoping was next tried, but the danger from falling ground was still too great. Sub-stoping was the third method used, and in some parts of the mine proved satisfactory. It is still used to some extent where the orebody is too narrow or too firm to be mined by the block-caving system. Block-caving was the next method used, and proved so well adapted to the conditions and physical characteristics of the ore that it has been adopted as the principal means of mining.

The levels at the Tobin are 125 ft. from floor to floor, and the main haulage drift follows closely the hanging wall. In the block to be mined by caving, parallel cross-cuts, 24 ft. from centre to centre, are driven from the main drift, as nearly at right angles as may be, to the foot wall, and are connected at the foot wall side by a small drift for ventilating purposes. Throughout the length of these cross-cuts, chute-raises are put up alternately on the right and left sides at intervals of 15 ft., to the sub-level 25 ft. above. The sub-level is opened 25 ft. above the back of the main level. A drift is driven, parallel with and about 15 ft. from the hanging wall, the entire length of the block to be mined. Cross-cuts are driven to the foot-wall from this sub-level drift directly above the cross-cuts on the main level. Opposite each cross-cut on the sub-level a raise inclined about 45° is put up from the sub-drift to the hanging wall, the object being to leave an additional thickness of back above the main haulage-drift. The cross-cuts on the sub-level are connected every 15 ft. by drifts over the line of chutes, leaving small pillars of about 10 by 16 ft. It is sometimes necessary to cross-cut these small pillars again, depending upon the nature of the ground. A drift is also driven along the foot-wall connecting all the cross-cuts.

After the pillars have been reduced to a suitable size, they are drilled with a sufficient number of holes so that they may be all blasted at once, the pillars farthest from the man-way being drilled first. Holes are also drilled around the tops of the chute-raises and blasted, making the raises funnel-shaped at the top. At the ends of the block to be caved, it is necessary to weaken the ground so that it will cave square with the pillar. Raises are put up from the end cross-cuts at varying intervals, depending on the nature of the ground. These raises are connected by two cross-cuts 25 and 50 ft., respectively, above the sub-level. After all the necessary raising, driving, and cross-cutting have been completed, the holes in the pillars of the sub-level are all blasted at once, undercutting the entire block, which settles down on the back of the level below. The ends of the block not being entirely cut off from the pillar, the ore does not drop down in one solid block, but breaks in settling and comes down in such shape that it can be handled through the funnel-shaped chute-raises with only occasional blasting of masses that lodge in the chutes. The caved ore is drawn uniformly throughout the level, so that it will settle down evenly, and this keeps the caved rock from the old level above from getting mixed into the ore.

Sub-stoping is used where caving is not practical; at the narrow ends of the orebody, and in pockets and smaller deposits that are sometimes found separated from the main body. Conditions vary so in these cases that they have to be met in different ways. The nature of the ground and dimensions of the orebody have to be taken into consideration in each case, and the method of mining

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*Abstract from paper presented to Lake Superior Mining Institute.

adapted to it. The usual method is to drive a drift on the main level the entire length of the orebody in question, and determine the width of the same by cross-cuts. Chute-raises are put up at intervals of about 15 ft. From a raise, at the end of the ore nearest the shaft, a sub-level is opened 15 ft. above the main level. This sub-level consists of a drift the length of the ore and connected at the far end with a raise from the main level. Second, third, and fourth 'subs' are opened in a similar manner above the first, 20 ft. being the usual distance from the back of one sub-level to the floor of the next above. The raise at the far end of the ore is carried through to the upper sub. All preliminary development work being completed, stoping is begun at the far end of the ore on the lower sub-level. Upper and underhand holes are drilled and blasted around the raise which connects all the subs at the far end. The ore thus broken falls into the chute at the bottom of the raise. This is repeated until the lower sub is drawn back 12 or 15 ft., when the miners on the second sub begin stoping in a similar manner to that done on the first sub. The second sub having been drawn back to a safe distance, the third sub-stope is begun. In this way each gang of miners is always working under solid ground and far enough back to escape falling ground from the stopes above.

The width of stope that can be carried this way depends upon the nature of the ground. In the Dunn and Great Western mines where the ground was exceptionally firm, with a strong capping above, stopes were worked out 80 ft. wide. The first stope was carried 30 ft. wide through the middle of the ore, beginning at the far end and drawing back. Benches were then cut at each sub-level the entire length of the ore pillar on each side of the stope. These benches were cut into the pillar far enough to protect the men from falling ground from the others working above. Beginnning at the far end and drawing back, these benches were stoped out by upper and underhand holes, the broken ore falling into the open stope. The process was repeated to remove the remaining ore in the pillars.

Coal Trade of the Pacific Coast

The fuel requirements of the Pacific Coast and the methods of meeting them will be discussed in the report on the production of coal in 1910, by E. W. Parker, of the U. S. Geological Survey, now in preparation.

The present consumption of coal on the Pacific Coast, according to Mr. Parker, is not large, and the successful operation of any coal mines in Alaska will depend on naming prices attractive to the development of manufacturing industries. For railroad and manufacturing purposes, the consumption of oil, particularly in California, largely exceeds that of coal—in fact, for railroad use oil is practically the only fuel. The principal domestic fuels are wood, and gas made from oil. Recently oil itself has assumed importance as a domestic fuel. About 15,000,000 bbl. of California oil were consumed by locomotives in 1909, as against a little over 18,000,000 in 1910. The total consumption of fuel oil was probably between 35,000,000 and 40,000,000 bbl. in 1909, and between 40,000,000 and 50,000,000 in 1910. The probability is that the consumption of fuel oil displaced about 10,000,000 tons of coal on the Pacific Coast in 1909 and between 11,000,000 and 12,000,000 tons in 1910. The per capita consumption of coal in California, Oregon, and Washington averages not much over 1 ton, while the average consumption in the United States as a whole is about 5¼ tons for each inhabitant.

The principal source of coal supply for the Pacific Coast is the State of Washington, the output of both California and Oregon being at present small. In 1909 the total production of coal in Washington was 3,602,263 short tons. California produced 45,000 tons and Oregon 87,276 tons. In 1910 the production of coal on the Pacific Coast was 3,903,983 short tons in Washington, 62,707 tons in Oregon, and 11,164 tons in California. The imports of bituminous coal amounted to 752,046 tons, and of anthracite to 9116 tons. The exports of coal from Seattle were 26,883 tons in 1909 and 23,771 tons in 1910. The total consumption of coal on the Pacific Coast from various sources in 1909 was 4,576,052 short tons and in 1910 4,812,389 tons. The imports of coke to Pacific Coast ports (exclusive of Hawaii), as reported by the Bureau of Statistics of the Department of Commerce and Labor, were 111,676 short tons in 1909 and 114,061 tons in 1910.

Including 761 short tons of coal sent from Puget Sound to Bering Sea, the total quantity of coal shipped into Alaska in 1910 was 98,420 short tons, of which 8178 tons went from British Columbia, and 15,877 tons from Washington. The production within the Territory was reported at 1000 tons, or about 1% of the total consumption.

Mining in New Zealand

The Wellington committee of the Waihi G. M. Co. held a meeting early in July, when a report was presented stating that replies to the circular which had been sent out disclosed the existence of a strong feeling against the present management. Owing to a regrettable misconception of the purport of the motion to remove the registered office of the company to New Zealand, in order to save New Zealand shareholders from paying double income tax, the committee did not get the support in England which its efforts should have obtained. However, A. E. G. Rhodes, a New Zealander, had been appointed an extra member of the board. Advices received at Waihi indicate that J. W. Walker is still seeking capital in London for the exploitation of mining leases, totaling 2000 acres, and reaching from the Waihi Reefs Con. property to the seacoast. Should his efforts be attended with success, a shaft will be sunk to a depth of 800 ft. in mineralized country, and prospecting drifts undertaken across the trend of the Waihi reef system.

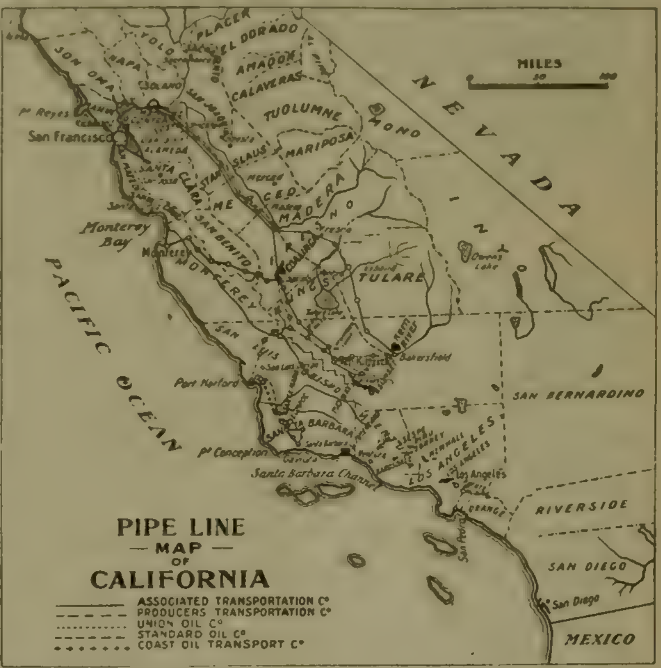
Steps are being taken by mining men now in London, and who are interested in the Waihi Beach mine, to raise capital for the flotation of a new company to thoroughly develop the claim, says the *Otago Witness*. Should the money be raised, it is intended to sink a main shaft farther inland, where operations can be conducted from a more central point. At present the property is under option for six months, commencing from May 30.

During June the Talisman Con. G. M. Co., whose property comprises 565 acres near Karangahake, crushed and treated 4580 tons of ore with a return of bullion valued at £19,020. Compared with the return for the corresponding period of last year, when 4090 tons yielded £18,372 5s. 5d., the past month's crushing represents an increase of £648. Costs for the past month totaled 34s. 6d. per ton, made up as follows: Mine development, 8s. 3d.; mining, 12s.; milling, 12s. 5d.; general expenses, 13s. 10d. The total value of bullion won from the mine to date is £1,525,622. The directors of the Taranaki Petroleum Co., at Moturoa (N. Z.), recently purchased 3500 ft. of 2-in. casing, and complete pumping-plant, from the Standard Oil Co. This casing will be placed in the well, and the oil allowed to flow. It has been flowing for some time between the casings in fairly large quantities, and in about a week it will be seen what the well is capable of producing. Oil still flows satisfactorily at No. 2 well, the quantity being well up to the usual average. No. 3 is now drilled to a depth of 4015 ft. The original intention was to drill to 4000 ft. The directors are now taking steps to test the oil at this depth. Many years ago oil was tapped in the Kotuku district, but absence of modern appliances and lack of expert knowledge have hitherto retarded development. The Consolidated company, of Reefton, however, is pushing ahead with boring operations. The latter operations contemplated will induce a large influx of mining men, and to provide for their housing, G. H. M. McClure (commissioner of crown lands) has gone to Kotuku to plan out the future town of Kotuku.—*Australian Mining Standard.*

Pumping California Petroleum

By C. P. Bowie.

The total length of oil pipe-lines in California at the present time is about 1600 miles. Of this amount 1250 miles leads from the San Joaquin Valley fields to the sea-coast and is owned and operated by four companies: (1) the Associated Pipe Line Co., which operates 262 miles of 8-in. line from the Sunset and Kern River fields, Kern county, to tidewater at San Francisco bay; (2) the Standard Oil Co., which has an 8-in. line 280 miles long from near Moron, Kern county, by way of Bakersfield, to Point Richmond in Contra Costa county, which line is joined in Fresno county by an 8-in. branch leading from the Coalinga fields; (3) the Producers' Transportation Co., whose 8-in. line extends from the Kern River fields, the Sunset fields, and the Coalinga fields to a junction station near Dudley, Kings county, and thence to the sea-coast at Port Harford, San Luis Obispo county, a distance in all of 200 miles; (4) the Associated Transportation Co., which has a 6-in. line 108 miles long from Coalinga to tidewater at Monterey, in Monterey county. The remaining 350 miles is made up of short lines in the southern part of the State leading from the coast fields to the ocean. Of these lines the Associated Transportation Co. operates one 8-in. line 35 miles long, and one 4-in. line 30 miles long from the Santa Maria fields to Gaviota in Santa Barbara county. The Coast Oil & Transportation Co. operates an 8-in. line 30 miles long from the same fields to Port Harford; the Standard Oil Co. operates an 8-in. line 28 miles long from near Orcutt, Santa Barbara county, to Port Harford, and a 3-in. line 45 miles long from the Torry Canyon fields in Los Angeles county to the city of Ventura; and the Union Oil Co., has both a 6-in. line 30 miles long, and an 8-in. line 50 miles long from the Santa Maria fields to Port Harford; a 4-in. line 45 miles long from Torry Canyon to Ventura, an 8-in. line 30 miles long, and a 6-in. line 25 miles long, from the Whittier and Salt Lake fields to San Pedro in Los Angeles county.



PIPE LINE
— MAP —
OF
CALIFORNIA

The base of the California oils is asphaltum. The gravity varies from 14 to 35°B., and the depth of the wells from 200 to 4000 ft.; the lighter oil being found usually in the deeper wells. In the Kern River fields, which was the first of the inland fields to be extensively developed, the producing sands were found at a distance varying from a few feet in depth to 1300 ft., and fully 80% of the oil was of a heavier gravity than 15° B. The difficulties in moving this viscous material through pipe-lines, especially in cold weather, has given rise to two distinct systems of pumping, known locally as the 'Rifled Process' and the 'Hot Oil Process'.

THE RIFLED PROCESS

The 'rifled process' was invented by J. D. Isaacs, consulting engineer of the Harriman railroads, and Buckner Speed, a professor in the University of California. It has been successfully used for the past three years by the Associated Pipe Line Co. between Bakersfield and Port Costa, Contra Costa county, this being the only rifled line operated in the State. The process consists in pumping cold oil of from 13 to 14° B., together with about 10% by volume of water, through a pipe which is corrugated spirally or 'rifled'. These rifles are put into the pipe in the making by running each joint with a twisting motion through a set of rolls, consisting essentially of wheels about one-fourth of an inch wide, which push the indentations into the pipe from the outside. The rifles make one complete revolution of the circumference in ten feet of length of pipe and give to the interior of the pipe much the same appearance as the barrel of a gun.

In operation, water is forced along the inner periphery of the pipe through an injection nozzle surrounding the pump discharge and at a distance of about ten feet from the pump. The pipe being already filled with oil, the water in this way is forced between the core of oil and the pipe itself. As the mass moves forward the rifles give to it a whirling motion. The water's greater specific gravity and this centrifugal motion form a water film between the pipe and the oil, thus keeping the oil from coming in contact with the pipe and consequently greatly reducing the frictional resistance.

Experience has shown that the following conditions are essential to the successful operation of a rifled system: (1) The oil must be very viscous—of a gravity not lighter than 15° B. An oil of higher gravity will form an emulsion with the water and produce a mixture which is very difficult to pump. (2) The oil must not be too warm. Heating an oil raises its gravity and increases its tendency to emulsify with the water. Best pumping results will usually be obtained when the oil has a temperature of from 65 to 85° F. (3) The velocity of the mass must be at least 3.5 ft. per second and should be greater if possible. (4) Sharp bends, rough places, etc., in the line which tend to break the water envelopment must be avoided.

The line now operated under this system is 285 miles in length. A steel pipe is used, 8 in. in diameter, each joint being tested in the shop to withstand a working pressure of 1200 lb. per square inch. Pumping stations average 24 miles apart, giving an available fall in pressure per mile, assuming 800 lb. working pressure on the pumps, of from 32 to 35 lb. At each pump station the oil is run into a tank and allowed to settle for from 24 to 48 hours or longer. The water, being heavier than the oil, will gradually drain to the bottom of the tank, where it can be drawn off. The process of settling is, however, much slower than might be expected, and no attempt is made to entirely separate the mixture before re-pumping. Although the oil is thus settled eleven times during the process of pumping 285 miles, it reaches the terminal station holding in mechanical mixture about 25% water. The greater portion of this water would probably leave the oil if the mass were allowed to remain undisturbed a sufficient length of time. However, to hasten the settling and render it more complete, the mass is pumped through a heating tower, or tank, 15 to 25 ft. in diameter and 40 ft. high, the first 12 ft. of which tank contains water at

212° F., kept boiling by means of steam-coils. The incoming oil is passed direct from the field line into this tank, which it enters through a pipe lying on the inside bottom of the tank in the form of a Maltese cross. In the upper circumference of this pipe slits are cut about ¼ in. wide and from 1 to 1½ in. long. These slits distribute the mixture into the boiling water in a series of ribbons. The sudden heating causes the oil to lose the greater portion of its moisture, so that it may be drawn off at the top of the tower containing not over 2 to 5% of water. From the heating tower the oil goes into a settling tank, where it is allowed to stand for several days. From this tank it is finally drawn off to cars and ships through a swing pipe operated to draw always from the top of the oil. Any water which settles in this tank is carried away through a bleeder in the bottom.

Commerce demands a fuel oil containing not more than one to two per cent of moisture. To make sure that this proportion is not exceeded, samples are taken daily from various depths in each settling tank as well as from all cars and vessels as they are loaded. It will usualy be the case that practically all the oil is drawn from a settling tank before the specified percentage is exceeded. There is, however, always a certain amount of residue left in each settling tank which contains water in excess of requirements. This residue is either passed back through the heating tower or placed in a similar but somewhat smaller tower where superheated air is pumped through it until the excess of moisture is evaporated.

HOT-OIL PROCESS

All other pipe-lines in California are operated under the so-called 'Hot-Oil Process'. This system consists in pumping the oil dry, that is, without the addition of water, and of passing it at each station, before it reaches the main-line pumps, through a heater where the temperature is raised from normal to 130 or 150° F., depending on the temperature of the atmosphere. The heater consists usually of a drum 5 ft. in diameter by 21 long, constructed much on the principle of a water-tube boiler. In this the oil, while passing through, is heated by means of exhaust steam.

Experience in pumping oil by this process indicates that the essential features to successful operation with California oils are: (1) An oil lighter in gravity than 16° B.; (2) A temperature at all times of 100° or greater; (3) A velocity of at least 3.6 ft. per second.

An oil of somewhat less gravity than 16° B. can be pumped, but its movement will be sluggish because of its high factor of viscosity. Raising the temperature of an oil will increase its fluidity; in general, any California oil between 16 and 20° B. must be raised to a temperature of at least 100° F. before the viscosity factor is sufficiently reduced to insure a free movement of the molecules of the oil one upon the other.

Under ordinary conditions, as when practically all of a pipe-line is buried in the ground for its total length and the pipe is running full under a constant velocity, the fall in temperature of heated oil between the initial temperature and normal is almost directly proportional to the distance traversed. When the distance between pumps is too great to admit of incoming oil having a temperature of 100° F., intermediate heating-stations are constructed. The heaters are placed in a bypass from the main line and consist of a two-compartment brick flue about 250 ft. long. In each compartment is placed a number of rows of pipe, about four inches in diameter, in such a manner that the oil, which enters the flue at one end, travels the full 250 ft. by the pipes in one compartment and returns a similar distance to the same end at which it enters by the pipes in the other compartment. The heater is fired either at the end or in the middle, and the air in the flues is kept at a temperature of from 400 to 900° F. With such an arrangement it is possible to raise the temperature of oil having a velocity of 2.5 ft. per second 40 to 60° Fahrenheit.

Pumping-stations for this system are usually so spaced as to give an available fall in head per mile of 60 lb. per square inch with 800 lb. working pressure at the pumps, or in level country they would be about 13.3 miles apart. The pipe used is black line pipe tested to withstand a working pressure of 1200 lb. per square inch.

The Davis, Oklahoma, Zincfield

By L. C. Snider

In the heart of the Arbuckle mountains, 7 miles southwest of Davis, Oklahoma, is a zincfield which has recently shown promise of development. The productive horizon is a dolomitic member in the lower part of the Arbuckle limestone. The dolomite outcrops from northwest to southeast along the northeast side of two large granite-porphyry hills, known as East and West Timbered Hills. The belt has a length of 15 miles and an average width of less than ½ mile. The porphyry and dolomite are separated by the Reagan sandstone, of Middle Cambrian age, and the lowest portion of the Arbuckle limestone, which is a dense, thin-bedded, blue-gray limestone. The limestone above the dolomite is similar to that below, except that the layers are much thicker. Locally, at least, there is an intraformational limestone conglomerate at the top of the dolomite. The limestones and dolomite dip steeply to the northeast away from the granite porphyry. The average dip is between 40° and 50°, but there is much variation due to minor folding and to faulting. Many small faults almost perpendicular to the strike cross the outcrop of the dolomite. The lateral displacement due to these faults varies from a few feet to 20 rods. In every case the northernmost block is displaced to the east. All the rocks are much broken by jointing, but this is especially true of the dolomite. A sharp blow of the hammer breaks a large block into small, angular fragments, few of which are over one inch in any dimension. The concentration of the zinc in the dolomite is probably due to this broken condition, the small seams forming channels for the passage of circulating waters carrying zinc in solution and at the same time affording small cavities for the deposition of the ore.

It is claimed by the prospectors and others interested, that all the dolomite area contains rich ore, but from the present development this is only proved in a limited portion of the belt, lying in sections 17, 18, and 21, in T. 1 S., R. 1 E. Here the zinc ore occurs as the carbonate from the surface to a depth of 5 to 8 ft. Below this level the zinc is in the form of sulphide or zincblende. The carbonate contains large proportions of dolomite. The blende is usually finely disseminated, but in some cases seems to have largely replaced the country rock so that the blende makes up the larger portion of some of the strata. The two most important mines that have been opened show two layers of the blende-bearing rock, each 3 to 4 ft. thick, separated by a layer of 'dead rock' 5 to 6 ft. thick, carrying only thin seams of blende. A well being drilled on one of the properties is said to have shown the rich ore to a depth of 30 ft. and to have penetrated a similar body at 125 ft. below the surface.

The samples collected so far show the following results:* Four samples consisting of chips from surface blocks in different parts of the field show, respectively, trace, 0.17, 0.77, and 1.32% zinc; samples of carbonate from near the surface and from shallow prospects in different localities show, respectively, 0.55, 0.45, 0.77, and 5.4%. A sample composed of chips of a large number of blocks in a pile of blende ore selected for milling shows 25.46%; a sample of blende from one of the deeper prospects shows 8.88%; a sample from all parts of one of the most widely advertised mines or prospects shows 7.29%. The concentrate from the only mill which has been built shows 45.96%. The mill was not run long enough to get the crushing machinery and tables properly adjusted, so that the showing of the concentrate is probably not so good as can be obtained. Much higher values than those shown by these analyses are reported by others, and for that reason it is judged best not to give the exact location of the samples until a larger number can be collected and analyzed.

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*Analyses by Frank Buttram, chemist, Oklahoma Geological Survey.

Other metals occur in small quantities with the zinc. An interesting feature is a narrow belt of iron ore (hematite) seldom over one rod in width, which lies near the middle of the dolomite member throughout the length of its outcrop. Bowlders of hematite, in part altered to limonite, are strewn thickly along the surface of this belt. Some of them are as much as 10 ft. in diameter. In only a few cases does the iron ore extend as much as 10 ft. beneath the surface. The richest portion of the zinc ore so far seems to be in close proximity to this iron bearing horizon. The cause of this segregation of the iron ore into so narrow a belt is problematic, but it is entirely possible that it is due to a small fault parallel to the strike of the rocks. Such a fault would be almost impossible to trace in the dolomite unless the belt of ore itself be taken as evidence of its existence. The localization of the ore took place before the formation of the small faults perpendicular to the strike previously mentioned, since the iron-ore belt is offset by them.

Pyrite and marcasite are practically absent from the zincblende in the body of ore near the surface. The cuttings from the deep body found in the well previously mentioned show some pyrite, but it is apparently in small quantity. Lead occurs in small quantity near the surface as the sulphide and as the carbonate. Copper stains are often present, and some pieces of malachite and azurite have been discovered in different parts of the field. So far no large body of copper ore is known to have been found, although there are rumors to the effect that such bodies exist.

The principal development so far consists in small openings or prospects. One company has a mill with four concentrating-tables. The mill was run less than one day before the water-supply was exhausted, consequently little can be said of the milling properties of the ore except that fine grinding is necessary to insure complete separation. A well is being drilled at this mill in the hope of securing a permanent water-supply. Three other companies have boilers on the ground and mills ordered. One of these companies has a core-drill outfit ordered and plans to prospect thoroughly for deep-seated ore. Several carloads of carbonate ore have been shipped from the field. This is reported to have paid fairly well. One or two carloads of sulphide ore has been shipped, but the results could not be learned.

Although there is undoubtedly considerable ore present in the field, there are several factors which combine to make the value of the field somewhat problematical and to render any prophecy along this line a matter of guesswork. Some of these factors are as follows:

1. The question as to the areal extent of the ore. While the prospectors admit that the richest ore is near the outcrop of iron ore which has been described, they claim that good ore is present practically to the edges of the dolomite outcrop. The samples so far collected from prospect pits near the edges of the dolomite, and analyzed in the Survey laboratories, do not bear out this claim, but the number of samples collected is too small to warrant a definite conclusion.

2. The depth to which ore occurs. The first body of ore does not exceed a depth of 40 ft. over most of the area which has been the most thoroughly investigated. The only investigation at a greater depth than 50 ft. is the well which has been mentioned. Some ore was found at about 125 ft., but as a churn-drill was used, neither the exact thickness nor percentage of zinc can be told with accuracy. Thorough prospecting with a core-drill is the only method of settling this question, and until this is done, any statement as to the probable value of the field must be founded on mere supposition.

3. The absence of pyrite is favorable to the production of concentrate low in iron, but, on the other hand, the extreme fineness of grain of much of the ore will render complete separation very difficult, and the concentrate will probably run high in lime.

4. The question of adequate water-supply is unsolved. The portion of the region which is being developed lies near the headwaters of a small creek, and there is not sufficient water through most of the year to supply the ore-concentrating mill already built. The limestone and dolomite are too badly fractured to form a reservoir for any water which might be impounded during the wet season. The problem may be solved by the deep wells which are proposed, but the high dip of the rocks, the small catchment areas, and the presence of numerous sink-holes renders it improbable that an adequate supply will be found at any reasonable depth. A possible solution is to pipe water from Honey creek near Turner's Falls. The distance is about 4 miles from the mines in section 18, and the mines are approximately 250 ft. above the creek. Water for the northern portion of the field can probably be secured from Colbert creek, about 2 miles below the stream from the mines.

5. The ore or concentrate must be hauled to Davis, a distance of 7 miles, over roads which at present are very bad. This, of course, is not prohibitive, but should be borne in mind in trying to arrive at any estimate as to the value of the field.

Silver and the Far East

Below are London's exports of bars of silver to the Far East, including India and China, together with corresponding influences affecting prices of silver, in pence:

	Av. price in pence.	London exports.	Influencing events.
1902	24 1/16	£ 7,565,305	Boxer war; silver falls.
1903	24¾	8,051,780	India buys heavily.
1904	26⅜	10,038,319	U. S. buys for Philippine coinage.
1905	27 13/16	8,643,405	Mexico stops free coinage; India buys more.
1906	30⅞	15,565,334	U. S. and India buy silver.
1907	30 3/16	12,752,230	India stops buying.
1908	24⅜	10,243,968	General depression.
1909	23 11/16	8,936,765	Big cotton crop.
1910	24⅝	8,700,000	Big wheat crop.

Crop conditions in India are so intimately associated with silver that a good yield soon reflects itself in better silver prices, if not in larger takings. India's great cotton crop in 1909 of 3,773,000 bales was an increase of 44% over the previous two-year average. The wheat crop of 1910, together with a good cotton yield, combined to restore the hope and confidence in the future of silver. But the natives have taken more gold, commerce has called for gold instead of silver, and the Government has not bought. This has left the speculative banks of Bombay to finance the silver movement. To what extent they have unloaded is uncertain, but if they still hold largely in the face of the new year's crop conditions, their prospect is not encouraging, and the prime hope of higher prices may yet lie in the revival of trade and industry in China and elsewhere.—*Boston News Bureau.*

STEAM-SHOVELS have been in use abroad for many years, but all modern developments along the line of power and size have emanated directly or indirectly from the United States. American shovels are now standard for heavy work, though a few heavy machines have been built recently in Germany. The first real 'steam-shovel' built in America was made by the Pound Mfg. Co. at Lockport, New York, in 1870. It was built largely of wood, mounted on wooden wheels, and controlled by one vertical engine. It was necessary to dismantle it in order to move it any distance.

Dredging at Dawson

Staff Correspondence

This season began with one of the latest and coldest springs on record. Consequently all mining work was delayed. The two dredges of the Canadian Klondike Mining Co., at Bear Creek, began work the latter part of April, and those of the Yukon Gold Co. a few days later. All dredges have since been running smoothly and doing well. The 16-cu. ft. boat of the Canadian Klondike M. Co. is working satisfactorily, and the owners are much pleased. No serious defects have developed, and the boat has been able to maintain its expected capacity. This company's 7-cu. ft. boat is also doing good work. These two dredges were designed and constructed by the Marion Steam Shovel Co. at Marion, Ohio. There is some likelihood of the Canadian company building another boat of the same size and design as the 16-cu. ft. boat. However, this has not been definitely settled.

The Yukon Gold Co. has under construction two new 7-cu. ft. Bucyrus dredges, with steel hulls, the first of their kind in the Klondike. One of these boats is to be placed on upper Bonanza creek, and the other on No. 7 Eldorado creek. It is expected that they will be finished early in September, and will be well tried out this year before going into winter quarters about November 1. This company also moved one of its boats from Lower Bonanza creek to a point six miles farther up the creek during last winter. It was dismantled last fall and hauled up the creek over snow roads during the winter and reassembled early this spring, getting to work in the latter part of May, since when it has been doing well. When the two new boats are completed the Yukon Gold Co. will have six 7-cu. ft. boats and three 5-cu. ft. boats in operation—nine in all; these boats dig an immense amount of gravel during each season. As these dredges work their way up the creek they will undoubtedly be in richer ground; consequently, each year should show an increase in their combined output. They are all well equipped and splendidly managed. The hydraulic work of this company has been going steadily ahead this season, plenty of water having been available. Several new properties have been opened which should materially add to the output of this part of the company's holdings.

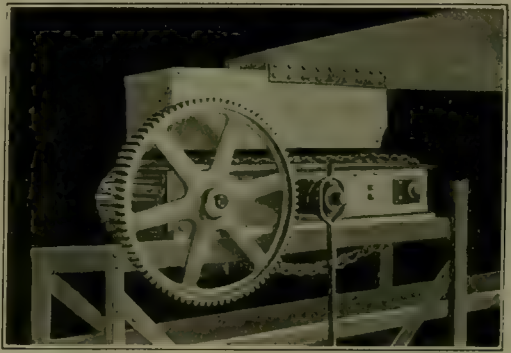
The Risdon dredge owned by the Gold Scoopers Co. of London, lately placed on the lower end of Walker Fork, Alaska, was dismantled last fall, and during the winter moved to the North Fork of Forty-Mile river, and reassembled this spring on a property known as Mosier Bar. This boat got to work early in June, and as the ground on which it is to operate is known to be exceptionally rich, there is no doubt that the boat will handsomely repay its owners for the difficulties they have experienced up to the present time. R. H. Milvain is resident manager for this company; Russel King, its president, remains in London. Mr. Milvain is also manager for the Walkers Fork Gold Dredging Co., whose property lies well up toward the headwaters of Walker Fork, a tributary of the Forty-Mile river, and is also in Alaska. The dredge belonging to this company is also a Risdon boat, and has been successfully at work since early in May. It is generally understood that some unexpectedly rich ground has been found of late, and it is to be hoped that this will continue. Generally, the clean-ups on this property are good, even for this country. The dredge operating at the lower end of the Forty-Mile river was sunk this spring during the high-water period and has not yet been raised.

The Northern Light & Power Co.'s plant at Coal Creek has been completed, and supplied power to the Yukon Gold Co. and the Canadian Klondike Mining Co. during the latter part of last season and the early part of this season. This company generates its power from steam, burning coal from its own mines, which are close to the plant, so that delivery to the furnaces virtually takes place at the mine's mouth. The plant has been shut down since about the first of July; it is probable, however, that it will be started up again about September 1. The hydroelectric power-plant of the Granville Mining & Power Co., situated on the North Fork of the Klondike river, began producing power this spring, and is at the present time supplying the Canadian Klondike Mining Co. with power for the two boats which they operate. This plant is capable of generating 10,000 hp. at present, and can be enlarged to twice this capacity at no great expense. It is expected that it will be necessary to increase its present capacity in the near future; this will be done as the occasion demands. The watercourse for the supply of the plant is ideally placed, running from its intake to the pressure-box over almost entirely level country. The entire bottom of the ditch is in gravel, so that no trouble need be feared from either leakage or the ordinary troubles of hillside waterways.

There is no new work under way in this section, though much talk of that contemplated; it is expected, however, that the Granville Mining & Power Co. will soon start work on a ditch that will carry water from the Klondike river up Hunker creek to a point opposite Dago hill, where it is understood it will be pumped by the company's power to an elevation sufficient to permit hydraulicking on this hill, which has an elevation of approximately 400 ft. above the Klondike river and 300 ft. above the ditch that will supply the pumps, necessitating a raise equal to at least 500 ft. for the purpose of hydraulicking. There have been some new finds made on tributaries of the Yukon river some hundred miles up-stream and south from Dawson, but nothing authentic has yet come in. On the whole, the district is in much the same condition as it was last year, though it is probable that this year's gold output will exceed that of last year, on account of the two new dredges now being erected by the Yukon Gold Co. and the addition of the 16-cu. ft. boat to the Canadian Klondike Mining Co. Account should also be taken of the richer gravel that Yukon dredges will undoubtedly secure as they advance farther up Bonanza creek.

Ore Feeder

At the Chino copper mine, Santa Rita, New Mexico, ore is drawn from coarse-ore bins upon a conveying belt which carries it to the rock-breaker. To meet the problem of gates and of steady feed the device figured below is used. The ore falls through an opening in the bottom of the bin, not as here represented through a chute, but directly upon a short length of steel conveyor which is mechanically operated. The gate itself is not closed, as when the conveyor is not moving the ore piles up on the belt and chokes. By changing the speed of the conveyor the amount drawn from each bin is regulated. The whole device is simple and effective. A similar arrangement was put in the Boston Consolidated mill when it was built, except that the short feeding-belt traveled at right angles to the main conveyor belt, instead of, as at Chino, parallel to it.



A cubic mile of average rock weighs 12,800,000,000 tons.

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

The Economy of Dynamite

The Editor:

Sir—Having read 'Student's' letter in your issue of August 19, I wish to question his statements as to the energy developed by the explosion of one pound of dynamite.

H. Brunswig, in his 'Explosivestoffe' (page 61), gives the following results of calorimetric tests of various explosives. (I have changed the units from the metric to the foot pound system.)

Explosive.	Heat developed in lb. Cal. per lb.	Energy equivalent to heat in Col. 2, ft. lb.
Blasting gelatine (7% cotton)....	1640	2,240,000
Nitroglycerin	1580	2,210,000
75% dynamite	1290	1,797,000
Nitroglycerin pulver (40%) (gelatine dynamite?)	1290	1,797,000

I should be interested to know on what grounds your correspondent "assumes" the initial pressure of the explosion to be 120,000 lb. per square inch, and how he "calculates" the energy expended to be 724,150,000 ft.-lb. per pound of dynamite.

ANOTHER STUDENT.

Douglas, Arizona, August 22.

Pitch of Ore-Shoots

The Editor:

Sir—The inquiry of the 'Gentleman from Sonora' as to the direction of pitch or trend of ore-shoots in the plane of the vein, is one that interests all miners. I have heard numerous engineers and miners express opinions on this interesting and important subject, but as far as I am aware no 'rule' has, as yet, been discovered by which the pitch of an ore-shoot may be pre-determined. I have repeatedly heard mining men say, that: "standing on the outcrop of a vein and looking down the dip, the ore-shoot will trend to the right." This is correct—where it happens to occur that way, but there are a great many exceptions to this 'rule.' In some instances there are certain 'indications' which may be considered a guide, but I am not sure that these indications are always to be depended upon. Take a case where a slaty or schistose formation, having a north-south strike and an east dip, is cut by a vein having a northwest-southeast strike and a northeast dip—the angle in either case is unimportant. Along the walls of such a vein the laminations of the inclosing slate, or schist, where exposed in the mine workings, will usually appear as a series of striations, or grooves, of greater or less strength, and the ore-shoots, if there are any, will be likely to be found to pitch downward along the vein in the direction of the pitch of these grooves. These grooves or striations must not be confused with the striations produced by movement of the walls of the vein. These latter are of common occurrence, and some consider them a safe index of the direction of the pitch of the ore-shoots, but I have not found them to be dependable. In fact, it is no uncommon thing to see two or more sets of such striations running in different directions, on the same wall. They merely represent movement of the walls in different directions, at various times, due to change in the direction of stress in the rocks. The walls of a vein, whether conforming to the strike and dip of the enclosing rocks or not, are often sinuous in their course as well as in their dip, these planes (the walls), appearing as a series of wave-like undulations, forming a succession of rolls or troughs, of varying size. Generally these rolls have a trend or pitch downward along the vein. In such cases the ore-shoots are likely to follow the trend of these rolls. A number of interesting experiments can be made in studying the result of the intersection of the strike and dip of strata by veins, by placing a number of thin boards side by side to represent the strike and dip of the formation, and then sawing these at various angles to represent the vein cutting the formation in different directions of both strike and dip. The two examples above mentioned will, I believe, give the key to the situation in most cases, though there may be exceptions. The trend or pitch of ore-shoots along a vein is due no doubt to physical conditions, and the direction of this trend can be determined with reasonable certainty wherever the true nature of these physical conditions can be ascertained.

WILLIAM H. STORMS.

Berkeley, California, August 7.

Mining and Speculation

The Editor:

Sir—During the past four or five years that I have been a reader of the *Press* I have often noticed in its columns the statement, that mining is a speculation; and being a man of limited ability, I was swayed by this talk so I bought myself an alfalfa ranch. This accounts for my being in arrears with my subscription. I would like to have it made plain that mining is not a speculation but a business that must be thoroughly understood the same as any other business in order to be a success. I contend that the surface indications of a new mining property are like the preface of a book; if we were only smart enough to read them correctly.

Reverting again to the farm, I will say to the editor when you are tired, weary, and long to be away for a little rest and recreation, come to the Silver Oak's Farm, six miles northwest from Modesto, and enjoy the exhilarating rural breeze of new-mown hay, have spring chicken for breakfast, help yourself to all kinds of fruit, and smoke a corn-cob pipe to your heart's content. If we are not at home when you get here, the latch-string is on the outside of the front door just above the cat hole. Walk in, introduce yourself to the family, and be at home till I come to talk mines with you. Once a miner always one. I shall keep the ranch, but continue mining.

AN OLD MINER.

Modesto, August 22.

[Thanks for the invitation. We will come at the first opportunity. We agree that mining is not a speculation, except in the sense that any business is speculative, to one who goes at it with knowledge and determination. Our preachments have been aimed rather at those who have neither special knowledge nor persistence. To such persons mining is highly speculative, and they have no right to blame the industry if they lose money mining.—EDITOR.]

TEXAS IRON ORE is expected soon to be available, especially for Eastern markets. Transportation facilities are now being provided between the orefields in Morris, Cass, and Gregg counties and the shipping port of Port Bolivar on deep water. From Port Bolivar the ore will be transported by vessel around Key West to Philadelphia. Shipping from these mines may be inaugurated soon after October 1. According to the *Iron Trade Review*, prospecting and development have disclosed the presence of a large body of hematite in Texas. This ore runs about 48% iron in the natural state, about 0.12 in phosphorus, 12 in silica, and from 2 to 5 alumina. The ore is lumpy material and of good physical quality. Some trial lots have been used in the mixtures of eastern Pennsylvania blast-furnaces within the past year and have produced satisfactory results.

SPELTER has advanced to 6.20c. per pound St. Louis and 6.35c. New York. At these levels a gain of one-half cent per pound has taken place within the past three weeks. The highest price at which spelter ever sold was in the neighborhood of 6½c. a few years ago.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE VOLUME of the lithosphere, including the continents elevated above the sea, is 1,633,000,000 cubic miles.

THE SALT in the ocean would make 4,800,000 cubes each 1 mile in dimensions, which, if spread over the United States, would form a layer 1.6 miles high.

RUSSIAN measures of volume may be easily translated by using the following formula: 7 cu. sagene = 343 cu. ft., 12.704 cu. yd., 2.68 cords, or 9.71242 cu. metres; 1 cu. chetverik = 26.24 litres; 1 vedro = 12.30 litres.

THE ATMOSPHERE is equal in weight to 1,268,000 cubic miles of water, which, however, is only one two-hundred-and-thirty-eighth of the volume of the ocean; yet this would be sufficient to raise the level of the ocean 45 ft. on all shores and to submerge an important part of the continents.

ROUND-POINTED shovels should be used where shoveling broken rock from a rough rock bottom. Where a smooth bottom is available or sollars can be laid, square shovels are to be preferred. At the North Star mines, laying sollars and changing to square shovels increased the amount of rock handled per man per shift by 20 per cent.

IN WATER-POWER development the prime requisite for a small power are, first, a stream of water of an appreciable volume, and second, a water fall, a rapid, or a gradient of appreciable amount. In round numbers a stream having a flow of one cubic foot per second will generate one theoretical horse-power for every 10 ft. of fall it has. Thus, a stream flowing 4 cu. ft. per second, and having a fall of 30 ft., could generate 12 theoretical horse-power.

DIAGONAL GRAIN, due to the sawing, is a serious defect in structural timbers, and there is ample justification for guarding against it in specifications and grading rules. The results of tests indicate that a slant in the grain as great as 1 in 45 inches can be admitted without seriously affecting the strength of the timber, but if the diagonal grain is much more pronounced than this, the timber, if heavily loaded, may fail suddenly in cross-grain tension some time before the compression strength of the wood is developed.

IRON DEPOSITS of the 'magmatic type' are due to the separation of the iron minerals from cooling basic igneous rocks. Magnetite is the most common iron mineral and usually carries titanium. The type is well represented by the titaniferous iron ores of Quebec and of eastern New York. From a commercial standpoint this ore is at present largely useless. Changes in furnace practice and improved methods of concentration will probably make it valuable in the future. The nickeliferous pyrrhotite of Sudbury also belongs to this class.

RUBBER SUBSTITUTES are much in demand, and in an effort to find a cheap one interesting experiments have been made with two bituminous minerals, elaterite and tabbyite. Material very similar to rubber can be produced, and good wearing qualities are claimed for it when used in automobile tires and elsewhere. Other varieties of bitumens similar to elaterite and tabbyite have been discovered. One of these, known as wiedgerite, is a soft moist material about the color and consistence of liver, which turns black on exposure. Wiedgerite, which is somewhat high in sulphur, is claimed to be especially valuable for the manufacture of rubber substitutes.

CHLORATES are salts used on matches and in gunpowder. Chlorate of potassium is a valuable salt with important uses. It is made from common cheap potassium chloride, in solution in water, by simply electrolyzing the solution without trying to separate the products forming at the electrodes. It is a simpler operation than the production of electrolytic alkali. Chlorate thus forms in the warm solution, and is obtained by letting the solution cool and the chlorate crystallize out. The ordinary chemical manufacture of this salt was tedious and dangerous; the electrolytic method has practically entirely superseded it.

THE PANAMA CANAL is undoubtedly the best instance of the use of modern excavating methods. Here there are 100 steam-shovels in use, 47 of which are of the heaviest and most powerful type. On account of the very accurate records kept it is particularly interesting to note the outputs recorded in material which is considerably harder than the average. The daily record is now held by a 95-ton shovel built by the Bucyrus company. This machine in 8 hours dug 4823 cu. yd. of material designated as rock and earth, although delayed 160 minutes waiting for cars and for other reasons. More remarkable performances are frequently reported by contractors, but the above is mentioned as it is strictly official.

'STAND-BY' losses constitute a serious element of cost in the running of a steam plant for generating electric current for community supply, where the load changes are great, and at times rapid. In order to handle this change, boilers have to be kept hot, ready for instant service, at a considerable loss of fuel, and when the load is off, the stored energy in these boilers is lost. With an oil gas-producer plant these losses disappear, as the plant efficiency is lowered only a few minutes after starting, and then only a small fraction from its maximum efficiency. Gas is generated the instant the fire is lighted, making it possible to operate a plant constantly at its highest economy by cutting out units as the load falls off, and putting them in as the load comes on.

THE FRASCH process, whereby practically pure sulphur is obtained directly from wells, was invented by Herman Frasch, of Cleveland, Ohio. It is extensively used in Louisiana. The process is as follows: A well is driven in much the same manner as a gas or oil well is sunk, and into it are placed several concentric lines of pipe. Superheated water, introduced through the outer pipe, melts the sulphur, which may be several hundred feet below the surface. Hot compressed air is then forced through the smallest of the pipes. This forms an aerated emulsion with the molten sulphur, which is forced out by hydrostatic pressure between the remaining pipes and discharged in a purified form into large vats where cooling, solidification, and feeding go on simultaneously. The sulphur is then broken up, shipped by rail to the Gulf coast, loaded on ships by machinery, and transported to Eastern coast ports.

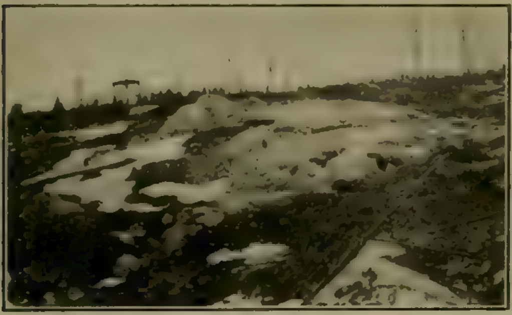
ASBESTOS, according to J. S. Diller, plays a more important part in the national life than is generally credited to it. The well-made asbestos theatre curtain assures the safety of the audience from stage fires. In the home the asbestos covering of the furnace and heating pipes, or of the gas logs in the open fireplace, makes for economy and comfort. Wherever steam is used as a motive power in factories, on trains, or on ships, it is asbestos packing that holds the steam to its work; on the other hand, if electricity is employed the wires are probably insulated by asbestos tape and the adjacent parts are made of asbestos 'lumber.' Asbestos shingles and sheathing make houses cooler in summer and warmer in winter and reduce the fire risk. From the ice-house, where asbestos protects the brine pipes from the heated air, to the foundry, where it shields the workman from molten metal, in the workshop, the home, or the place of amusement, asbestos contributes materially to human welfare.

Special Correspondence

TORONTO, CANADA

Porcupine Ore Occurrence.—Cobalt Shipments.—Revival in Lake of the Woods District.

Porcupine stocks have been steadily declining for some time, but the recent sharp downward tendency has probably been largely due to the publication of a report by the Ontario Bureau of Mines in which the writer, A. G. Burrows, corrects some of the greatly exaggerated ideas prevalent as to the richness of the area. Mr. Burrows, after dealing with the geology of the district, states that the occurrence of gold is associated with the quartz solutions which circulated through the fissures in the Keewatin and Huronian formations, and emphasizes the irregular and non-continuous character of the fissuring, owing to which the quartz structures present a great variety. While some are tabular, though often irregular and lenticular veins traceable for several hundred feet, others are mere veinlets, very narrow and only a few feet in length. Irregular bodies are often found, which may have a width of 10 or 20 ft., but disappear at a distance of 50 ft. The underground extension of the dome-like quartz masses presenting an elliptical or oval surface outline, has not been closely examined, but the report states that in some parts these masses can be seen in contact with underlying rocks at a low angle. This would suggest that they are broad lenticular masses which have filled lateral fissures in the country rock.



OUTCROP OF QUARTZ AT DOME MINE.

The general conclusion reached is that the distribution of gold in the veins is as a rule irregular, occurring along one or both walls, while other portions of the vein may be very low in grade. Spectacular showings occur on many properties, but these are limited to portions of the veins, and therefore, considering the irregular character of certain veins and the quantity of country rock which will have to be mined, the ore must be regarded as low grade. The slump in the market coincident with the publication of this report, if not mainly due to it, has apparently run its course, and the market shows some indications of greater firmness during the last day or two. There are at present four stamp-mills either under construction or shortly to be established, so that it is anticipated that active production will be under way by the New Year. The work is in progress at the Hollinger and the Dome, which will install 40 stamps each, the McIntyre will proceed at once to lay the foundations for a mill of the same capacity, and the Vipond, which had determined on putting up a 10-stamp mill, will delay operations until another level has been reached and more ore blocked out. At the Crown Reserve property a 12-ft. vein of quartz and schist running from the Hollinger has been opened by trenching and found to carry free gold. At the Rea an adit has been pushed for 100 ft. on the orebody at the 200-ft. level. Native gold shows across the width of the vein, which is 4 ft. The Dome has taken over on option, for an amount stated to be $500,000, the seven Jowsey-Wood claims in Carscallen township, Cripple Creek area. The veins contain iron and copper pyrite as well as good showings of gold. Men identified with the Crown Chartered have taken an option on the five Davidson claims in Northern Tisdale at a price reported as $175,000. Two of these claims adjoin the Crown Chartered location. Louis Reyersbach, business manager for the Central Mining & Investment Corporation of London, and Hugh Marriott, consulting engineer for the same interests, recently visited Porcupine and Cobalt.

Although the tonnage of the shipments of ore from Cobalt shows a decrease as compared with last year, the value of the output shows a satisfactory increase, owing to the greater quantities of concentrate and bullion sent out. The output for the first six months of the year was 11,978 tons, as compared with 11,868 for the first six months of 1910. The values of ore and bullion are calculated at $7,927,333 and $6,104,372 for these respective periods. The Coniagas has made remarkable progress lately and has ore of the estimated value of $8,000,000 blocked out. A good find has been made on the Gould Consolidated property on Cart Lake, native silver in considerable quantities having been found in shaft No. 2. A large force will be set at work and development pushed. At the Gleason claim, half a mile from Gillies station, where extensive prospecting had for some time led to no important results, wire silver has been found in a smaltite vein at 45 feet.

The Black Eagle gold mine, also known as the Regina, in the Lake of the Woods district, is being unwatered for examination on behalf of an English syndicate. It was at one time a large producer. The Penniac, another Lake of the Woods property, though just across the Manitoba border, is working in good ore. Visible gold is shown at the bottom of the shaft 76 ft. down, and surface stripping has disclosed high-grade ore. The St. Anthony at Sturgeon lake, another old-time producer, is being successfully worked. An off-shoot of the main vein traced 20 ft. at the 100-ft. level has widened from 18 in. to $3\frac{1}{2}$ ft. and the orebody is reported to assay very high.

JOHANNESBURG, TRANSVAAL

Criticism of Hatch.—Temperature in Depth.

The prediction of F. H. Hatch, in his 'James Forrest' lecture delivered before the Institution of Civil Engineers, that the future output of the Rand would be limited to £1,046,000,000, has caused much adverse comment on the Rand. From the full text of the lecture, now arrived, it would, however, appear that the depth limit was fixed at 6000 ft., or only about 1000 ft. below the present deep mines, and based on calculations made some ten years ago, while it was further stated that he was inclined to the view that a gradual impoverishment with depth does exist. It is some time since the lecturer was on the Rand. Outside a few instances where he has obtained recent information on metallurgical matters, his illustrations and statements are many years behind the prevailing opinion on the Rand. To limit the mining possibilities of the Rand to a vertical depth of 6000 ft. is far behind present-day opinions. The figures quoted with regard to underground temperatures are six years old. Later observations in the deepest mines have shown that the temperature increases only 1° F. for every 255 ft. in depth, and not 1° F. for every 208 ft. as stated. Then as to the gradual impoverishment with depth, there have been numerous instances of late where the grade has improved at the deepest point, which, as a matter of fact, is shown in the lecturer's own statement of value of ore developed. In many of the new deep mines there has been lately marked instances of improvement in depth as compared with the ore now being obtained in the corresponding outcrop mines. There are, of course, cases where the grade has also fallen with the depth, but there is no general gradual impoverishment as the lecturer is now inclined to believe, and both with regard to the depth and future resources of the Rand competent authorities on the spot would have a little hesitation in doubling the lecturer's figures, providing something unforseen does not happen to reduce the grade of ore more than 30% below its present average.

FAIRBANKS, ALASKA

Quartz Development.—New Companies.—Dredging.

The Newsboy Mining Co., which recently sold 100,000 shares of stock to continue development and buy a plant, has already erected a hoist and compressor and will continue sinking. The shaft will be put down beyond the 115-ft. level as fast as possible, so that when the mill arrives the ore reserves will be ample. To further aid development, 100 tons of ore will be milled at the Chena customs mill this month. The 5-stamp Joshua Hendy mill for the Rhoads-Hall property arrived at Fairbanks early in July and is being freighted to the claim. Another month should see the mill in operation. In sinking below the level of the main tunnel, Mr. Rhoads has struck a flow of water that solves the problem of water-supply for the mill during the winter. The last run of 90 tons sent to the Chena customs mill netted a bar worth a trifle over $10,000, besides the value of the concentrate. The Homestake Mining Co. has placed on the market an issue of 80,000 shares to carry on development. This company owns the claim known as the 'Russian Kids', on which a remarkably rich lead was recently found. The McCarty lead also passes through its ground, and it is the intention of the company to drive the adit until this is intersected. The Tanana Hydraulic & Quartz M. Co. has also placed a block of 50,000 shares on the market. This property, better known as the 'Tony Goessman', adjoins the Rhoads-Hall claim and should be intersected by the Rhoads lead. A parallel vein has been opened for 200 ft. on one of the claims. Inside of two weeks the Huntington mill being erected on the Tolovana will be in operation. Enough ore has already been broken to keep the mill busy for some time.

Since putting on a boiler and hoist, Alois Friedrich has cleaned out the shaft, cut a station at the 110-ft. level, and is now sinking to the 200-ft. level. A large body of good ore was found on the foot-wall while cutting out the station. Two samples across the vein have been sent in which assay $94 and $104 per ton. While timbering the shaft, antimony ore was found on the hanging wall. While some of the hitches cut penetrated this for 14 in., the further extent of the shoot is not known. Three tons of the high-grade rock is now going through the test mill. Negotiations are under way by outsiders for a bond on the properties between Vault and Wildcat creeks, owned by Drury, Cathcart, Friedrich, and McDonald.

Sinking is still going ahead on the Fairbanks Quartz Development Co.'s lease, although water and bad ground have been struck. Mr. W. B. Vanderlip, of the Bonding & Leasing Co., has been suddenly called back to Seattle, by the illness of his wife. A shaft is being sunk by contract on the Berry-McIlroy ground on Fairbanks creek. A recent mill-run of 13½ tons of ore from the McCarty Ledge on Fairbanks creek netted the owners $181 per ton. The litigation concerning this claim has been settled out of court, Angus McDougald getting the upper 300 ft. of the claim. Owing to scarcity of timbers, August Hess, of Fairbanks creek, has had to abandon his shaft till the cold weather again tightens up the ground. He is now engaged in surface prospecting. A mill-run of 50 sacks was recently put through the test-mill by Andy Olson of Wolf creek. The rock came from a new find. The dredge owned by the Alaska Exploration Co. and brought from Dawson is being dismantled at Chena and hauled to Fairbanks creek, where the company has considerable ground. It is also the intention of the company to bring in a 10-stamp mill from Dawson, a complete mill being available there. G. G. Lemmons is manager for the company here, while Dupree Lance is consulting engineer.

Rice & King, who hold an option on a Moose creek prospect owned by Alois Friedrich, are now down 25 ft. in the new shaft. The rock is of high grade and a shipment will be made soon to the test-mill. W. H. Isom, of the N. A. T. & T. Co., has wired for the company expert to investigate the quartz mines of this vicinity, with the idea of investing. Mr. Isom has been in Fairbanks but a few weeks. The expert is expected by the first of August.

JARBIDGE, NEVADA

Discoveries on Buckeye and Bacon Claims.—Buster Flotation.—True Fissure.—Wagon Roads and Mills.

Jarbidge is steadily advancing; new veins are being discovered in new territory, additional orebodies are being opened in the older veins, shafts and adits are proving the veins and grade at depth; one mill is running, another is about ready to be started, several mines are showing reserves which will soon warrant other mills; preliminary work has been started on two water-power plants; one new road into the district is finished and another is nearing completion; the telephone line to Rogerson is almost finished and the one to Elko has been started. Two new discoveries of great importance and equal to anything yet found have been made. The first was on the Buckeye claim, over half a mile southeast from the Bourne mine; the second about five miles farther to the southeast and on the Bacon claims. The Buckeye find was made after considerable trenching in from three to seven feet of surface wash and slide matter. The vein uncovered is equal in size and value to the Bluster. It has been traced by numerous surface cuts 100 ft. on each side of the original discovery and is 5 to 10 ft. wide with good ore in all these openings. Some idea of the average richness of this ore can be formed from the amount of gold accumulated by saving the pannings from the small test-samples panned while prospecting during the past three weeks. This saving amounts to over three ounces of gold. The Buckeye is high up the slope of the mountain, in the heavy slide, east of the great quartzite dike, and heretofore has been considered to be of but little promise.

The Bluster property has had several would-be owners bidding for it, but the owners and buyers could not agree. A company has been organized to work the property, and the first offering of its stock at 30c. was quickly taken. The ground on either side of the Bluster shaft has been surveyed into blocks for leasing, the company reserving the central portion, with three leases to the north and three to the south. All of the leases were taken immediately; two of the lessees have found good ore, while the others were so confident that they began at once on a short adit to cut the vein at a depth of 50 to 100 ft. The Bluster vein has been opened on the Success claim; and has been traced down the hillside across the It and the Sliver fraction to the north side of Bonanza gulch. George Wingfield has been in negotiation for the Bluster and adjacent claims. He is now in camp.

The latest find on the Bacon claims in the Cougar Creek basin, or so-called 'Fifth Crater,' promises to be one of the most important yet made in the district. It was made on newly located ground and entirely to the east of that already proved. A large amount of prospecting has been done along the strike of this vein during the past two weeks and numerous openings have been made where good pannings are obtained, extending along it for a distance of two miles. The first discovery was made on Bacon No. 1. It was traced south onto Bacon No. 2 and Bacon No. 7, and north on the Colonel George, Etta B., and Good Luck fraction. The gold found in this vein is quite yellow in color and seemingly high grade. It is also much heavier than that in the west side veins. From the Etta B. some specimens of free-gold ore have been taken which are equal in richness to any yet taken out of any vein in the camp. The Sugar claim of the Crater City Co. lies between the Colonel George and the Etta B. claims, on the line of the vein, but as yet the company has done no prospecting on this vein, being busy with development on the True Fissure vein and the Sugar vein. The True Fissure Co., having proved the value of its vein by surface work, has started development, that can be carried on all winter, in a long adit to tap the vein at a depth of 500 to over 1400 feet.

The wagon-road from Three creek into and up the East Fork of the Jarbidge, which is being built by the True Fissure and Crater City companies is almost finished to the Dixie cabin, from which good pack trails extend on up Fall, Elk, and Cougar creeks to the Third, Fourth, and Fifth Crater mines and prospects. The Crater City Co. has secured the water-rights on the three creeks named and will put in a power plant near the junction of these streams and just below the end of the road, where it is expected at least 200 hp. will be developed. While the mines of the older section of the camp, such as the Blaster, Buckeye, Bourne, and Pavlak, may have richer ore and wider orebodies, the veins to the southeast, along the higher part of the range, seem to be more regular in formation. They have been traced for longer distances and show a more general mineralization and gold content. There seems to be about an equal division of opinion as to the relative value of the two sections, but some of the best engineers in here tend to the belief that the southern part of the district will eventually prove the most productive. The Clark Fletcher mill on the Bourne vein is grinding away and so far has been running quite well for a new plant. The Pavlak mill is expected to start in less than a week.

JOPLIN, MISSOURI

Higher Prices Lead to Renewed Activity.

With the rise in zinc-ore prices, mines have resumed work to a great extent in the sheet ground district north of Webb City, and for the first time in many months extensive mill building is going on in that locality. Among the more recent plants planned is a 300 ton mill for the S. Y. Ramage ground, where a deep run of ore has been found in a number of drill holes and in prospect drifts. In the soft ground camps, where the cost of production is low, virtually every mine that has not been drowned by the recent floods is producing ore or getting ready to produce. In the flooded camps, pumps are working day and night. Galena, Kansas, especially, suffered greatly from high water, thousands of dollars worth of damage having been done to the mines in the Short Creek bottoms. Many of the mines, flooded the middle part of August, will not be in shape to produce ore again for several weeks.

Mining on an extensive scale has been begun by the Kramer Mining Co., operating the old Herald property at Cave Springs, Missouri. A mill with a daily capacity of 500 tons has been constructed. Zincblende is being developed at 240 and 270 ft., while from a shaft to the west of the mill, dirt from the 100-ft. level is milled. The shallow blende occurs in flint; the deeper ore is disseminated through limestone. Numerous drill-holes have shown the formation to be extensive. Faces 80 ft. high are being carried. Throughout the mill and in the underground workings numerous warning placards are posted. Printed instructions on the best method of cutting drifts, the proper ways of handling explosives, etc., are to be found at every turn. The signals are posted both at the mouth of the shaft and at each level to do away with the possibility of incorrect signals.

The erection of a big concentrating plant on the Ideal Mining Co.'s plant, southwest of Joplin, Missouri, has proved again the oft-repeated fact that a tract is not worked out merely because operations have been suspended. Almost a quarter of a century ago the Ideal ground was one of the heaviest producing properties in the entire district. Then it passed the way of numerous other small properties, and lay dormant for years. The new operators, Craver & Barnes, went into the heart of the old district and at a depth of 55 ft. have opened a series of pockets which have been tested both with drill-holes and with prospect drifts. The mill is one of large capacity and is of modern equipment. Another tract that has 'come back' is the old Kohinoor on the Continental ground at Joplin. For years the Kohinoor was an enormous producer; then it passed into the hands of 'gougers'. The ore was found at varying levels from 75 down to 125 ft. The new company working the Kohinoor is composed of Kansas City men. They first drilled the ground and found that an extensive but comparatively lean blende run, underlay the old mine. The ore is of semi-sheet formation and is found at a depth of 175 ft. The shaft has been sunk to this level, and the Quindaro-Continental mine, as the property is now known, is turning out from 60,000 to 80,000 lb. of zinc ore per week, while the production of galena will average several tons per week.

NEW YORK

Dull Markets — International Lead Furnace — Hayden Smelter — Guggenheims and Copper — Finlay Report

The acute conditions prevailing during the past two or three weeks have not been eased in any way. Liquidation is in full swing. The dominant factor in the situation is the conviction, which in the past few weeks has forced itself upon Wall Street, that there is to be no relief from the present strain until corporate regulation is achieved in some form. That the present agitation will be prolonged into the approaching Presidential campaign is one thing upon which there seems to be a unanimity of opinion. There seems to have been no reaction as yet in the Porcupine issues. A sensational find was made on the North Dome this week; there is some new work going forward, a crew has been started on the Daly Taylor and a vein uncovered. Thirty miles to the northeast of Porcupine, near Matheson, in New Ontario, there are some new properties being opened that show quite as well as the average properties in Porcupine, but in the present depression it is hardly to be expected that new finds would receive attention.

Ever since the erection of the plant of the International S. & R. Co. at Tooele, Utah, it has been anticipated that the A. S. & R. Co. would make some counter move. The International smelter is now handling 700 tons of ore per day. The long promised shipments from the Giroux are now apparently farther away than ever, but the lead stack is nearing completion and the bag house and two of the furnaces are so nearly done that the plant may go into commission in November. In erecting a lead stack the Cole-Ryan people got into territory long considered private property by the Guggenheims, and the announcement that the Ray Con. has sold its smelter site to the A. S. & R. Co. may be looked upon as a bid by the Guggenheims for the business of developing Arizona coppers as a counter for the International move in getting into Utah to handle lead-silver ores. The A. S. & R. Co. takes over the partly constructed plant of the Ray Con. at Hayden and agrees to immediately erect a much larger plant of the latest type and to give to the Ray Con. an advantageous long-term contract. The ores of the Miami Copper Co. go to the Greene-Cananea smelter; this will be one contract that the new smelter will be out to get immediately. The Inspiration, the Live Oak, the Keystone, and other mines are developing and the new plant is expected to soon have all the tonnage it can handle. Presumably the new smelter will have a contract with the Chino, where the first section of the concentrator is just being started. Ray Con. is a particular example of the caprice of market followers. A year or more ago, when ore reserves and metal content were largely problematical, the shares sold above $30. Now with tonnage easily calculable and a mill half completed, the stock is quoted at less than $15. Ray Con., Chino, Braden, and Miami make up a string of new producers that are bound to influence the copper situation. Present equipment plans contemplate an annual output of 80,000,000 lb. of copper from the Ray, 50,000,000 from the Chino, and 40,000,000 each from the Braden and the Miami; a total of 210,000,000 to be produced at not more than 8c. per pound. All of this production is controlled by the Guggenheims, except that of the Miami. They control therefore 170,000,000 lb. of new production to be added to the possible 285,000,000 of the combined output of the Nevada Con. and the Utah Copper, and 24,000,000 now said to be coming to the Tacoma smelter from Alaska, making a rough total of 479,000,000 lb. of copper, practically all of which could if necessary be sold considerably under present prices and still show a handsome profit. On the other hand, the situation is working out along normal lines, in that several high-cost coppers are dropping from the producing list. Not all of these shut-downs are directly due to the poor metal market conditions, but if the metal market conditions were better, there would undoubtedly be found a way to keep the properties going. Among those which have discontinued operations temporarily, First National has closed on account of fume trouble; Granby and British Columbia are closed on account of the strike in the coalfields; Imperial of Arizona is in the hands of a receiver; Butte Ballaklava is closed on account of litigation with the Anaconda; Shattuck Arizona is frankly shut-down on account of the low price of copper; Tuolumne in Butte and the Tamarack of Michigan are only producing about one-half full capacity. This is real curtailment to the extent of about 70,000,000 lb., and while some of these mines will in all likelihood resume operations in the near future, the low price of the metal will not hasten the resumption. J. R. Finlay's report on the copper mines of Michigan, prepared for the Board of Equalization for taxation purposes has worked a world of discussion concerning the mines, and, incidentally, concerning Mr. Finlay. The generally unsettled condition of the Lake copper mines owing to the proposed merger now being bitterly fought in several courts, has not served to quiet the shareholders, and they are in a frame of mind to attach possibly too much importance to Mr. Finlay's report. Still, when Mr. Finlay says the future "is much less promising than it is popularly supposed to be," and again that "the limit of profitable working is now in most cases in plain sight," it is little wonder that holders begin to ask if such opinion comes from competent authority or is to be sustained by facts. Mr. Finlay's report in the main, however, does not vary widely from the figures of the Calumet & Hecla committee, so far as the producing properties are concerned, but Mr. Finlay does wipe out the Superior, the Centennial, the Mass, the Gratiot, and some others that are unable to turn out any copper at a profit on a 14-cent market. Michigan copper people are believers in higher prices and insist that while for taxation purposes these properties may have no present value, eventually their ore will be taken out at a profit.

There is a rumor that L. Vogelstein & Co. have taken over control of the Nevada-Utah Mines & Smelters, but this is denied. Vogelstein & Co. have for some time had an eye on Pioche and it is possible that there is some real foundation for the story. Owing, it is said, to a disagreement concerning the dividend policy pursued by the Nipissing company, D. Lorne McGibbon is resigning from the board of directors. His action breaks the strongest connection between the Nipissing and the La Rose companies. Mr. McGibbon is president of the latter and the La Rose has persisted in maintaining an 8% dividend rate and has accumulated a surplus of approximately a million and a half, while Nipissing has been distributing 30% annually and paying out almost dollar for dollar of its net earnings.

HOUGHTON, MICHIGAN

FINLAY'S APPRAISAL OF COPPER AND IRON MINES.

The State Tax Commission recently arranged for an appraisal for taxation purposes, of the copper and iron mines of Michigan, the farmers of the southern part of the State having contended that the mines were not paying their fair share of the taxes. J. R. Finlay was employed to make the appraisal and the following abstract of his report has been telegraphed by the Associated Press. Mr. Finlay values the copper mines at $69,815,000, the iron mines at $119,485,000, and the coal at $861,745.

He says: "Only nine copper companies in Michigan made money during the last five years. If we could assume that these mines would last forever the investor would probably be satisfied with a 5% income and he would probably capitalize their average earnings of $8,240,000 into a present value for the group of $164,800,000. The fact is that these mines are not worth even half of this amount, because their life is not by any means perpetual. On the contrary, their future is much less promising than it is popularly supposed to be. These mines have shown unusual persistence, but the limit of profitable working is now in most cases in plain sight. It must not be forgotten that the tonnage maintained now is three times as great as the mines have averaged in their fifty years of existence. During the past five years," he continues, "profitable copper mines earned $50,937,690.27 over expenditures, but I consider these earnings abnormal, being chiefly due to the great boom of 1906 and 1907. The iron mines earned in five years, $57,551,202 without the benefit of any abnormal prices." He estimates that the Marquette, Menominee, and Gogebic iron ranges will produce 360,000,000 tons more of ore. Mr. Finlay bases his figures on an estimated price of 14c. for copper, and it is interesting to note that his valuation of the Calumet & Hecla properties, while differing in detail, checks closely in totals those upon which it was proposed to consolidate the companies.

KALGOORLIE, WESTERN AUSTRALIA

JUNE YIELD.—BULLFINCH.—A NEW CAM.—RE-TREATING CHARCOAL.—SALTING SANDS.

The gold yield from this State for June was valued at $2,480,000, and dividends were paid amounting to $552,000.

In the main shaft of the Bullfinch Proprietary, at 210-ft. depth, a flow of 3000 gal. of water per hour has been found. Development of $20 ore recently sent shares up from $3.36 to $4.22. The field is very dull on the whole. Experiments are being tried at the Lancefield mine with the Minerals Separation process as used at Broken Hill. The Lancefield ore is somewhat refractory, containing pyrite, arsenic, and graphite, and extractions average 85 per cent.

All the ore milled at the Oroya Links is now being treated direct in the vacuum plant, but results have not been disclosed so far. A new cam has been devised here by W. Birrell. It is cast in halves, and locked on the shaft by the halves being fitted in one another, and by the ordinary Blanton wedge. The cam has been running for 10 days in a custom mill with 900-lb. stamps, with satisfaction; but is now being tried in the Horse-Shoe mill with 1275-lb. stamps. The idea of the split cam is to facilitate removal from the shaft in case of breakage. Its utility has yet to be proved. The cost is about the same as an ordinary cam.

In the June report of the Chamber of Mines, V. T. Edquist discusses the 'Recovery of Gold-Bearing Charcoal on Re-treating Filter-Pressed Slime.' Years ago this slime was dumped from trucks which had a coating of wood ash to prevent the wet slime sticking to the sides. In re-treating, the slime is mixed and passed through trommels with $^3/_{16}$-in. holes, the reject being mixed again, giving a clean product of charcoal, wood, jute, and waste, assaying from 20 to 40 oz. Au per ton as collected. That portion escaping to the agitators is skimmed off. The rubbish is burned, and the product sold to smelters. The charcoal contains as much as 100 oz. Au per ton, it being the chief gold-bearing material. The other organic matter varies from 1 to 7 oz. Au. The charcoal re-precipitated the soluble gold from the old dump, which contains 23% moisture. The bullion from the charcoal carries only 3% Ag, while from the working solution it is 18% Ag, showing a somewhat selective action.

At a customs mill recently 23 tons of ore was milled, and returned $10.50 per ton from the plates, while the sand assayed $220. The mill people would not pay for the sand on this basis, so the customers took action at the Civil Sessions for a balance of $1400 due. Some interesting discussion on battery work took place, including matters of foul mercury, bad condition of plates, etc. The disputed sand contained a lot of free gold which readily amalgamated when tried. Allegations of salting were made, as the plaintiffs had access to the sample room. The judge concluded that the sand contained only $7 per ton, on reckoning the value of some other sand mixed with part of this particular lot. The plaintiffs lost the case with no costs, and retired sadly, with the stigma of having salted the sand sample. It was a clear case. Another case of alleged salting took place about a year ago in another custom plant. A lot of telluride ore was assaying $40 regularly, when it suddenly jumped to $140, the working of the plant not showing such ore to have been treated. This case was more complicated than the one above mentioned, and to save expense the higher value was paid. Two cases of mines employing foreigners who did not understand the English language were recently brought up by the Mines Department. Fines of $150 and $100 and costs respectively were imposed.

General Mining News

ALASKA

The Tanana

The Tolovana M. Co. has started crushing on its property on Willow creek with a new Huntington mill. Water power is used.

It is reported that on both American and Sullivan creeks in the Hot Springs district the extensions of pay streaks have been found which promise a future for the camp. The Sullivan vein was traced to the McVicker claim.

T. A. Utgaard, T. Nerland, and Nels Gieske are to sink a 70 ft. shaft on the Pioneer property on Chatham creek. On an adjoining claim ore assaying $90 per ton was obtained.

ARIZONA

Gila County

D. C. Jackling, president and manager for the Ray Con. Copper Co., is quoted in the press as stating that negotiations have almost been completed by the A. S. & R. Co. to take over the partly built smelter of the Ray company at Hayden. Final arrangements should be completed inside of two weeks. Three units of the Ray concentrator are in commission and the fourth will be ready in a short time. The present output of the concentrator is about 150 tons of concentrate per day. It is rumored that the capacity of the concentrator is to be increased about three times that figure. The principal source of ore for the smelter under the management of the Guggenheims, who are to operate it as a custom plant, will be the Ray mines. Later advices from Boston quote Charles Hayden, vice-president of the Ray company, as stating that the deal has been completed. The proposed early extension of the Southern Pacific from Hayden to San Carlos, 29 miles, and the finding of new ore in the Globe and Kelvin districts, were factors prompting the taking over of the smelter by the A. S. & R. Co. It is stated that E. L. Newhouse, for the purchasing company, offered to pay the Ray company all money expended on foundation work and machinery and to give the latter a low smelting charge for concentrate from the Ray mill.

CALIFORNIA

Kern County

There were rumors during the week that the Honolulu company's properties had been sold to either the Standard or the Dutch company for $10,000,000. This report was denied by William Watson, of the Honolulu company, who stated that there was no foundation for the report. While the machinery for the extraction of gasoline has arrived, the erection of the house will not be commenced until the close of the warm season. Owing to the expense of construction and the competition of the Standard, the plan to pipe natural gas to Los Angeles has been abandoned.

Nevada County

(Special Correspondence.)—Efforts are being made to open promising quartz veins in the North Bloomfield district, formerly noted for its hydraulic mines. Outcroppings of veins are numerous and it is generally believed that the wash from these orebodies yielded the phenomenal gold gravel of the North Bloomfield placers. On the Jenny Lind, McKilliran, King Edward, Bunker Hill, Oriental, White Diamond, and other claims indications are particularly promising. The development thus far consists merely of slight surface trenching, no attempt at shaft or adit work having been made. From the outcrops the quartz is said to be largely free milling, with values ranging from $5 to $50 per ton. A 4-ft. vein has been discovered on the 400-ft. level of the Golden Gate mine. It has been opened about 25 ft. and appears to carry good milling ore. The 10-stamp mill will go into commission within a few days. The Golden Gate is owned largely by Charles C. Haub, of San Francisco. It is reported that the Prudential mine, formerly the New York-Grass Valley, has been purchased by George A. Aldrich, who has recently become interested in the promotion of the California Midland railway. The Prudential has had a stormy career, lack of finances militating against its deep development. A. P. Wilson is superintendent. Along Deer creek, at Nevada City, several men are washing the gravel. The old time pan is much in evidence.

Nevada City, August 26.

The mill at the Alaska mine will be increased from 20 to 40 stamps, and an order for the machinery will soon be placed. All of the latest gold saving devices will be used, it is stated. The principal development is on a drift driven east on the 750 ft. level. A new hoist for the Alaska has arrived at Nevada City and will be hauled there in the near future. It has a 4000-ft. capacity. Gen. W. S. Schuyler, stationed at Fort Riley, Kan., H. A. Moss, of Moss & Co. of San Francisco, and Oliver Crook, of Oakland, all of whom are heavily interested in the mine, have just made an inspection. George St. John is manager of the mine.

Sierra County

Unusually rich quartz has been discovered at the Red Ledge mine at Alleghany. Two chunks assayed, it is reported, at $1000 and $2500, respectively. It is said that the ore did not come from a pocket, but from a vein which is believed to be a continuation of the Tightner vein. The mine is being operated under bond by J. M. O'Brien, who is represented at the mines by C. C. Derby and L. N. Wagner. The 10-stamp mill at the Tightner mine will be in operation in a few weeks.

ALLEGHANY, CALIFORNIA.

Tuolumne County

(Special Correspondence.)—During the next few months operations at the Mohican will be confined to the development of the property, under the direction of E. McHale, the superintendent.

An increased flow of water in the main shaft has caused the Springfield Tunnel & Development Co. to reopen the old 200-ft. shaft, where an electric hoist and a pump will be installed. By sinking a little deeper and driving to the channel it is hoped to drain the workings.

Work has been commenced at the Starr King mine, near Tuolumne, which was recently bonded to a San Francisco company represented here by A. H. Wagner as manager. A hoist, compressor, four machine-drills, and a 5-stamp mill have been purchased, and an effort will be made to have all the machinery housed before the wet weather sets in. The former operators had uncovered good-grade ore in several places, but abandoned the property when the mill, which had just reached the point of completion, was destroyed by fire. The shaft is 800 ft. deep. The rich vein recently uncovered at the 1500-ft. level of the Black Oak mine has been tapped at the 1400-ft. level, and, according to report, the ore is of a remarkably high grade. The Soulsby mine, which the Bagdad-Chase company operated until recently, is to be worked by a number of the miners who were in the employ of the former management.

Under the direction of C. E. Shafer, a long adit is being driven at the Punch Bowl gravel mine, on Table mountain, to tap the ancient channel. The work of erecting a small mill on the Grant mine, near Columbia, will begin at once.

Tuolumne, August 26.

COLORADO

Clear Creek County

(Special Correspondence.)—A body of ore 18 in. wide has been uncovered on the Aetna vein at the Capital mine that assays 14 oz. gold and 26 oz. silver per ton. The discovery was made by Tong. McCluskey & Co., who are operating under lease. H. Holcombe & Co., leasing on the same vein, have shot into a 16-in. streak of ore that mills 8 oz. gold and 11 oz. silver per ton. A pool of Silver Plume lessees has secured the Pelican mill under lease and the plant will be operated on the coöperative plan. On the Senator vein of the Blue Ridge M. & M. Co. a streak of ore 12 in. wide has been found that assays as high as 35 oz. gold and 300 oz. silver per ton. P. H. Stanhope of Denver is manager. B. Converry & Co., leasing on the Millington mine, have started shipments of ore that mills 260 oz. silver per ton. Work will be resumed next week on the Golden Glory property on Saxon mountain. The adit will be driven for several hundred feet to intersect the series of veins controlled. J. F. Puchert is manager. Brad Cowles, operating the Frisco property on Wood mountain, has uncovered a 12-in. streak of sulphide ore that carries free gold. Test assays show as high as 1000 oz. gold per ton. A tramway has been constructed from the National mine in West Argentine, and shipments of galena ore have been started. Charles Coggswell is manager of the mine. Four carloads of machinery for the new Conqueror mill at Empire arrived last week. The plant will be equipped for amalgamation, while cyanide tanks also will be provided. The capacity will be 300 tons per day. G. S. Schneider is manager.

Georgetown, August 28.

(Special Correspondence.)—The Tennessee M. M. & T. Co. has been organized to operate the King Solomon mines, on Chicago mountain. C. S. Birkins is manager for the company. The adit will be advanced 800 ft. to intersect the series of veins on the property.

Idaho Springs, August 29.

Dolores County

John W. Burton and Clinton D. Day, of Salt Lake City, have secured several important groups of claims, including the General Sherman, General Sheridan, General Howard, General Logan, Maid of Australia, Wellington, and Zona K.

La Plata County

Ore assaying as high as $6000 per ton in gold is reported to have been found by lessees on the Buffalo, a claim that lies next to the Neglected. Although the former is an old patented claim, it has been undeveloped until this year, when it was leased to James Dennison and associates of Durango.

Additional specimens from O. N. Kee, the prospector sent out by the grubstake committee of the Denver Chamber of Commerce, are said to be better than the first ones he sent in, about a month ago, which assayed $60 per ton. An engineer will be sent to examine the property.

San Miguel County

It is reported that platinum assaying as high as $500 per ton has been found in a sandstone deposit in the Naturita valley, near Norwood. In appearance the ore resembles the vanadium ore of the same region. The General Vanadium Co. has an option on 26 claims which it obtained through the belief that the ore was vanadiferous.

Teller County

The Kavanagh mill at the Jo Dandy mine, built by Kavanagh & Co., has been opened. It will treat the dumps at the Jo Dandy. The mill has five large tanks of 200 tons capacity each. Ed. Parlin, of Victor, has taken a lease on the Theresa dump on the Golden Cycle estate and will place a washer there. The shaft is on Bull hill. After being closed four months, the Happy Year mine, D. O. Darnell, lessee, has been reopened. Darnell and James Bacon have secured a lease on the Pride of Cripple Creek dump and will start treatment in a short time. Lessees of the Pharmacist mine, on Bull hill, have resumed shipping ore.

By September 1 the Homestake mill, on the estate of the Rex M. & M. Co., on Globe hill, will be in operation. It has been leased to Joe Cooper, superintendent for the Altman Leasing Co., and W. Huxley. Power will be supplied by the Pueblo & Suburban Traction & Lighting Co. Ore from several old dumps will be treated.

IDAHO

Shoshone County

Hypotheek mine, three miles south of Kingston, one of the oldest properties in the Coeur d'Alene, has started concentrating its ores in a small mill, and if the tests are satisfactory, additions will be made to the plant. The property, which was located by Octave Quay more than 25 years ago, has been developed 1000 ft. by adit and shaft. Drifts on the 800 and 1000-ft. levels have opened ore. Recently electric power was installed.

The Federal M. & S. Co. recently made a distribution of 1¾% on its preferred stock, bringing the total dividends paid by the company on this class of stock since its incorporation, eight years ago, to $6,502,426. On common stock for the same period, $2,850,000 has been paid. The dividends on preferred stock this year amount to $629,265, or 5¼%, while the company's customary annual dividends are 7%. The earnings for the current fiscal year to June 1 amounted to $887,000, after all charges, an increase of $405,000, or 86% over the corresponding period of last year. Some difficulty has been experienced through a change in ore content at the Morning mine. A saving of about $3000 per month has been effected through the introduction of the McQuiston tubes. The unit treats about 50 tons per day.

Gold Ridge M. & D. Co., which recently acquired the Buckhorn mine in the Ten-Mile district, Idaho, will install a 15-ton mill on the property and have it running by October 1, it is reported. The Buckhorn group has nine claims and includes a water right on Buckhorn creek from the State of Idaho for milling purposes. A new adit driven this year gives 175 ft. more depth under the upper workings, and when driven 1800 ft. ahead will give a vertical depth of 800 feet.

Press reports state that a consolidation of the Beartop and Orofino properties, in Bear gulch, east of Murray, is planned. Such a merger would end the legal tangle which has tied up the Beartop mine.

The Federal M. & S. Co. has taken a bond for $400,000 on the Cleveland mine, near Mace, adjoining the Standard-Mammoth group, which the corporation acquired from the late Thomas Greenough and Peter Larson for $3,000,000 about seven years ago. The Cleveland is owned by Mrs. James Leonard of Spokane, William R. Leonard of Denver, and Richard Wilson and Walter McKay of Portland. It is reported that the Standard-Mammoth orebodies extend into the Cleveland property, to the line of which the former has been worked. Charles Sweeny, former president, and F. H. Brownell, president of the Federal, started negotiations for the option at a conference in Seattle several months ago. Clayton Miller, of Spokane, general manager of the Federal properties, confirmed the report of option, but declined at this time to give any details.

ILLINOIS

Lawrence County

(Special Correspondence.)—It is reported that the Asiatic Oil Co. has secured options on several oil properties in the Lawrenceville district. The same company has secured a 49% interest in the Indian Refining Co. of Georgetown, Ky., and there are rumors that an American company, capitalized at about $20,000,000, will be formed to operate the holdings. The transactions involve properties valued at $8,000,000, according to report.

Lawrenceville, August 26.

KENTUCKY

(Special Correspondence.)—A new record was made in the yearly production of coal by Kentucky mines in 1910 with a total output of 14,720,011 short tons, states C. J. Norwood, chief inspector of mines and State geologist, in his annual report. Of this amount, 76,108 tons was of cannel coal produced in Bell, Breathitt, Johnson, and Morgan counties. In regard to home consumption, the report states:

"No better coals are sent to market from any mines than are produced in Kentucky, and yet, because of lack of manufacturing enterprises, the increase in the home consumption is relatively slow. Of the output for 1910, 8,800,682 tons was reported as shipped to other States, and it is probable that the actual tonnage so shipped somewhat exceeded that amount."

All Kentucky fluorspar marketed in 1910 was produced by mines in western counties, according to the report. The amount mined was 10,576 short tons, and the amount marketed was 17,008 tons, valued at $124,575. The coal in stock at the end of the year was 1830 tons.

"The year 1910," states the report, "in the number of fatal accidents was the most disastrous in the history of coal mining in Kentucky. This was due to three explosions, as the result of which 50 persons lost their lives. The number of fatalities from all causes was 84, all but one of which occurred underground. Forty-five wives were made widows, and 94 children rendered fatherless."

The report includes a recommendation that laws be passed regulating the quantity of powder that may be carried into a mine each day, and prohibiting shooting on the solid, and regulating the use of electric machinery in mines. One explosion of powder, in which one miner was killed, was due to a trolley wire coming in contact with a keg of powder which was being placed on a car.

Lexington, August 25.

MINNESOTA

ST. LOUIS COUNTY

(Special Correspondence.)—A body of high-grade hematite ore has been discovered at the Camp shaft of the Vermilion & Mesaba Iron Co., one mile east of here. The company took over the holdings of E. C. Kennedy, an attorney of Ely, and began development more than a year ago. It is thought that the Lucky Boy property, on which the discovery was made, has a continuation of the vein of the Chandler mine, which is reported to have produced 10,000,000 tons of ore.

It is stated that more money is being spent on the Vermilion range than at any previous time, and with better results. It is said that several new mines will become shippers, judging from indications, within the next year.

Ely, August 19.

MONTANA

FLATHEAD COUNTY

(Special Correspondence.)—J. J. Hibbard, manager for the Kalispell-Lincoln G. M. Co., is in town from the company's claims on the West Fisher river and reports that the adit is now in 80 ft. and there is a good showing of free-milling gold ore. Two shifts of miners are employed on the tunnel work. The pay-streak in the vein on this property is only about 18 in. wide, Mr. Hibbard says, but is quite rich. It was the intention to put in a stamp-mill this summer, but it has now been decided to wait until winter, when the machinery can be hauled over the snow.

Libby, August 28.

LINCOLN COUNTY

(Special Correspondence.)—Operations are progressing steadily at the Blacktail gold mine, in the southern part of the county, and the mill will soon be in shape to treat the ore which has been mined during the summer. A. M. Balfour and others are working the property on a lease. Three settling-tanks are being built for cyaniding.

J. M. Roberts and Louis Hale have returned from the headwaters of Pipe creek, where they have been searching for Lincoln county's lost coal mine, but state that they have been unable to find the lost vein. This is the second trip that they have made into the country this summer, and they feel confident that they have found the place in which the coal is situated, but owing to the heavy growth of timber, prospecting is difficult.

It is reported here that the Independence copper property, in the northern part of Lincoln county, has been sold to Eastern parties and that it will be operated.

Libby, August 28.

SANDERS COUNTY

(Special Correspondence.)—The Royal Copper M. Co., Ltd., will undertake extensive development work in the spring, according to general report. J. W. Wright, who has the contract for development work, has secured funds to complete the 190 ft. remaining under the contract. The property consists of 12 patented claims four miles north of Belknap, on the Northern Pacific railroad. John H. Nordquist, of Wallace, Idaho, is president of the company.

Belknap, August 28.

SILVERBOW COUNTY

The Tuolumne company, a few days ago, encountered a fine body of high-grade ore on the 1600-ft. level, which is the same body of ore as encountered on the 1400-ft. level, but it is much wider and runs higher in both copper and silver. It is said to be a 22-ft. orebody of bornite and copper glance, and runs on an average 12% in copper with a fine yield of silver. The company is continuing its usual shipments of about 150 tons per day, which runs fully 7% in copper and about 8 oz. in silver per ton. The spur which is being constructed by the Butte, Anaconda & Pacific railway from the Tuolumne mine to the railway connection for the purpose of hauling the ore direct to the smelter at Anaconda is to be ready for operation by September 12, and then hauling ore by teams will be discontinued.

NEVADA

CHURCHILL COUNTY

The Pirouette, controlled by Pennsylvania capitalists, will resume operations in the Wonder district, according to press reports. An electric hoist will be placed, and development work on the 500-ft. level will be pushed. Three or four miles of wire will be strung to connect with the power lines at Wonder.

CLARK COUNTY

The stamp-mill at Newberry mountain will be moved to the Paden property at Crescent peak. The Paden mine has recently shipped to the Salt Lake City smelter a carload of ore which is reported to assay as high as $800.

The New York-Searchlight M. Co. has applied for a patent for the Waterspout group of claims, in the Ormond addition to Searchlight. W. W. Hurt, president of the New York-Searchlight company, is quoted in the press as stating that warranty deeds for surface rights will be given to everyone holding quit-claim deeds or contracts for lots who have their taxes paid, if the patent is granted.

ESMERALDA COUNTY

(Special Correspondence.)—At the Goldfield Belmont, four miles northeast of the Goldfield Con. property, an oreshoot has been opened from which several shipments of ore assaying from $40 to $80 per ton have been made. The driving before reaching the shoot was through faulted ground. A stope on the 300-ft. level, where the discovery was made, also exposed an orebody, $2\frac{1}{2}$ to 3 ft. wide, which assays about $200 per ton.

Seams of quartz assaying $2.50 to $9 have been cut in the dacite in sinking the shaft of the New Jersey M. Co., three miles east of Goldfield. Two or three other companies are working in the neighborhood. This is known as the central dacite formation, and is similar to that found by producing mines farther to the west.

The Florence company is treating 170 tons per day, and is making an improved recovery since using the Akins classifiers and Dorr pulp-thickeners. Operating costs have been reduced, and the capacity of the mill increased. The main shaft has been sunk through bad ground to 880 ft. At the 900-ft. level a station will be cut and driving started north to intersect the rich Reilly ore-shoot. Some good ore has been sent from the 500-ft. level. On the Polverde claim the Jumbo Extension is driving south on the 1030-ft. level, and good ore has been found on levels above the 850-ft. level.

Goldfield, August 21.

Lander County

(Special Correspondence.)—There has been quite a find at Gold Basin, 65 miles east of Fallon. The geological conditions are greatly similar to Tonopah in that the country rock seems to be dacite, while the orebodies are along dikes of rhyolite-porphyry. The orebody thus far is quite wide, the best of it being 6 ft. of $60 ore, chiefly silver, although it pans well in a very fine low-grade gold.

Fallon, August 29.

Nye County

(Special Correspondence.)—The Bath lease on Union No. 2 claim of the Litigation Hill Merger M. Co., is developing what appears to be one of the most promising orebodies in that section of the Manhattan field. The new incline shaft has attained a depth of 250 ft. and reveals an 8-ft. vein said to assay about $32 per ton. This is at a vertical depth of 100 ft. from the surface. The vein is termed a replacement fissure in the lime formation, with the ore so soft it does not require drilling. An electric hoist has been installed and the shaft will be sent to water-level. A pump will be installed later. From 15 to 20 tons of quartz is hoisted daily. An 8-ft. vein of $10 to $25 ore has been opened at a depth of 65 ft. on the Union No. 4 claim. The find was made on the McNeil lease while running a drift to connect the two shafts. The quartz will be treated by the 10-stamp mill on the lease. The winze from the 100-ft. level of the Crescent has entered good ore, and the sinking of the shaft will be carried 50 ft. deeper. At the Tip-Top claim of the Seyler-Humphrey group, the 45-ft. shaft is said to have entered a large body of ore assaying over $25 per ton. Neither wall has yet been encountered. At the Big Four work is going on near the 300-ft. level. The Dexter Con. Leasing Co. is keeping the War Eagle mill running on ore from upper levels of Union No. 9 claim. The inrush of water on the 500-ft. level has increased so that a new pump has been ordered. The entire Manhattan district is showing remarkable activity, but lack of adequate milling facilities continues to handicap operations. In numerous instances leases are compelled to proceed slowly because of inability to have their ore treated promptly. Despite these handicaps an excellent rate of production is maintained. Electric power costs $2 per horse-power month in the district.

Manhattan, August 27.

(Special Correspondence.)—At the War Eagle mill intermediate grinders are being placed between the stamps and the tube-mill to increase the crushing capacity. This step has been made necessary by the steadily increasing demand for reduction facilities. It is reported that ore is being extracted more rapidly than the mill can treat it, and that contracts for ore on the dump will keep the establishment busy for months to come.

Manhattan, August 19.

Storey County

(Special Correspondence.)—The Eagle's Nest-Hailstone Con. Mining Co. has been incorporated with a capitalization of $2,500,000, to be assessed until fully paid up. The incorporation marks the final consolidation of the properties. The secretary is John Matheson. Directors, F. J. Symmes, J. V. De Laveaga, Herman Zadig, C. E. Hudson, and A. S. Wollburg. Principal place of business, Virginia City.

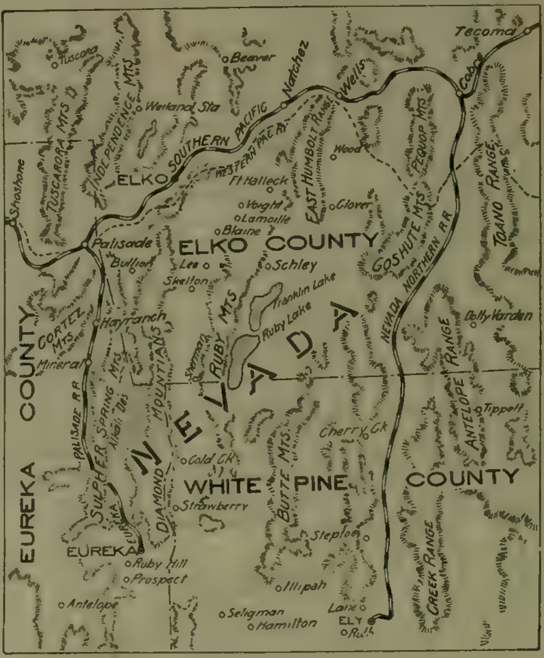
Virginia City, August 29.

(Special Correspondence.)—The weekly report on the Mexican, Ophir, and Union Con. mines shows a gross output of $40,096, which with $4767 from the Crown Point, gives a total extraction from the Comstock Lode of $44,863. This is nearly equal to that of the previous week, when the Mexican made a record for extraction. The water at the C. & C. shaft was from 5 to 10 ft. above the 2500-ft. level through the week, but water was kept from the latter mine by a dam. For safety, no work was done on the 2500-ft. level until the dam was relieved of the pressure, and accordingly much work was done on the 2300-ft. level.

Virginia City, August 26.

White Pine County

(Special Correspondence.)—A silver discovery of great importance was made last week in the southern end of the White Pine mountains and has created much excitement. The vein is said to be 6 ft. wide and to assay from $400 to $600 per ton. The discovery was made on Willow creek, about 25 miles from the Blue Eagle district.



MAP OF EASTERN NEVADA.

The new potash fields of Nye county are situated about midway between Ely and Goldfield, and are attracting much attention. It is said that the ore averages from 7 to 10% in potash on the surface of the ground. Many locations have recently been made, and arrangements have been completed for testing the deposits at depth with a churn-drill, which soon will be operating on the ground. Mining men are of the opinion that the tests will show a large body of water charged with potash, and should this be the case, the future of the new field would seem to be assured. It is claimed that soda in almost a pure state has been found there, from which prospectors are in the habit of making their biscuits. There are also salt deposits in the same neighborhood. Several hundred locations have already been made, and much activity is expected. The new district is near the line of the proposed Ely Goldfield railroad.

Ely, August 19.

(Special Correspondence.)—The Nevada Con. M. Co. in July 1911 produced 5,258,582 lb., against 6,896,429 lb. for the same month last year. The production for the first seven months of 1911 is 37,345,715 lb. During the same period last year 37,848,427 lb. was produced.

Ely, August 26.

(Special Correspondence.)—One more miner injured in the fire in the Giroux shaft last week has died in the hospital, making a total of seven deaths. It is stated that the others have good chances for recovery. It is reported that neither the [illegible] water used to quench the flames caused serious damage.

Ely, August [illegible]

The Nevada Cons. M. Co. has declared its regular quarterly dividend of [illegible] per share.

NEW MEXICO

Socorro County

At the Socorro [illegible] the woodchoppers employed by the power plant were taken off some time ago. Several thousand cords are cut, and by the time this is transported to the power plant the oil engines will be installed.

The Ernestine M. Co.'s mill treated 705 tons during the week and produced [illegible] oz. of gold and silver bullion and 4½ tons of concentrate for the first 10-day period of August. Grading and foundation pits for the new power plant are completed, and construction work has been started. Over a carload of cement will be required for the foundations.

Mogollon, August 18

OREGON

Josephine County

L. L. Jewell has leased the Mountain Lion mine on the Applegate, sixteen miles south of Grants Pass, to C. C. Daniels of that city. The mine has been tied up by litigation, which has been settled, and for a time was a satisfactory producer. There are a 5-stamp mill and two concentrating tables on the property. The ore is a quartz.

TENNESSEE

Polk County

(Special Correspondence.)—The Tennessee Copper Co. has been fighting actions based on alleged fume damages by the Ducktown smelter to timber lands for several years. A verdict recently rendered against the company was for $4650. This particular case has been tried twice previously. One former verdict having been for $10, and one for $32,000.

Ducktown, August 19.

UTAH

Salt Lake County

(Special Correspondence.)—The production of the Utah Copper Co. for the first seven months of 1911 was 53,321,919 lb., against a production for the corresponding period in 1910 of 52,447,279 lb. The production for July 1911 was less than the production for July last year, 7,555,407 lb., against 8,677,851 lb. The production for the month is 1,307,493 lb. short of that of May 1910, 8,862,900 lb., which is the record for the company.

The Utah Copper Co. has declared its regular quarterly dividend of 75c. per share.

Salt Lake City, August 27.

WASHINGTON

Ferry County

(Special Correspondence.)—The Republic Mines Corporation has driven a cross-cut 20 ft. on the 600-ft. level of the Surprise mine and intersected an 8-ft. wide vein, from which the average assay of eight samples is $80.55. The cross-cut is vertically on the dip below the Bonanza shaft and on the hanging-wall side of the vein. Where the cross-cut from the main shaft intersected the vein on the 300-ft. level, the vein is narrow and the ore low grade. A drift in 30 ft. southward shows the vein widening and the quality of the ore improving. On the 200-ft. level the Wallek stope is 25 ft. wide, and the shoot is being mined on the glory-hole system. The ore shipments to Tacoma have been increased, amounting in all, in 18 days, to 30 cars from the Surprise and four cars from the Lone Pine mine.

The Hope company is sinking a shaft, now down 30 ft., on a 6-ft. cross-vein, the ore assaying from $5 to $53 per ton. A raise is going up on the main Black Tail vein, near the winze, on the adit-level. The east drift on the 300-ft. level (formerly referred to as the 100-ft. winze level) is in 30 ft. and shows the pay-shoot on the cross-vein gets longer with depth.

Republic, August 19

CANADA

British Columbia

The British Columbia Copper Co. has declared no dividend for September 1, the regular date for the quarterly distribution. Unsettled conditions due to the miners' strike caused the failure to declare dividends.

Assurance that the Government is to commence work on a pack-trail from Portland city to the British Columbian boundary line has given great encouragement to miners in the Portland Canal district. At present supplies have to be taken to the mines on men's backs, at a cost of 30c. per pound. The first proved property to be tapped will be the Cascade Falls, or Dilworth Bunting group at the junction of Cascade and Cowper creeks, 900 ft. above sea level. The Indian Mines, Ltd., lies a mile northwest. George A. Clothier is superintendent for the latter company.

A luncheon was held August 11 to celebrate the completion of the Canadian Northeastern railroad to the Red Cliff mine. Among those present were J. W. Bryant, representing the Tyee smelter; A. E. Smith, president, and H. Beil Smith, superintendent of the Red Cliff mine; several officials; and representatives of the railroad.

Ontario

(Special Correspondence.)—Re-sampling of the No. 3 vein of the Porcupine G. M. Co.'s property shows 15 ft. of ore assaying $11.70 per ton and 10 ft. of mineralized schist assaying $5.20 per ton, according to C. H. Poirier, manager for the company. The No. 3 vein was found in the cross-cut from the No. 2 workings. The cross-cut reached the south wall before the fire damaged the workings, but the mine recently has been pumped out and the surface equipment overhauled.

Porcupine, August 24.

Yukon

Scroggie creek, for a long time 'tied up' by a mining concession, has been thrown open to prospectors, according to press reports. Many are prospecting there. A large sack has been filled with virgin gold washed on No. 16 Above Discovery, by W. J. Lee and partners. The gold is coarse and brown and resembles somewhat the Jack Wade gold.

Britannia creek, the scene of recent placer discoveries, is being prospected by a large number. The creek is several miles long. Nansen creek is the scene of considerable activity. The pay-streak is said to be 30 ft. wide and the gold is found from the surface to bedrock. The greatest drawback to Nansen creek is the scarcity of timber.

MEXICO

Chihuahua

It is reported that the hydro-electric plant for furnishing power for the mine at Palmarejo has been completed. A new 300-ton mill will be constructed and an aerial tram will be built from the mine to the proposed mill. The old plant has been destroyed. Water-power will be used. The crushing machinery will include stamps and tube-mills. The cyanide process will be used.

Sonora

The new Greene-Cananea mill, the only electrostatic plant in this district, has been placed in operation, and within the next few months the Calumet and Sonora mines will begin to ship ore in quantities larger than ever before. The old mill continues to operate, although it had been operating only one shift before the completion of the new mill.

The new mill was constructed on account of the refractory nature of the concentrates, which in most of the ores contain copper, silver, zinc, and lead. Except in the case of pure zinc and lead ores the company was unable to treat the concentrates at a profit and they were stored, with consequent loss from oxidation. The oxidized concentrates will be given a cyanide bath before treatment.

Company Reports

GOLDFIELD CON. JULY REPORT

The report of J. F. Thorn, general superintendent for the Goldfield Con. M. Co., for July, shows: Total production, 29,253 tons, containing $848,429.44, an average of $29 per ton, of which 29,174 tons was milled with an average extraction of 94.55%, and 79 tons of an average value of $46.80 per ton was shipped. The net recovery from all the ore was $27.42 per ton. The total net profit was $582,021.68, or $19.89 per ton. Development included 4078 ft. The total cost of mining, development, transportation, milling, office and general expense was $7.66 per ton, distributed as follows:

Mining:		
Development	$0.97	
Stoping	2.46	
		$3.43
Transportation		0.07
Milling		2.27
Marketing		1.12
General expense		0.33
Bullion tax		0.31
Marketing ore shipped		0.03
Construction		0.10
Total cost of operation		$7.66
Miscellaneous earnings		0.13
Net cost per ton		$7.53

In the Combination mine, on the third level, about 300 ft. north of the shaft, ore of a good grade has been found. It is probably the downward extension of the 136 orebody on the second level. In the Mohawk the 163 and 155-ft. drifts on the 150-ft. level were extended 100 ft. and produced 400 tons of ore worth $20 per ton. The 354 sill was extended on the hanging-wall side and produced 245 tons of ore worth $58 per ton. The 490-ft. intermediate, 60 ft. below the 450-ft. level, produced 161 tons of ore that averaged $30 per ton. This orebody is probably the downward extension of the north end of the 354 orebody. The 499 was extended about 50 ft. and produced 150 tons of $13 ore. In the Clermont the 408 sill was extended along the 413 intermediate and produced 1576 tons of ore that averaged $53 per ton; 306 N., on the 600-ft. level, mentioned in last month's report as the probable extension of the 354 orebody, has been considerably extended, and produced 870 tons of $12 ore. In the Laguna the 303 E. raise from the 600-ft. north drift of the Clermont has produced 122 tons of $20 ore. The 329 intermediate, probably the upward extension of the 303 E. orebody, produced 377 tons of $12 ore. The Jumbo has produced 365 tons of ore that averaged $14 per ton. The indications are that this mine will produce a large tonnage of about $15 ore. The mines, as a whole, are looking exceptionally well.

ALASKA UNITED GOLD COMPANY

This, the youngest of the three mines of the Treadwell group on Douglas Island, Alaska, operates two mines, one on the 700-Foot Claim between the Treadwell and Mexican, and the other, the Ready Bullion, south of the Alaska Mexican. Details regarding the operation of these mines have been given from month to month in the *Mining and Scientific Press.* In the report of the superintendent, Robert A. Kinzie, for the year ending December 15, 1910, a great deal of interesting technical information is given. The Ready Bullion mine, at the date of the report, had in sight below the 900-ft. level 1,754,350 tons of ore of which the average assay value was $3.02. In 1910, 232,330 tons having an average value of $2.43 were milled. Since 1900 the average of the ore milled has assayed $2.06, showing that the ore now in reserve, despite increased depth, is worth more per ton than the average already milled. Indeed the reserves in 1902 were estimated at only $2.03 per ton. In the operation of the mine in 1910, 151,460 tons of ore and 2756 of waste were broken. An average of 10.12 machine-drills were kept busy with an average duty of 36.12 ft. drilled per shift and 23.06 tons broken. The cost was $8.35 for labor, $2.43 for explosives, and $4.96 for supplies, power, repairs, and incidentals. In stoping, 1.61 tons was broken per foot drilled; in development, 0.22; and in cutting out stopes, 0.31 tons. The total number of feet of holes drilled in the mine in the course of the year was 241,679. The average of the assay values by levels was 1050-ft., $1.99; 1350, $3.07; 1500, $4.07; 1650, $2.86; 1800, $2.74. From the 700 mine 188,329 tons was milled, and in it 865,223 tons is in reserve. Here again the average assay value of the present ore reserve, $2.51, is higher than the average of the ore so far sent to the mill, $2.33. The tons broken per machine-drill shift was 30.41, and feet drilled 34.37. Costs were: labor, $6.96; explosives, $2.84; supplies, power, repairs, and incidentals, $4.55. A central hoisting plant designed to handle 5000 tons from a depth of 3500 ft. in 20 hours is now being erected at the 700 mine and will be used to hoist ore from it, the Treadwell, and the Alaska Mexican mines. The head-frame will be built of steel and the power-house of reinforced concrete.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS.

RECOVERY OF MINING CLAIM—PLEADING AND PROOF

In an action to recover certain mining claims a particular location was not mentioned in either the complaint or answer, but the defendant claimed some rights in reference thereto. On the trial evidence was properly admitted showing a forfeiture of the location by a failure to perform the required assessment work on the plaintiff's behalf without an express plea.

Harper *v.* Hill, (Cal.) 113 Pacific, 162, Jan. 1911.

MINERAL LEASE—IMPLIED COVENANTS AND DUTY OF LESSEE

An exclusive lease giving the lessee the right of exploring for and taking minerals from certain lands for a long term, based on a cash payment and royalties, implies a covenant on the part of the lessee to make proper and reasonable diligent explorations and development of the premises, and such a lease may be forfeited for breach of the implied covenant on the part of the lessee to make such exploration and development. But if a lease to explore for and take minerals expressly provides when and how the exploration shall be made, then there is no implied covenant. However, a provision that failure to begin prospecting on the land, or on other land within four miles thereon within one year, should defeat the lease, does not preclude forfeiture for the lessee's breach of the implied covenant to diligently explore and develop the premises.

Mansfield Gas Co. *v.* Alexander, (Ark.) 133 Southwestern, 837. Jan. 1911.

JURISDICTION TO DETERMINE TITLE TO MINES

The land department of the United States is not a tribunal authorized to determine the title to lands, but it is only the medium through which parties may acquire the title of the United States. Accordingly its functions are mostly administrative and only incidentally judicial, and it only determines the existence or non-existence of alleged facts in order to enable it to select the person who is entitled to purchase. The proceedings before the land department is to acquire title and not to determine who has title. Therefore in an action by an owner of a mining claim against the owner of an adjoining claim for damages for encroaching on the former's claim, and where both parties allege title to the property in question, it is not a question for the land department to determine, but is one of law for a court of competent jurisdiction. And this rule applies in cases where there is an adverse claim.

Lightner Mining Co. *v.* Superior Court, (Cal.) 112 Pacific, 909. Jan. 1911.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

Harry Paul was in San Francisco.

George Walker is at Salt Lake City.

T. T. Read has returned from Nevada.

Z. Cushing has returned from Alaska.

C. B. Naremore was in San Francisco.

W. R. Hamilton has been at Coalinga.

Pope Yeatman has left Salt Lake City.

C. B. Lakenan has returned to Nevada.

F. Augustus Heinze is at Salt Lake City.

E. F. Burchard has been at Trenton, Georgia.

R. A. F. Penrose, Jr., has been in San Francisco.

W. E. Defty is examining the North Star mine, Arizona.

Edmund Juessen has returned from Pittsburg and the East.

S. F. Shaw will be in Porcupine during September and October.

D. C. Jackling and F. G. Janney have returned to Salt Lake City.

Oliver B. Finn is in New Mexico investigating a dredging property.

J. B. Tyrrell, of Toronto, has returned from a short visit to London.

W. J. Loring was in San Francisco and has gone to Porcupine, Ontario.

Frederick G. Clapp is conducting geological work in Tennessee in search of oil or gas.

C. B. Whitwell has gone to White Horse, Yukon Territory, to report on some gold properties.

Joseph T. Terry, Jr., of Butte, Montana, is now superintendent of the Dan mine, twelve miles from Baker, Oregon.

H. H. Johnson and J. T. Hoffmann have gone into partnership, with offices at 216 Moorgate Station Chambers, London.

Carl F. Dietz and Dyke V. Keedy, of Boston, have gone to Nova Scotia to examine two copper properties in the interest of Halifax people.

H. W. Hardinge has just returned to New York from an extended trip in the West, and expects to go to Europe on professional business this month.

F. M. Field and T. H. Teal have completed their examination of the Commonwealth mine at Pearce, Arizona, and have returned to Los Angeles.

D'Arcy Weatherbe has severed his connection with Orsk Goldfields, Ltd., and is examining gold mines near Nikolaievsk for the Russian Corporation.

Frank H. Probert is at the Ray Central Copper Co. property at Ray, Arizona, for ten days; from there he will go to the Alamos district, Sonora, Mexico.

Edwin Higgins has returned to Los Angeles after a five months stay in the Randsburg district. He has reopened his office at 312-314 Trust & Savings building.

Ernest Grave has stopped all work for the Candelaria y Anexas, at Pinos, Zacatecas, Mexico, and has left the property in the hands of a caretaker. Mr. Grave will be at Tampico, Tamaulipas, Mexico.

C. H. Repath, who was consulting engineer in charge of the construction of the International smelter at Tooele, Utah, is to have charge of the rebuilding of the United Verde smelter at Jerome, Arizona.

The San Francisco Section of the Mining and Metallurgical Society of America will hold a meeting at 1026 Crocker building following dinner at 6:30 in the men's grill room of the Palace Hotel, Monday, September 4. Visiting members are especially invited to attend.

Recent Publications

Risks in Modern Industry. *The Annals* of the American Academy of Political and Social Science, Vol. XXXVIII, No. 1, July. 317 pp., index. Philadelphia, 1911.

Uniform Child Labor Laws. Supplement to *The Annals* of the American Academy of Political and Social Science, Vol. XXXVIII, No. 1, July. 224 pp.; index. Philadelphia, 1911.

The Johnson Electric Zinc Furnace. By Joseph W. Richards. From Trans. Amer. Electro-Chem. Soc., Vol. XIX., pp. 311-316, 1911. Description of an American furnace of large possibilities.

Contribution of the Mining Profession to the Conservation of Our Natural Resources. By H. S. Drinker. Pam. Pp. 19. 1911. A scholarly address delivered by the president of Lehigh University at the exercises commemorating the twenty-fifth anniversary of the founding of Michigan College of Mines.

Porcupine Mining District. The *Canadian Mining Journal's* Porcupine Series, Vol. 1. Pp. 86. Ill., maps. Toronto, 1911. This is a re-publication in convenient form of the excellent articles on the new Ontario gold district, that have been printed by our enterprising Canadian contemporary. We hope that numerous additional volumes may follow.

Geological and Mineral Resources of the Arbuckle Mountains, Oklahoma. By C. A. Reeds. Oklahoma Geol. Surv., Bull. 3. 66 pp.; ill., map. Norman, (Okla.) 1910. A convenient summary of the essential facts regarding an important area. The mineral resources are in the main non-metallic, though iron and manganese occur in quantities of possible significance.

Geology and Ore Deposits of the Blewett Mining District. By Charles E. Weaver. Washington Geol. Surv., Bull. 6. Pp. 104. Ill., index, map. Olympia, 1911. A welcome account of the mining district often known as the Peshastin, and situated in south central Chelan county. Both placer and quartz mines have been worked and the total output to date is estimated at $1,700,000.

Copper Deposits of the United States. By Walter Harvey Weed. U. S. Geol. Surv., Bull. 455. Pp. 166. Ill., index. Washington, 1911. This is a welcome addition to the literature of ore deposits since it is a re-description of the classic mines of the Eastern States, written by an engineer especially qualified for the task. Mr. Weed precedes the descriptive chapters by a classification of the deposits, a study that will be of especial interest to students of ore genesis.

The Resources of Tennessee. Pub. by the State Geol. Surv., Nashville, 1911. The aggressive State Geologist of Tennessee, G. H. Ashley, has undertaken to satisfy demands for prompt information regarding the resources of his State by means of a little monthly publication of which the issue at hand forms the second. It includes papers on 'The Camden Chert—An Ideal Road Material,' by Mr. Ashley; 'The Fernvale Iron Ore Deposit of Davidson County,' by W. A. Nelson; 'Cement Materials of Tennessee,' by C. H. Gordon; and a few briefer notes.

The following publications of the United States Geological Survey have recently been received: 'Reconnaissance of the Ore Deposits in Northern Yuma County, Arizona', by Howland Bancroft; Bull. 451, 131 pp., ill., maps, index, 1911. 'Mineral Resources of the Llano-Burnet Region, Texas', by Sidney Paige; Bull. 450, 103 pp., ill., maps, index, 1911. 'Results of Spirit Leveling in South Dakota', by R. B. Marshall; Bull. 472, 52 pp., ill., index, 1911. 'The Production of Sand-Lime Brick in 1910', by Jefferson Middleton, Advance Chapter from 'Mineral Resources for 1910', 6 pp., 1911. 'The Production of Chromic Iron Ore in 1910', by Ernest F. Burchard, Advance Chapter from 'Mineral Resources for 1910', 5 pp., 1911.

Electric Hoist at Ray

The large electric hoist recently installed by the Ray Consolidated Copper Company at Ray, near Kelvin, Arizona, at its No. 1 shaft, has attracted a great deal of attention on account of its many unique features, the heavy loads handled, and the large production required from this shaft. The following detailed description has been prepared by the builders, The Wellman-Seaver-Morgan Co., and is published to supplement Mr. Dinsmore's general account of this mine, appearing elsewhere in this issue.

The hoist is intended to handle a net ore load of 12½ tons, together with a skip weighing 16,000 lb., from a maximum depth of 500 ft., hoisting at a speed of 300 ft. per minute. The hoist operates with balanced skips entirely, one of the drums being keyed fast to the shaft, while the other is being driven by a powerful band-friction clutch for the adjustment to different levels, as desired. The hoist is equipped with an alternating motor, 440 volt, 3 phase, 60 cycle, with a full-load speed of 430 r.p.m., and is rated at 300 hp. This motor is fitted with a rope wheel, 44 in. diam., having turned grooves for 32 one-inch ropes, the motor being connected to the hoist by a rope drive engaging the 13-ft. rope wheel on the pinion shaft of the main hoist. The idea underlying the design of this hoist is that the motor for running the hoist shall operate continuously in one direction, while the drums may be started, stopped, or reversed. The principal electric loss in hoists operating by alternating-current motors is occasioned by the starting of the motor, which, when the motor is large, becomes serious. It is therefore desirable not to be obliged to start the motor at each trip, since, when the motor is running idly, the current required by it is limited, so that the peak losses are very materially reduced. In this type of hoist the load is gradually accelerated by applying the powerful clutches.

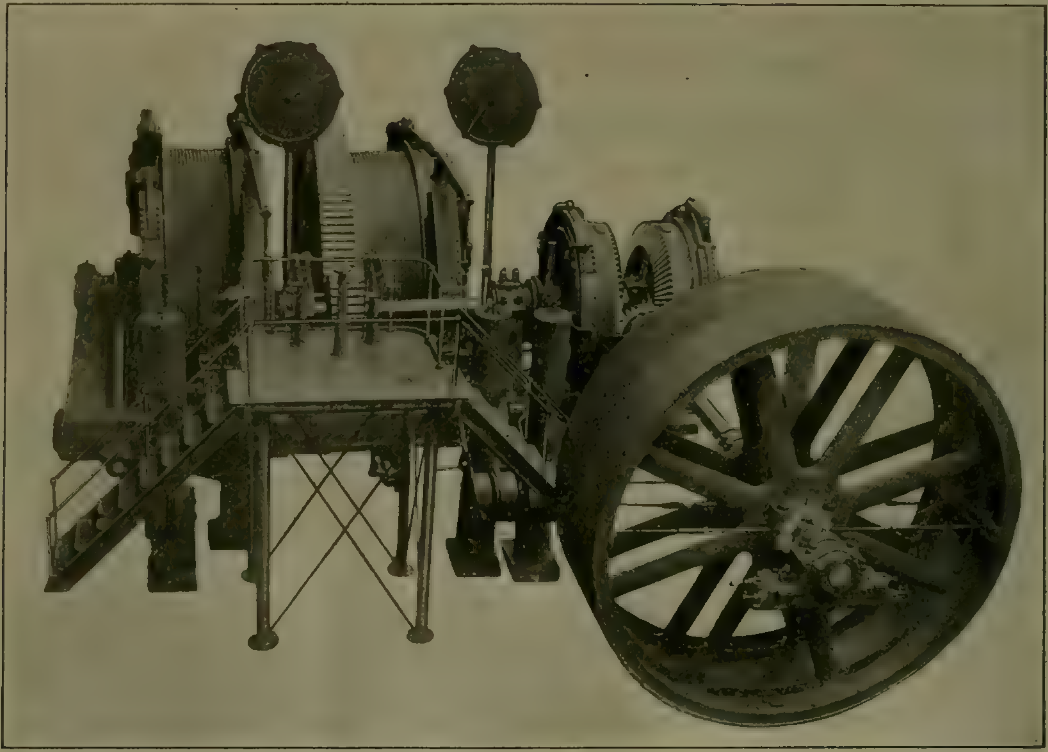


FIG. 1. GENERAL VIEW.

The accompanying illustrations show various views of the hoist and its details. Fig. 1 gives a general view of the hoist with the exception of the motor and rope drive. The power is transmitted from the motor to the hoist by means of a bevel-gear driving and reversing system. The pinion, which is of forged steel with machine-cut teeth, engages in two cast-steel, machined, bevel-gears, running in opposite directions, which are completely enclosed in the steel casing, the top half of which is removed in the accompanying illustration. Both these gears are loose on the immediate shaft, being fitted with bronze bushings of ample proportions, easily removable for renewal, while on the back of each of these gears is a friction ring which the band-friction clutch engages. These clutches are securely keyed to the intermediate shaft, and are operated by vertical-operating cylinders, the clutches being applied by weights and released by the operating cylinders. The cylinders are controlled in their movement by a cataract cylinder filled with oil, the power used in the operating cylinder being compressed air taken from the air mains supplying the mine, but there is an auxiliary motor-driven air-compressor in the engine-house. This automatically provides air for operating the hoist should the mine pressure be shut off or go below a certain predetermined pressure. Both of the clutch-operating cylinders are worked by single lever to the operating platform and so connected that either clutch may be thrown in at will, but both clutches can never be in at the same time, and one clutch must be wholly thrown out before the other can be thrown in.

The intermediate shaft is extended and fitted with a forged-steel, machine-cut pinion, which engages in the main driving-gear for the two drums. This gear is of cast steel with machine-cut teeth, and is approximately 16 ft. in diameter. The drums are 12 ft. in diameter and grooved to carry about 600 ft. of 1¾-in. hoisting rope. The loose drum is fitted with a powerful band-friction clutch of the modified Lane type, illustrated in Fig. 2. The clutch is of massive proportions, with a 12-ft. driving-ring and built for a possible working load of 50,000 lb. The clutch-disk is of cast steel, and the fixed and movable arms engaging the driving-band are of annealed-steel castings. Ample adjustment is provided for taking up the wear of the band, which is of high-grade steel lined with basswood linings. Lifters are provided as shown, for equalizing the clearance of the bands from the clutch ring when the clutch is released. Each drum is provided with a powerful post brake, the beams of which are built up of steel plates and angles, as shown, and fitted with basswood wearing-blocks 11 in. wide.

The brakes, as well as the main clutch, are each operated by means of a combined air and cataract cylinder fitted with floating valve-gear under control of a hand lever on the operator's platform. The design of the connections is such that the brakes are set by means of weights and released by the air cylinder. Dial indicators are provided, one being driven from each drum for showing the position of the skip in the shaft. The skips are not provided with safety dogs or appliances, on account of the extreme weight and bulkiness of such equipment for a load of this magnitude, but an over-winding device is provided to prevent the skips being carried into the sheaves through any neglect of the operator. This device consists of two limit-switches, one for each skip, so placed that when the skip is carried beyond the highest point for dumping, it will come in contact with an extended lever fitted with a roller, which lever, moving through an arc of 35°, disengages the contacts. These limit-switches are connected by wires to solenoids operating quick-opening valves in the supply-pipes to the air-cylinders, so that if the skip passes a given point in the shaft, the solenoids come into action and at once release the pressure from the operating cylinders, allowing the weights to apply both the powerful brakes and throw out the clutches, bringing the hoist at once to a stop without the necessity of stopping the motor.

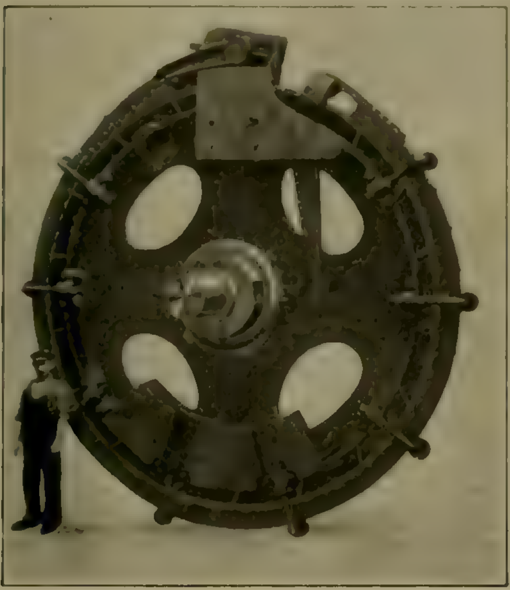


FIG. 2. CLUTCHES.

The hoist is of massive proportions throughout, designed with a high factor of safety, so as to guard against any possibility of delay from breakage or derangement while handling this immense tonnage. The compartments of the main hoisting-shaft are 6 by 7 ft. in the clear, having a distance of 7 ft. 10 in. centre to centre of compartments.

The ore-skips are constructed of ½-in. steel plate, 4 ft. 10 in. by 5 ft. 2 in. by 10 ft. in depth, while the total height from the centre of bottom swing-bearing to the top of the universal socket taking the 1¾-in. diameter hoist-cable is 18 ft. The bottom swing-bearings and saddles are of cast steel, each having a bearing area on the bottom of the skip of 15⅛ by 45 in. The swing and saddle shafts are each 5½-in. diam., collared and placed on 22-in. centres. The dumping rollers are of cast-steel bronze, bushed with cast-steel trunnions 5½-in. diam. The cross-head frames are 1¼ in. thick by 20 in. deep, and are provided with special cone roller bearings taking the lower member of the cable socket. This construction permits the cable to turn or twist freely. The forged-steel skip frames are 1¼ by 12 in. in cross-section. The inside front and back of the main skip body is protected by 2½ by 1 in. bars extending from the mouth of the skip to a distance of 3 ft. 6 in. from the bottom. These bars are riveted to auxiliary plates ¼ in. thick, which are bolted to the main body by means of special ⅞-in. bolts. This permits of easy access in removing the bars for repairs or renewal. No supplies, waste rock, or men are handled in the main hoisting shafts, but a smaller electric hoist is used in an auxiliary inclined shaft at each plant for handling waste rock and supplies, while the men have access to and egress from the workings by means of an easy stairway in these inclined shafts.

IRON ORE movement down the Lakes during 1911 has been sensibly less month by month than that of 1910. According to figures compiled by the *Iron Trade Review*, the fleet moved, to August 1, 1910, 21,863,549 tons, and to August 1, 1911, 14,064,291 tons, a decrease of 7,799,258 tons. If the movement of the remaining months of the present year should equal that of last year, the total shipments for 1911 would be approximately 34,000,000 tons. It is now clear, however, that no such movement will mark the remaining months of the year, and total shipments are likely to fall under 30,000,000 tons. Following is the table:

	1910.	1911.
April	1,520,305	331,645
May	6,081,358	3,684,819
June	7,316,592	4,826,505
July	6,945,289	5,221,373
August	6,964,381	....
September	6,273,832	....
October	4,877,441	....
November	2,641,886	....

Market Reports

LOCAL METAL PRICES.

San Francisco, August 31.

Antimony	12—12¾c	Quicksilver (flask)	48½
Electrolytic Copper	14—15¼c	Tin	47—48¾c
Pig Lead	4.75—5.70c	Spelter	7½—8¼c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50—9.75; large $7.50—8.50

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Aug. 24	12.38	4.50	5.98	52¼
" 25	12.38	4.50	5.93	52⅜
" 26	12.38	4.50	5.90	52¼
" 27	Sunday		No market.	
" 28	12.33	4.50	5.88	52⅜
" 29	12.33	4.50	5.88	52¼
" 30	12.33	4.50	5.88	52¼

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing prices, Aug. 31.		Closing prices, Aug 31.
Amalgamated Copper	$ 57¼	La Rose	$ 3⅞
A. S. & R. Co.	68½	Mason Valley	7⅞
Braden Copper	4½	Miami Copper	19⅛
B. C. Copper Co.	3⅞	Mines Co. of America	4¾
Butte Coalition	15	Nevada Con	17⅜
Chino	18	Nevada Utah	⅝
Davis Daly	⅞	Nipissing	7¾
Dobie	1	Ohio Copper	1⅜
Dolores	4½	Ray Central	1¼
First National	1	Ray Con	13⅝
Foley O'Brien	1	South Utah	⅝
Giroux	4⅝	Superior & Pittsburg	15
Goldfield Con	5½	Tenn. Copper	31⅜
Greene-Cananea	6	Trinity	8⅜
Guanajuato Con	½	Tuolumne Copper	4
Hollinger	10¼	United Copper	1⅝
Inspiration	6⅜	Utah Copper	42
Kerr Lake	4⅛	Yukon Gold	3⅝

COPPER SHARES—BOSTON.

	Closing prices, Aug. 31.		Closing prices Aug. 31
Adventure	$ 4	Mohawk	$ 40
Allouez	25½	North Butte	23
Calumet & Arizona	49¾	Old Dominion	87½
Calumet & Hecla	405	Osceola	88
Centennial	9	Parrot	9½
Copper Range	51⅝	Santa Fe	¾
Daly West	5	Shannon	8
Franklin	7¼	Tamarack	25
Granby	27	Trinity	3¼
Greene Cananea, ctf	6⅞	Utah Con	12
Isle-Royale	13	Victoria	2
La Salle	8⅜	Winona	5¼
Mass Copper	5¾	Wolverine	99

(By courtesy of J. C. Wilson, Mills Building.)

NEVADA STOCKS.

San Francisco, August 31.

Atlanta	$ .16	Mayflower	$ .05
Belcher	.60	Mexican	3.75
Belmont	6.50	Midway	[illegible]
B. & B.	.16	Montana Tonopah	.72
Booth	.09	Nevada Hills	2.92
Chollar	.12	Ophir	1.72
Combination Fraction	.08	Pittsburg Silver Peak	.73
Con. Virginia	.67	Round Mountain	.69
Florence	1.22	Sandstorm Kendall	.04
Goldfield Con	5.50	Savage	.21
Gould & Curry	.11	Tonopah Extension	.88
Jim Butler	.25	Tonopah of Nevada	5.85
Jumbo Extension	.20	Union	1.60
MacNamara	.18	West End	.57

(By courtesy of San Francisco Stock Exchange.)

San Francisco, August 31.

Alpha	$ .03	Justice	$ .08
Alta	.05	Mexican	3.75
Andes	.09	Occidental	.50
Belcher	.52	Ophir	1.70
Brunswick Chollar	.1	Overman	.34
Brunswick Potosi	.1	Potosi	.18
Bullion	.10	Savage	.21
Chollar	.12	Scorpion	.15
Con. Virginia	.66	Seg. Belcher	.11
Crown Point	.78	Sierra Nevada	.46
Gould & Curry	.11	Union	1.60
Hale & Norcross	.20	Utah	.09
Julia	.30	Yellow Jacket	.39

(By courtesy of San Francisco Stock Exchange.)

OIL SHARES

San Francisco, August 31.

Associated Oil	$47.50	Palmer	$ 1.20
Bay City (New Stock)	—	Palmer Union	.40
Brookshire	.90	Peerless	4.00
Caribou (New Stock)	.60	Premier	.50
Claremont	1.10	Producers	2.50
Coalinga National	.16	Republic	.40
Con. Midway	.03	Sauer Dough	1.40
Cresceus	.12	Silver Tip	.90
Empire	1.20	S. & F. McKittrick	13.00
Enos	.50	S. W & B.	.21
Maricopa National	.24	Sunset Monarch	.18
Monte Cristo	2.00	Turner	1.00
Nevada Midway	.16	United Oil	.68
Occidental	.15	Wolverine	.30
Pacific States Petroleum	.25	W. K. Oil	2.90

(By courtesy of San Francisco Stock Exchange.)

Current Prices For Chemicals

(Corrected monthly by Braun-Knecht-Heimann Co.)

Prices quoted are for ordinary quantities in packages as specified. For round lots lower prices may be expected while in smaller quantities advanced prices are ordinarily charged. Prices named are subject to fluctuation. Other conditions govern Mexican and foreign business.

	Min.	Max.
Acid, sulphuric, com'l, 66°, drums, 100 lb.	$0.75	$1.00
Acid, sulphuric, com'l, 66°, carboy, 100 lb.	1.00	1.50
Acid, sulphuric, C.P., 9-lb. bottle, bbl., lb.	0.13	0.18
Acid, sulphuric, C.P., bulk, carboy, lb.	0.09½	0.12
Acid, muriatic, com'l, carboy, 100 lb.	1.60	2.00
Acid, muriatic, C.P., 6-lb. bottle, bbl., lb.	0.15	0.20
Acid, muriatic, C.P., bulk, carboy, lb.	0.10½	0.15
Acid, nitric, com'l, carboy, 100 lb.	5.25	6.50
Acid, nitric, C.P., 7-lb. bottle, bbl., lb.	0.16	0.22
Acid, nitric, C.P., bulk, carboy, lb.	0.12½	0.15
Argols, ground, bbl., lb.	0.20	0.25
Borax, cryst. and conc., bags, 100 lb.	2.75	3.85
Borax, powdered, bbl., 100 lb.	3.00	4.00
Borax glass, gd., 30 mesh, cases, 100 lb., tin lined	10.00	13.00
Bone ash, 60 to 80 mesh, bbl., 100 lb.	4.50	5.50
Bromine, 1-lb. bottle, lb.	0.55	0.65
Candles, adamantine, 12 oz., 40 sets to case	3.50	4.15
Candles, adamantine, 14 oz., 40 sets to case	4.00	4.55
Candles, Stearic, 12 oz., 40 sets to case	4.95	5.50
Candles, Stearic, 14 oz., 40 sets to case	4.65	5.20
Clay, domestic fire, sack, 100 lb.	1.50	2.00
Cyanide, 98 to 100%, 100-lb. case, lb.	0.20¾	0.24¾
Cyanide, 98 to 100%, 200-lb. case, lb.	0.20	0.24
Cyanide, 129%, 100 lb. case, lb.	0.27½	0.28½
Cyanide, 129%, 200-lb. case, lb.	0.26¾	0.27½
Lead acetate, brown, broken casks, 100 lb.	8.75	9.00
Lead acetate, white, broken casks, 100 lb.	10.00	10.25
Lead acetate, white, crystals, 100 lb.	11.75	12.25
Lead, C.P., test., gran., 100 lb.	13.00	15.00
Lead, C.P., sheet, 100 lb.	15.00	18.00
Litharge, C.P., silver free, 100 lb.	10.50	13.00
Litharge, com'l, 100 lb.	7.50	9.00
Manganese ox., blk., dom. in bags, ton	20.00	25.00
Manganese ox., blk., Caucasian, in casks, ton (85% MNO_2—¾% Fe)	42.50	50.00
Nitre, double ref'd, small cryst., bbl., 100 lb.	7.00	8.00
Nitre, double ref'd, granular, bbl., 100 lb.	6.50	7.50
Nitre, double ref'd, powdered, bbl., 100 lb.	7.25	18.00
Potassium bicarbonate, cryst., 100 lb.	12.00	15.00
Potassium carbonate, calcined, 100 lb.	15.00	18.00
Potassium permanganate, drum, lb.	0.11	0.12½
Silica, powdered, bags, lb.	0.03	0.05
Soda, carbonate (ash), bbl., 100 lb.	1.50	1.75
Soda, bicarbonate, bbl., 100 lb.	2.00	2.50
Soda, caustic, ground, 98%, bbl., 100 lb.	3.15	3.50
Soda, caustic, solid, 98%, drums, 100 lb.	2.65	2.85
Zinc shavings, 850 fine, bbl., 100 lb.	10.75	11.75
Zinc sheet, No. 9—18 by 84, drum, 100 lb.	9.50	10.50

Current Prices for Ores and Minerals

(Corrected monthly by Atkins, Kroll & Co.)

The prices are approximate, subject to fluctuation, and to variation according to quantity, quality, and delivery required. They are quoted, except as noted, f.o.b. San Francisco. Buying prices marked*.

	Min.	Max.
Antimony ore, 50%, per ton	*$20.00	$25.00
Arsenic, white, refined, per lb.	0.01¾	0.02¼
Arsenic, red, refined, per lb.	0.06¾	0.07¼
Asbestos, according to length and quality of fibre, per ton	100.00	350.00
Asbestos, lower grades, per ton	10.00	100.00
Asphaltum, refined, per ton	15.00	20.00
Barium carbonate, precipitated, per ton	42.50	45.00
Barium chloride, commercial, per ton	42.50	47.50
Barium sulphate (barytes), prepared, ton	20.00	30.00
Bismuth ore, 10% upward, per ton	*75.00	upward
Chrome ore, according to quality, per ton	10.00	12.50
China clay, per ton	15.00	20.00
Cobalt metal, refined, f.o.b. London, per lb.	2.50	
Coke, foundry, per 2240 lb.	15.00	17.50
Diamonds:		
Borts, according to size and quality, per carat	2.00	15.00
Carbons, according to size and quality, per carat	75.00	100.00
Feldspar, per ton	5.00	25.00
Firebrick:		
Bauxite, per M.	175.00	
Magnesite, per M.	190.00	275.00
Silica, per M.	42.50	47.50
Flint pebbles for tube-mills, per 2240 lb.	15.00	25.00
Fluorspar, per ton	10.00	15.00
Fullers earth, according to quality, per ton.	20.00	30.00
Gilsonite, per ton	35.00	40.00
Graphite:		
Amorphous, per lb.	0.01	0.02½
Crystalline, per lb.	0.04	0.13
Gypsum, per ton	7.50	10.00
Infusorial earth, per ton	10.00	15.00
Magnesite, crude, per ton	7.50	10.00
Magnesite, dead calcined, per ton	22.50	27.50
Magnesite, brick (see firebrick).		
Manganese ore, oxide, crude, per ton	10.00	25.00
Manganese, prepared, according to quality, per ton	40.00	120.00
Mica, according to size and quality, per lb.	0.05	0.30
Molybdenite, 95% MoS_2, per ton	400.00	500.00
Monazite sand (5% thoria), per ton	150.00	200.00
Nickel metal, refined, per lb.	0.45	0.60
Ochre, extra strength, levigated, per 100 lb.	2.25	3.25
Platinum, native, crude, per oz.	30.00	40.00
Scheelite (see tungsten ore).		
Sulphur, crude, per ton	15.00	25.00
Talc, prepared, according to quality, per ton.	20.00	50.00
Tin ore, 60%, per ton	450.00	475.00
Tungsten ore, 65%, per ton	487.00	520.00
Vanadium ore, 15%, per ton	200.00	250.00
Wolframite (see tungsten ore).		
Zinc ore, 50% up, per ton	*15.00	20.00

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EDITORIAL

THE American Peat Society will hold its annual meeting at Kalamazoo, Michigan, September 21 to 23 inclusive. An interesting program has been arranged.

BUTTE was the scene of a bad accident this week as a result of men insisting on riding on a cage loaded with drill steel. Impatience of restraint even when for their own good is sadly characteristic of North American miners.

CONSERVATIONISTS are to meet at Kansas City, Missouri, September 25 to 27 inclusive. The call for the National Conservation Congress provides for selection of delegates by Governors, Mayors, County Commissioners, Chambers of Commerce, Universities, and Societies. A large and representative attendance is expected.

FIRES have been started under the boilers at the mill of the Chino Copper Company and actual production of concentrate will be under way before the end of the month. Record time has been made at this property since the present management took hold a little over two years ago. It is just fourteen months since construction of the mill at Hurley began.

SUFFICIENT attention has never been devoted in the United States to selection of candidates for the Vice-Presidency. As *Harper's Weekly* truly observes, as a rule the candidate "is not selected at all, but the office is scrambled for in convention as the delegates are leaving, and it is a gamble whether a fit man gets it or not." Providence has been kind to the country through more than one administration in preserving the life of the President.

LEASING has become the established method of working mines at Cripple Creek, Colorado, and the district was therefore thrown into confusion when the big companies began to hold up applications last month. An act had been passed by the Legislature that, in the opinion of attorneys, would have placed on the owning company responsibility for lessees debts. Attention having been thus forcibly called to the practical result of the law, the Governor decided to veto the bill.

AN INVESTIGATION of the Kansas natural-gas fields is to be made on behalf of the Kansas City public utilities commission, by Mr. Erasmus Haworth. The Kansas Natural Gas Company, despite heavy investment in lands, leases, and pipe-lines, has found itself unable to furnish gas to its customers as freely as in former years. Loss of its supply of fuel gas would be a severe blow to Kansas City, and the public is not unnaturally much exercised at the prospect. Ultimately the supply of gas is sure to fail, but prolonging its life even a few years will mean much to the community. We heartily commend the action of the commission in calling in expert service. It is another indication of the new order of things in American municipal government. Incidentally, the whole situation re-emphasizes the necessity of conserving by every possible means the supplies of natural gas that remain in other States as well as Kansas.

AUSTRALIA'S dependency, Papua, has remained little known, owing mainly to the difficulties of tropical exploration and the fact that Australians have been busy at home. Recently a party of Federal officials visited the territory and we reproduce this week an account of the mineral resources of the island, prepared for our Australian contemporary by Mr. Hugh Mahon, one of the members of Congress accompanying the expedition. Apparently the veins on the island are important, and as the country becomes better known good mines will be developed.

WILLOUGHBY'S CONSOLIDATED has joined the ranks of the dividend payers after many discouraging years. Formed in 1894, this great Rhodesian company now controls 1,339,000 acres, including over 3000 gold claims. Development of such an estate would be slow anywhere, and in Rhodesia, where the work of the pioneer is still far from complete, the period between flotation and dividend paying is not unnaturally long. American engineers are glad to extend congratulations to the management of the company and to the consulting engineer, Mr. Walter Currie, whose visit to the United States is pleasantly remembered.

AIR-COMPRESSORS do not exhibit good efficiency at high altitudes, because of the low barometric pressure. This is a familiar phenomenon to mining engineers, but the similar effect which altitude has upon gasoline engines is not so well known. At 18,000 feet an automobile motor is reduced to one-half its normal horse-power and there is a greater difficulty in securing proper cooling of cylinders because of the low boiling point of water. At Quito, Ecuador, at an elevation of 9000 feet the use of automobiles is much restricted by the abrupt changes of altitude met in traveling in the vicinity, motors adjusted to operate at the higher levels giving poor service on the plains below.

LEASING the public coal and oil lands is a policy now frequently proposed. In an address delivered at Houghton, Michigan, August 9, and reproduced in the *Mining and Scientific Press* August 12, Mr. George Otis Smith, Director of the United States Geological Survey, discussed the whole matter of the mining industry and the public lands from what may perhaps fairly be considered the 'Administration' point of view. In this week's issue of the *Press*, Mr. William Forstner analyzes the proposed application of the leasing system to California oil-lands and states forcibly the difficulties that must be met. In still other articles now in preparation other phases of the matter will be taken up. The proposal is of such profound interest to the whole mining industry that every engineer can well afford the time needed to study these articles and to make his own contribution to the discussion. Letters from our readers will in this case be particularly welcome.

THE NEW SPIRIT in old China is well exemplified by five full pages of display advertising of the Imperial Railways of China in our excellent contemporary, the *Far Eastern Review*. China is passing through a stage in her development not dissimilar to the period when 'States Rights' were a burning issue in our own politics. Among the rights claimed and exercised by the eighteen provinces are the minting of coins and the construction of railways. Recently the central government has taken upon itself these rights, since modern thought so clearly proves that they may best be performed by a central authority rather than left to the vagaries of provincial officials. This, indeed, is evidenced by experience within the borders of the Flowery Kingdom, as the Imperial Railways of North China now pays handsome dividends, while the Canton provincial company collected and spent some twenty million pesos, with only one hundred miles of road as a net result. Apparently China has a firm policy at last, and correspondingly great progress may be expected.

GEOLOGISTS are in high favor in any mining district when they are sufficiently optimistic, but are regarded as extremely theoretical when they urge caution. Mr. A. G. Burrow's report of Porcupine is considered unduly pessimistic by the local press, because, apparently, of his statements as to the irregularity of the occurrence of the rich streaks of ore. That the deposits of Porcupine will prove to be large and of low grade rather than small and of high grade is the common opinion of engineers who have studied the district. The *Porcupine Press* calls upon Mr. Burrows to agree "that no geologist has to date ever opened up a mining country." This is positively funny in view of the presence of Mr. Malcolm Maclaren at Porcupine at this time for Bewick, Moreing & Company, to say nothing of the services of Mr. W. G. Miller at Cobalt, and the whole succession of geologists who have contributed so largely to the 'opening up' of Ontario and the Lake Superior region.

PROSPECTING by means of drills is becoming increasingly common as new and better types are being perfected. In a large way low-cost and security of results stand in antithesis. Drilling a hole, and getting a true sample of the rock drilled, are two different things, and methods must be varied with conditions. In the Joplin district it has long been considered impracticable to do core-drilling; not that a core could not be obtained, but that the cost would be out of proportion to the benefits. This week Mr. Otto Ruhl describes for our readers recent work in that district accomplished with the calyx drill, and the showing is certainly one that promises much for the district as a whole. It will not do, however, to jump to the conclusion that loss of diamonds always off-sets the speed of work with a diamond-drill. In Nova Scotia it has been found that the diamond loss was practically the same as the shot loss, while labor costs with a new diamond-drill were less. No doubt the character of the ground and the conditions of the drill explain the difference. In developing the porphyry copper deposits the churn-drill has been found both cheap and safe. In outlying corners of the world where transportation costs mount up, the hand-drill has proved to have peculiar advantages. Engineers should be familiar with each type and should study the range of usefulness of each. Get the best for your particular piece of work. There can be only one 'best' in a given case.

Steam-Shovels in Mining

A purist might be inclined to question the use of steam-shovels for mining, as it is perhaps doubtful whether the latter term can be applied with precision to sub-aerial excavations. But engineers are more anxious for results than for precision of speech, and conspicuously successful results have followed the use of steam-shovels for mining ores that fortunately occur in large bodies near the surface. In our issue of April 15 Mr. J. Parke Channing gave a brief resumé of the development of steam-shovels for this work on the iron ore ranges of the Lake Superior region. As our readers know, an extension of their use to the mining of copper ores has been made by the Utah Copper Company and the Nevada Consolidated Copper Company. Through the courtesy of Mr. C. B. Lakenan, general manager of the latter company, we have been furnished with some recent records made in the Copper Flat pit at Ely, where, during the June the No. 6 shovel handled 74,600 cubic yards of stripping, approximately 150,000 tons. The cost of the work averages 15 cents per dry ton of ore (average moisture 6 per cent) or 14 cents per cubic yard of stripping. Slightly lower costs are attained in summer when the digging is a little easier, and the delays are fewer. Similar work is being done in the Bingham pit of the Utah Copper Company, where with 18 or 19 shovels at work, ore and overburden are being handled at the rate of 40,000 tons per day, or roughly, 30 tons per minute. During the quarter ended March 31 the cost of dry excavation in the central zone of the Canal was given as 57 cents per cubic yard. In the absence of itemized costs, close comparisons are impossible, but it is evident that our friends in Nevada and Utah are making records in this work.

To the engineer of imagination the scene at Bingham at night, with the shovels at work beneath the glare of the searchlights placed upon the hills opposite, is dramatic in the extreme, indeed, the whole work which Mr. D. C. Jackling and his associates have carried on is a striking example of creative imagination applied to engineering work. In a later issue we propose to discuss more at length some of the problems met in carrying on mining and milling on so huge a scale.

San Francisco Meeting of the A. I. M. E.

Plans for the meeting of the American Institute of Mining Engineers in San Francisco October 10 to 17 have been announced in the Bulletin of the Institute and in a special circular mailed this week to California members by the local committee. The opening session will be held at the St. Francis Hotel, official headquarters, Tuesday afternoon, October 10, and will be followed by other sessions on Wednesday and Thursday mornings and perhaps in the evenings. Under the chairmanship of Mr. F. W. Bradley, who has charge of the matter, particular emphasis is being placed upon the sessions, since there has been in some quarters too much of a disposition to regard the excursions as the most important feature of Institute meetings. One session will be especially devoted to the consideration of problems of cyanidation, and a number of important papers are already in hand. On Thursday afternoon, October 12, a special train of Pullman and dining cars, in charge of the local committee on excursions, of which Mr. E. H. Benjamin is chairman, will take the party to Bakersfield, arriving early Friday morning, for a visit to the various oilfields. On Friday night, October 13, the party will proceed by train to the heart of the gold-dredging district, near Folsom, spending Saturday morning, October 14, in visits to the gold dredges and the great rock-crushing plant of the Natomas Consolidated Company. On Saturday afternoon, through the courtesy of Hon. Hiram Johnson, Governor of California, a public reception will be held in the State Capitol, Sacramento. Later in the evening the train will transport the party through the Napa and Sonoma valleys, arriving at the Bohemian Club amphitheatre on Sunday morning, October 15, where a barbecue luncheon will be held. The day will be spent in this delightful grove and an orchestral concert will be given on the great natural stage where the plays of this famous Club are presented. On Sunday evening the party will return to San Francisco, and devote Monday, October 16, to rest and preparation for the Japanese delegation, and possibly to a few local excursions. Suitable provision will be made for entertainment of the ladies accompanying the members, but exact details regarding this have not yet been announced.

In order to complete arrangements it is necessary that the committee should know at the earliest possible moment for how many to make provision. The cost of the excursions, including railway and Pullman fares and meals, will be $35 per individual. It is proposed to offer this excursion free to members of the Institute outside the State, but those living within California and taking part will be asked to pay their *pro rata*. Members residing in California, particularly, are asked to notify the chairman of the local committee, Mr. W. C. Ralston, whether they expect to take part in the excursions. They are also requested to contribute to the general expense of the meeting whatever they may be able, and to do so promptly. A large and interesting meeting is assured, but papers, money, and personal service are all needed to make the session entirely successful.

Chicago and the Mining Congress

The meeting of the American Mining Congress at Chicago September 26 to 29 will probably be of more than usual importance and interest. According to the program announced, a large measure of attention is to be devoted to Western land problems and especially to those relating to the public coal lands. No topic more important could have been selected and the discussion should result in something definite and practical. Chicago is a great coal centre and attending the Congress will be an unusual number of men who know the coal business in all its details. There will also be a liberal attendance of Government officials and leaders of Eastern thought. Mr. Walter Fisher, who as Secretary of the Interior is sure to have large influence on the future policy of the Government, will be present, as will, probably, the President. The West will be well represented, for the American Mining Congress remains dominantly Western in membership and spirit.

A curious situation has arisen, one in which the East, the staid conservative East, is moving for a change, while the West, the harum-scarum radical West, is resisting. That the land laws of the United States are archaic and much in need of revision is generally recognized. The East, having the votes, is likely to control results if it be united and determined. At present it is fair to say that, without perhaps full information on the subject, the East favors the application of some form of leasing system to the remaining coal-lands. The West, with full knowledge of the methods under which development has so far taken place, but with little experience in leasing, opposes. We do not propose to discuss the matter at this time, but we would point out that Chicago is a peculiarly favorable place, and the meeting of the American Mining Congress a peculiarly favorable time, for a full investigation of the matter. At Los Angeles last year the meeting was dominated by men opposed to any leasing system. It is but fair to say that they were, in the main, entirely unexperienced with such systems as have been developed on private lands in the East, on State lands in Colorado and Montana, and on public lands generally in the British Dominions. There were as a result numerous misstatements of fact, and the ignorance exhibited by advocates of the present system was quite as dense as any that may properly be imputed to 'uninformed Easterners.' It is to be hoped that a more valuable discussion may take place at Chicago.

At bottom, this is a business matter. The great national resources must be both developed and conserved. The present system has numerous admitted faults and any proposed substitute may be reasonably expected to show others. No system of administration of the public lands will prove beyond criticism. The essential thing is to make a wise choice, and one which is not irrevocable. That experience is a 'dear teacher' is true, but the experience of others may be cheaply converted to our own uses. It is desirable to have fewer arguments about what will or may happen, and a more careful consideration of what does actually happen under different systems of administration. Go then to Chicago and speak out of the fullness of your experience, and then keep still and learn from other men's experience.

The Oil Industry and Public Lands in California

By William Forstner

All present indications tend to the conclusion that the oil-bearing public lands in California, temporarily withdrawn from entry, will at some time in the future be again made accessible to the public under a leasing system, and that the present method of acquiring those lands under the placer law will not be reintroduced. It is useless in the present state of public mind to argue that the introduction of a leasing system will not prove beneficial to the development of the oil industry. Arguments as to the inconsistency of a governmental regulation which allows one man to obtain a patent on 160 acres of government land, carrying gold-bearing gravel, or any other mineral, upon the condition that he shall have spent $500 in improvements on that ground, and refuses to grant a patent to another man on 160 acres of government land carrying mineral oils, for the discovery of which he must have spent much larger sums of money, only granting him a lease on that land are interesting, but likely to be futile. It is apparent that unless an unexpected change in the mind of the authorities at Washington takes place, it will be useless to attempt to obtain a more favorable settlement of this question.

It is contended that the leasing system is worked to advantage on lands belonging to private individuals; that it is also used in other countries; but it must be conceded that in both these cases the conditions are different. The same may be said in regard to the proposal to modify the present coal-land law into a leasing system. The conditions under which oil discoveries are made are essentially different from those governing discovery of other minerals. The discovery of those minerals is generally brought about by surface indications at some not distant point; the discovery of oil is based on outcrops of formations at a considerable distance from the point of actual development, and occurring under such conditions that it is impossible to determine beforehand whether at the point of discovery the oil will be found in commercial quantities or not; nor is it possible to even approximate the cost to be incurred in this discovery. With coal lands the conditions are different; usually the outcrops of the coal beds can be traced and a general opinion as to their thickness and that of the intervening strata can be gained from surface indications. The underground conditions can in most cases be ascertained by diamond-drilling, at a relatively low cost, and in this manner the risks in developing a new territory are greatly reduced.

I have before me a map on which the different withdrawals and restorations to entry on the west side of the San Joaquin valley from Coalinga to Sunset are designated. In this territory the Government has had a number of its best geologists for a considerable length of time, and yet some of the withdrawals have been subsequent to the discovery of oil in the territory so withdrawn, and other discoveries have been made in territory not as yet withdrawn; while in large withdrawn tracts development done has as yet failed to prove the existence of commercially valuable oil. I do not wish to have this statement understood in any way to be a criticism of the government geologists, it simply enforces my argument that the existence of commercially available oil deposits can only be proved by actual drilling. The drilling of oil wells in a new territory is expensive, and can only be undertaken by men or by companies commanding considerable capital. It is true that the original discoveries of oil have in most cases been made by men of small means, but here the element of chance has played a considerable part. When the men who drilled the first well in the Coalinga oilfields, at Oil City, struck the oil-bearing sand they had arrived at the limit of their resources, and if the territory had been somewhat deeper they would have had to abandon their undertaking. This is only one instance out of many. When men have the energy to take such chances it is only fair that they should receive ample returns. I will go farther and state that such men will only take those chances when they are assured of such returns in case of success; and if regulations be made which will hamper them in getting those returns in case of success, they will apply their energy elsewhere.

The leases taken in California on oil lands belonging to private individuals vary according to the conditions of the district. In proved or nearly proved territory these leases are generally for 20 years, usually with a right of an extension, at least as far as the producing wells are concerned, until production is exhausted. The usual consideration is a royalty of from one-eight to one-fourth of the production; in doubtful and unproved territory those leases usually carry the privilege of purchase within a certain lapse of time after discovery at a price far below the value of the land when proved to be oil-bearing. Most of the owners of private lands are more or less in touch with the oil business; they are to a certain extent acquainted with the many difficulties with which the operator has to contend, and in these leases they leave him entirely free in his mode of operation, only stipulating for a moderate rate of development. This may have some disadvantages, especially in the matter of allowing water to enter the oil strata through the carelessness of the operator, but as this endangers the neighboring properties, the community interests in a district under development tend toward a protection.

One of the greatest objections to the system of leasing by the Government lies in the fact that those leases will be subject to regulations made by the department in Washington, and thus terms will be settled by officials who have no actual experience with the details of the operation of oil properties. It is the experience all over the world that government bureaus always have the tendency to expand their influence and regulate from the seat of the government the minutest details of all matters coming within their supervision. If a leasing system for the government lands is to be introduced, the oil-men will have to use their best efforts to have the regulations drawn in such a manner as to prevent any undue interference with the operations of the leased lands by the authorities in Washington; to obtain this result will demand all their efforts, and even then I doubt whether they will entirely succeed. That the terms upon which leases will be granted are of the greatest importance will be readily recognized by those acquainted with the oil business, but it is doubtful whether this will be the case with the authorities in Washington, and certainly not with the members of Congress, where the matter will finally have to be settled. Unfortunately the general public has the mistaken idea that the development of an oil property is a very simple undertaking, 'just drilling a hole in the ground.' All the difficulties encountered in drilling that 'hole' and the great expense incidental to the taking care of the product are seldom, if ever, brought to the attention of the public. The oil-men will have for their own protection to begin a campaign of education.

Another difficulty which will be encountered in framing a law adequate to the situation is the present condition of the public mind in regard to corporations. During the last years the public has been so constantly impressed by writers in the public prints with the evils and abuses of the large corporations, that it has got into a state of hysterics on this subject, and at the present time no sane and businesslike appreciation of all the intricate conditions pertaining to its consideration can be expected. Everyone connected with the control of a large corporation is considered by the public at large as tainted with dishonesty, and every act of such corporation to protect the interests of its stockholders as an act of monopolistic oppression. Corporations have made mistakes and will make mistakes in the future, so do all of us individually, but the benefit they have brought to the development of the resources of the country overshadows their mistakes a hundred times. The enormous expansion of the industries, business of the country during the last 25 years is almost entirely due to the activity of the large aggregations of capital, working through the instrumentality of the corporations. This is not a local phenomenon, but world-wide. Large industrial establishments can produce and distribute their product cheaper than a number of small producers, having in the aggregate the same output, and this economic fact underlies at the present time the industrial business policy of the entire world. This is the reason that in all countries, except our own, the governments are friendly to the combination of enterprises working in the same line of business. The United States has become in the latter years an exporter of manufactured articles; in other words in order to keep up the present rate of production, which is larger than our local consumption, this country must compete in the world market with all other manufacturing countries. Is it then rational to destroy, or at least to seriously hamper the only instruments through which this competition can be successfully carried on? The result would be that power to compete in the world market would be crippled to such an extent that production would have to be restricted to the local power of absorption of manufactured products; which would mean a restriction of production, and a further decline of consumption. Another inevitable result of the present tendency to antagonize capital must be well considered. Capital can find employment and is offered remunerative investments all over the world. If then the United States pursues the policy of persistently harassing it, the inevitable result will be that, not only foreign capital will retire its investments in this country, but that local capital will seek investments in those countries which adopt a more friendly attitude.

This subject is germain to the question here discussed, because the oil business, for its proper development, requires the use of large capital. The following examples will prove this contention. In the south Coalinga district work was begun years ago, when ten wells were drilled in the Kreyenhagen field and three in the northwest part of the district. In 1909 work was again resumed, and since then 19 wells have been drilled. Out of this number only the two shallow wells of the Berkeley-Coalinga Oil Co. are producing. Of these 19 wells, three are over 400 ft. deep, and one of these, costing about $100,000, has been abandoned. Another well, after having been drilled to a depth of 2400 ft., had to be turned into a water well, and a new well drilled which is at present 3450 ft. deep. I believe I am not far wrong in estimating that close to $1,000,000 has been expended in this district without, as yet, any financial return. In the Kettleman Hills, certainly $300,000 has been spent without a discovery of oil being made. In the Elk Hills at least $1,000,000 has been expended in the last two years, and up to date only one well has been brought in, with a daily output of 160 bbl. and a depth of over 4000 ft. To market this oil a pipe-line more than 7 miles in length would have to be laid. The oil and gas discovery in the Buena Vista Hills was made by the Honolulu Consolidated Oil Co. This company has been working three years in this territory; has spent $2,500,000; some of its wells have cost over $80,000 to drill not including the general operating expenses, as building of roads, establishing of machine-shops, etc. The present output in natural gas and oil is not sufficient to cover the operating and development expenses.

Similar cases could be cited from each district in California, but the above will be sufficient to justify my assertion, that for the interest of the oil industry in this State it is of the greatest importance that nothing be done to deter the investment of capital in its development. It might be argued that, as we have at the present moment an overproduction, there is no need for the development of new territory, and that in the territory already proved, the small producer can take care of the situation. The present surplus of the production over consumption is the result of extraordinary conditions in the past. If the production and consumption of the months of April, May, and June, 1910 be compared with those of the same months of 1911, the following appears:

Year	Production, bbl.	Increase, per cent.	Consumption, bbl.	Increase, per cent.
1910	20,702,880		16,176,211	
1911	20,746,881	0.2	18,144,286	12.2

These figures indicate that before long the surplus of production over consumption will disappear, unless an unexpected extraordinary increase in the production should occur. The gradual decrease in production of the existing wells in the productive area will counterbalance the increase resulting from the new wells brought in within those areas, and the production would soon become stationary unless the development of new territories did not enlarge the productive area of the State.

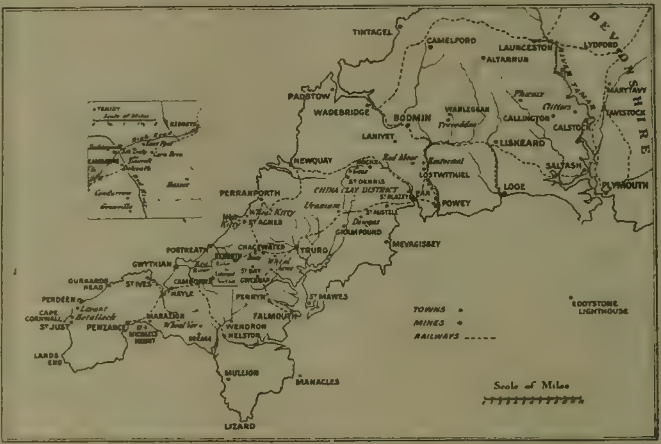
In the interest of the oil industry it is, then, of the utmost importance that in the new legislation regarding the future development of the Government lands within possible oil-bearing districts, no stipulations be enacted which will tend to deter capital from readily investing in this industrial field. This feature must be borne in mind by the men interested in the oil industry, especially when George Otis Smith, Director of the U. S. Geological Survey, an official who will undoubtedly have a large influence on the drafting of the terms whereunder the Government leases will be granted, emphasizes that those leases should "secure the prohibition of too large holdings of Government leases by big companies," and further states that they shall "insure against excessive charges to consumer". I believe that a small lease-holder should be at liberty to transfer his lease to such parties and under such conditions as are at the time the most advantageous to him. He has given his time, his energy, and his money, and he is entitled to derive therefrom the greatest possible benefit, without interference from the party, in this instance the Government, who has profited by his efforts. To have the Government supervise the returns he may receive from his product is certainly unsound from an economic standpoint. To demand that the man who has invested his time and money in a risky undertaking shall be limited in his profits in the case of exceptionally favorable circumstances, is an economic mistake, unless the Government agrees to pay him a certain minimum price for his output, as the Canadian Government undertakes to do without specifying a maximum price. It may be to the ultimate benefit of the oil industry in California that the regulation of this matter be delayed for a time, until public opinion be restored to a frame of mind which will allow a dispassionate and business-like discussion of the different conditions which demand consideration in the final settlements of this question, even while recognizing the great harm done by the present muddle in which this question finds itself.

SUBSTANTIAL progress has been made during the last twelve months with the construction and equipment of the Benguella railway, Portuguese West Africa, and traffic is now running up to the railhead, 200 miles from the sea. This railway runs from the port of Lobito, on the west coast of Africa, eastward through Portuguese Angola toward the Belgian Congo, and it is proposed ultimately to extend it to join the Rhodesia railways and the Cape-to-Cairo line. The portion from 123 miles to 200 miles was completed in October last. A contract has been arranged for the construction and equipment of a further section extending up to 223 miles, and the surveys for the line up to Mutota, 559 miles from Lobito, are to be completed by the end of June. The total distance from Lobito to the Congo frontier is estimated at about 807 miles. The gauge is 3 ft. 6 in. Lobito possesses one of the finest natural harbors in Africa, with a substantial timber jetty that is capable of accommodating the largest steamers running to South Africa.—*Railway Age Gazette.*

THE VOLUME of the ocean is 302,000,000 cubic miles.

An Engineer's Pilgrimage to Cornwall

A visit to Cornwall bears to the mining engineer much of the significance that a journey to Italy and Greece does to an artist. It was, then, with lively anticipations that one morning shortly before Christmas, I set out on the Penzance Express from Paddington in company with Mr. Fern, the secretary of the London and West Country Chamber of Mines. Having specified the time and place, it is perhaps unnecessary to add that the day was chill and overcast, with lowering clouds that from time to time proved that their threat of rain was not merely an empty one. As we followed the Thames, near Maidenhead, the swollen river was seen to have invaded the fields, and in places even ventured to lap the edges of the railway embankment. There is no stop before reaching Plymouth, and the first sight of that wonderful harbor makes the preceding events of the journey seem of little import. At its mouth the Tamar river widens, forming Plymouth south and the great basin of the Hamoaze, four miles long, which together with the estuary of the Plyne, called the Catwater, form the most beautiful of English harbors. The Eddystone lighthouse was lost in the mists a dozen miles off shore, but the citadel and the warships at anchor showed the naval importance of this famous town, from which the Pilgrim Fathers in 1620 set out for the New World. And as one surveys the sweeps of the harbor, the curves of the hills, and revels in the soft tones which the mists of Devon, Cornwall, give to the landscape, a better understanding of Turner's genius is obtained. The train glides over the Royal Albert bridge, the most striking of the engineering works of the celebrated Brunel, and we are in Cornwall. The country becomes more mountainous and is everywhere a vivid green. An American is surprised to see how little active cultivation is going on. There are flocks of cattle, to be sure, but few ploughed fields are seen, and a clearer perception comes of how marked is the effect upon industrial life of a social system that permits the holding of large tracts of land as private parks and game preserves.



GRENVILLE, SHOWING CORNISH STAMPS.

GRENVILLE, SHOWING STYLE OF CONSTRUCTION.

Between Plymouth and Truro the train skirts the border of St. Austell bay, the track occupying the narrow beach between the foot of the cliff and the sea's edge. When there is a storm the spray and spindrift must make this portion of the journey seem almost like a ride with Neptune. At Truro it is necessary to change to the local train which stops at Redruth, where I had planned to stay. This typical Cornish town reminded me strongly of towns of the same size in the Lake Superior district, but Tabbs hotel was as unlike anything to be found in America as was the clotted cream served me to eat upon my dessert. Continental cities are something of a disappointment, they are so unlike preconceived ideas of them, but England is so astonishingly and pleasingly English that it is a delight. Then, too, blood is thicker than water, and though the disputes between relatives are often more acrimonious than those with strangers, kinship holds, and the American feels in England a sense of at-homeness that is lacking on the Continent.

Tin mines can be found throughout Cornwall and the adjacent portion of Devonshire, but many of the largest and most famous are between Redruth and Camborne, skirting the northern border of the great granite batholith which has shattered and metamorphosed the slates about its borders, giving rise to veins which pass from the granite into the slate and are most strongly developed near the contact, though many veins occur wholly in the slate or in the granite. The valuable minerals are 'tinstone' or cassiterite, wolframite, and metallic sulphides, chiefly of iron, copper, and arsenic. Formerly the mining of copper in Cornwall was an important industry, but now it is a thing of the past; tin, tungsten, and arsenic, the two latter by-products of tin-production, are now the only metals of much importance in Cornish industry. In ancient days tin was produced from the stream beds and copper from shallow underground workings, but now the streams, except the Red river, into which the tailing from the mills discharges, are largely worked out, while the copper veins have grown too poor in depth to permit of deep mining. Deep mining of the tin veins is now most important, though the others still persist in places, and an attempt has even been made recently to dredge the stream deposits, but without financial success. This leads naturally to another significant feature of Cornish mining that comes as a surprise to the visitor; the number of mines which continue working, though not a financial success. This takes us into a critical examination of the Cornish social system, a maze where even the incautious would fear to tread. Generalizations upon any intricate subject are necessarily incomplete and inaccurate, but it does not follow that they are not worth while, for they permit the conveying of general impressions in a way otherwise impossible. At the risk, then, of destructive criticism, I will venture to give the impressions formed during so brief a visit.

Cornwall is an old mining district, therefore an intricate network of relationships has gradually formed and the tracing of the threads becomes almost impossible. When a eucalyptus tree grows, the old bark cracks off and falls away, leaving the trunk free to expand, but a social system appears to lack so useful a development, and therefore revolutions and social upheavals bring about the catastrophic changes that uniform change is unable to effect. Industry is likewise restricted in its growth, and the Cornish mining industry of the present is hampered by much that persists from former times. When a business has outgrown its building and equipment, we tear them down, sell them for scrap, and erect new machinery in more commodious quarters. But an outgrown superintendent or manager has no value as scrap, nor may he be so ruthlessly torn down. Then, too, it is often possible to continue to make small profits with antiquated equipment that is already amortized, where the increased saving made by new and better machinery would not equal the increased interest and amortization charges. This serves to explain methods of work that appear peculiar to the uninitiated, but throws no light on the question why mines should continue to work at an annual loss, as may be seen to be true by referring to table I. But this is equally explainable; the principal shareholders in the mines are local landlords and business men, who derive their income from rents, or the profits of other business. To close down a mine when its yearly profits are not a fair interest on the invested capital, would seem a wise proceeding, but when we remember that on the loss of their employment the workmen would emigrate, producing a loss in rents and profits many times the loss resulting from mining operations, the folly of such a course of action becomes evident. What at first sight seems unwise proves, on closer examination, to be very good business, and this is likely to prove true of many phases of Cornish mining, for it must be remembered that the peculiar features of a system of working may be perceived at a glance, but the governing causes that have produced them are not often so quickly discerned.

So many descriptions and discussions of Cornish mines and their methods of work have appeared that it is scarce worth while to attempt a detailed description of the few I was able to see, and I will content myself with giving bits of description that may prove of interest.

DOLCOATH, SHOWING 'RAG-FRAMES' AND 'STRIPS.'

One of the best known Cornish mines is Dolcoath, where the situation is easily reviewed. To the east, in the Red river valley, are the small, crooked, old-time shafts that are still used to a certain extent; to the west, in the hill, are ordinary shafts from which the production is now obtained, while to the south, beyond the railroad, is the new 3000-ft. shaft, 17½ ft. in diameter, and lined with 9 in. of brick. It is equipped with plunger-pumps, belt-driven from an electric motor, and when this shaft is fully in use, all the hoisting and pumping will be concentrated at this point, replacing the old 'Cornish pitwork.' Objections to Cornish pumps are: (1) they cannot be speeded above 6 to 8 strokes per minute without shaking to pieces; (2) the leakage-water dropping down the shaft interferes with its use as an upcast; (3) they take up too much room and make the shaft too unpleasant to work in. The plant on the surface shows equally striking contrasts. In one mill the old Cornish pumps, with their 660-lb. cast-iron shoes cast directly on a square wrought-iron stem, are pounding away. In place of the modern cam there are pegs on the shaft, and, since the stamps cannot turn, they wear rapidly. After a while they are turned around, to make the wear even, but the decrease in weight as they wear away makes the stamp-duty low. As these old stamp-mills wear out they are gradually being replaced by either the ordinary California stamps, or else the Holman pneumatic stamp. These latter I saw at work in the mill of the East Pool and Agar United, near Carn Brea. They are quadruple-discharge single stamps of a capacity of 24 to 28 tons per day with a power consumption of 20 hp. The stamp drops 140 to 180 times per minute. The shoes last 9 days, the dies 45 days, and the suspension trunnions about two years. The cost of crushing by the three different methods is analyzed in the following table (II), kindly furnished by Harold Fern.

TABLE I

RESULT OF WORKING FIVE OF THE LARGEST MINES IN CAMBORNE AND REDRUTH DISTRICT DURING 1909.

	Dolcoath, Ltd.	Carn Brea & Tincroft Mines, Ltd.	South Crofty, Ltd.	Basset Mines, Ltd.	Grenville United Mines, Ltd.	Total five Mines.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Ore raised and treated	92,229	74,638	59,327	42,587	42,491	311,272
Black tin recovered	1,904½	1,066⅓	696	844⅓	642	5,153
	£	£	£	£	£	£
Value of black tin	154,276	75,317	53,481	62,749	50,263	396,086
Other products and incidental credits	3,379	6,536	20,152	719	30	30,816
Total receipts	157,655	81,853	73,633	63,468	50,293	426,902
Value per ton of ore	34s.2.24d.	21s.11.2d.	24s.9.87d.	29s.9.68d.	23s.8.07d.	27s.5.15d.
Labor Charges	76,030	52,223	34,294	33,451	31,891	227,889
Coal and materials	36,334	26,070	20,118	28,023	18,542	109,087
Royalties	10,381	2,949	2,643	....	....	15,973
Rents, rates, and taxes	3,462	996	397	940	796	6,591
Incidental charges	3,898	1,722	2,124	967	1,416	10,127
Depreciation written off	5,682	......	3,266	....	....	8,948
Total cost for year	135,787	83,960	62,842	63,381	52,645	398,615
Total cost per ton	29s.5.35d.	22s.5.98d.	21s.2.21d.	29s.9.19d.	24s.9.35d.	25s.7.34d.
Profit for year	21,868	....	10,792	87	....	28,287
Profit for year per ton	4s.8.89d.	....	3s.7.66d.	0s.0.49d.	....	1s.9.81d.
Loss for year	......	2,107	....	....	2,352	....
Loss for year per ton	......	0s.6.78d.	....	....	1s.1.28d.	....
Issued share capital	340,000	135,560	50,000	120,000	90,000	735,500
Expenditure placed to capital account during the year	29,327	835	4,983	410	....	35,555

TABLE II

RELATIVE STAMPING COSTS

		Power cost.				Stamping cost.				
	Tons stamped.	Fuel.	Oil.	Wages.	Total.	Shoes and dies.	Screens.	Oil.	Wages.	Total cost per ton.
Cornish stamps	19,561	30.5	1.0	3.8	35.2	8.0	0.68	0.90	6.2	51.1
Holman pneumatic	52,852	17.8	0.5	3.0	21.4	7.0	1.28	0.95	4.2	34.7
California	60,916	...	..	..	17.5	5.7	1.60	0.65	4.5	29.4

TABLE III

WORKING COSTS OF TWO CORNISH MINES

	Basset Mines, Ltd. Cost per ton of ore crushed.		Wheal Kitty and Penhalls United. Cost per ton of ore crushed.	
	s.	d.	s.	d
Mining	6	4.5	7	9.74
Development	6	2.5	5	1.02
Pumping	6	11	2	0.54
Dressing	5	2.5	4	11.56
Repairs and maintenance	4	8.5	1	3.31
	—	—	—	——
	29	5	21	2.17
General administration	1	10	2	0.79
	—	—	—	——
	31	3	23	2.96
Royalties	0	3	1	6.19
Depreciation	......		1	7.91
	—	—	—	——
	31	6	26	5.06

A striking feature of Cornish mines is the peculiar methods followed in the transaction of business and the keeping of accounts. The ancient charters, by which the tinners are exempt from the jurisdiction of any court besides the Stannary Courts, except in cases affecting land life or limit, and the curious practice of 'tin ticketing' are of great interest, but they have been often described and more space cannot be accorded them here. The 'cost-book' system of account keeping is typically Cornish; those who are interested in the details of its working should refer to the extended discussion given in the interesting paper, 'The Cost-book Company,' by Harold Fern, but a crude statement of it would be that it is a partnership, where all the receipts and expenses are put down in a book and at the end of the year the profit or loss is shared proportionately. The disadvantages of this are obvious, and the companies are now nearly all being converted into limited liability companies. But even in these the methods of keeping accounts are such that it is usually impossible to analyze the working costs. But two of the mines do this, and in the table below is given a summary of their working costs. The most striking feature of these is the high cost per ton for pumping; this is one of the burdens of mining in Cornwall, and the many tons of water to be raised daily from deep shafts form a strong argument for the use of the Cornish engine, with its large number of foot-pounds of useful work per ton of coal.

Returning to London and reflecting on what I had seen, I was irresistably led to the conclusion that great and important as the output of mineral wealth of Cornwall has been, it is far outranked in worth and importance by her greatest contribution to civilization, the Cornish miner and engineer. The names of those who have gone out from Cornwall to be leaders in the development of mining and metallurgy are known the world around. I had seen Redruth and Camborne, Dolcoath, East Pool, Carn Brea & Tincroft, I had lunched with the veteran, J. H. Collins, whose sons have in the far corners of the earth upheld the reputation of the Cornish engineer, and I had shaken hands with Richard Pearce and heard him tell of the days when metallurgical history was being made in Colorado; I had finished my pilgrimage.

Better Prospecting at Joplin

By Otto Ruhl

For many years mine operators and engineers have recognized the need for better prospecting in the Joplin district than that afforded by churn-drilling, but trials of diamond-drills failed to encourage, and so makeshift methods were accepted. As the district developed year by year, as the investment for each mine grew from a few hundreds to upward of $30,000, the need for more certainty before sinking a shaft became insistent and the search for a drill that would give accurate results began in earnest. Recently core-drilling has been successfully done by the Oronogo Circle Mining Co., operating a mine at Oronogo, Missouri, eight miles northeast of Joplin. In an effort to demonstrate the extent and character of the ground below the 240-ft. level, churn-drilling was first attempted. Three holes were drilled with an ordinary churn-drill starting in the mine. The machine was lowered into the ground, and for the first time in the district's history drilling was done underground. This effected a saving of 240 ft. over work from the surface. The results were highly satisfactory in showing rich zinc down to the 330-ft. level, but the investment necessary to open these deeper runs, together with the known inaccuracy of the churn-drill, caused the company to hesitate about undertaking the work until the supposed discovery should be confirmed. It was at this stage of the proceedings that a decision to try out a core-drill was made.

The work of selecting a new machine was approached with considerable care. So far as could be ascertained, only one successful drill-hole had ever been put down in this district by a diamond-drill. This was done by the Edgar Zinc Co. on its Homestead tract at Carterville. But it must be remarked that no more were attempted, because of the excessive cost. Diamonds were costly and the number lost by the drilling into crevices in flint were too many to encourage further trials of this machine. Trials at other points in the district were even more discouraging, and the diamond-drill was generally condemned as impractical and too costly. Shot-drills had also been tried. These, while not successful in the full sense of the term, did make a better record, both as to cost and performance. They then offered the better prospect, and the company ordered a Davis-Calyx class F-1 shot-drill, from the Ingersoll-Rand Co. To insure a fair trial, an expert drillman was sent to erect the machine, start the drilling, and train a crew of Joplin men.

Due, perhaps, both to the expert operator and the determination of the company management that everything possible should be done to insure the success of the machine, the drill was a success from the start, not only from the standpoint of speed, but also, after the first hole, from that of cost. As the crew of Joplin drillmen became more familiar with the machine, better speed and better results were obtained. Even the first hole showed an average of 4 ft. per day, while a maximum of 8 ft. was attained on several days. The maximum increased to 13 ft. on the second hole, and to 17 ft. on subsequent holes. The speed of drilling, however, is directly proportional to the hardness of the rock, while other factors entering into the speed are the number of crevices and the frequency of taking out the cores.

In hard rock, of which the 'black flint' is by far the hardest, the drill could make but slow headway. Three feet per day of eight hours in this formation was considered rapid progress, while ordinary limestone was easily penetrated. The ordinary white and blue flint of intermediate hardness showed an intermediate rate of drilling. The scale of rapidity was from limestone, white flint, blue flint, to 'black flint'. Crevices proved troublesome from the standpoint of speed, only. When one was found it was only necessary to fill it with quick-setting cement, after which drilling could be resumed. Waiting for the cement to set was the factor that consumed time. This time could be utilized in taking out the accumulated core, but other than this and perhaps the few little adjustments of the machine, the time loss was heavy.

The taking of the cores from the core barrel had to be frequent enough to prevent any great abrasion. The hardness of the flint as contrasted with the softness of the zinc blende created a condition that necessitated care. If a core broke just at the junction of the flint with the zincblende, the two sections of core revolving upon each other had a tendency to rapidly pulverize the blende; thus vitiating the record. Necessarily, then, when the drilling was in an ore deposit, the core had to be drawn often, and it is estimated that this occupies fully one-third of the time. The character of the rock drilled determined the character of the core. The six holes put down show practically the same sequence of interbedded limestone and various colored flints or cherts. Many crevices were encountered, some of them entirely open, others partly filled with zincblende. Such crevices usually resulted in the core being broken. The partings were not always horizontal, but varied from horizontal to an angle of over 45° from horizontal. Cores 30 in. long were taken out. From this they ranged downward to 2 in. The average was 6 to 8 in. in length. The zincblende occurred in pockets or seams running from 1 to 6 in. in thickness and also disseminated in the flint and limestone. The cores were 3¼ in. in diameter and came from a hole 4¼ in. in diameter. They gave a good sample of the ore, its gangue matter, and information regarding the manner of its association. From the records so far obtained, the amount of disseminated ore in both flint and limestone at this point is considerable, and gives an insight into what may be expected when the deeper levels come to be worked at other points in the field.

The cores are stored in boxes especially constructed to hold 10 ft. of core. The boxes are 5 ft. long and contain two 5-ft. lengths. The depth is indicated on the cores by proper tags, each separate piece of core being so tagged. The cores containing ore are sawed in two vertically, one-half being ground for a sample for assaying, leaving the other half to complete the core record. This system was employed for a few of the holes, while with the remainder the cores were broken to ½ and ¾-in. sizes, then quartered, and a sample taken, which was assayed, the remainder being returned to the core box.

The cost of drilling with this machine to a depth of 90 ft., as figured from the records of the Oronogo Circle Co., was $1.25 to $1.30 per foot. This cost includes the items of labor 95c. per foot, power and repairs 10c. to 15c., and steel shot 15c. per foot. These cost items should be analyzed to be fully understood. In the first place, only skilled workmen of the highest order were employed in the operation of the machine. The ordinary churn-drill can be operated with cheaper labor, first because it does not require such skill, and second because of the greater number of men familiar with churn-drill work. In the second place, it should be kept in mind that these costs are based upon work which was largely experimental, as the records of improvement in the drilling showed. It is believed that with the present trained crew of workmen the cost can be reduced to $1.10 to $1.15 per foot on a similar amount of work under similar conditions. This would compare with 80c. to 90c. per foot for churn-drilling. In the core-drill work the record or log obtained would be absolutely accurate and knowledge of a concrete character would be obtained from it, while in the churn-drill log inaccuracy would be certain, and the knowledge gained from the log would be meagre.

This record of performance has been watched by a number of the most progressive operators, and already plans for core-drilling in other portions of the field are in progress. For the present these plans involve work in a limited field; the Webb City sheet-ground area, the West Joplin disseminated field, and the deeper levels of disseminated ore in limestone, developed at Cave Springs and in North Empire. It is apparent immediately that the 'soft ground' deposits are outside the limit of this machine's work, and these will always be developed by the churn-drilling. But the field for the deeper drilling in hard ground is large, and, judged by the development of the past seven years, will become even more important. It is just this field that has the narrowest limits for successful operation and in which the largest numbers of failures have been recorded. The one remedy agreed upon is that such prospecting must be adopted as will give absolute and reliable information before expending the money necessary for developments. Core-drilling seems to promise such a remedy.

A few instances of the inaccuracies of churn-drilling will suffice to show the possibilities for the core-drill work in the Joplin district. In the drilling with a churn-drill the sample may be too rich, or the reverse. One is just as likely to have a good drill record upon a poor property, and a poor drill record upon a good property, as to have the records give correct data. In sheet-ground a drill-hole put down may show a thick stratum of zincblende in shelly flint. The softness of the blende causes it to be broken quite a distance from the outer edge of the hole and to salt the sample. Even where cased off, the impact of the falling steel will jar loose considerable blende which, falling down through the crevices, salts the sample, and an inaccurate log results. There are numerous instances of such holes in the north Webb City district. The directly opposite condition sometimes results when the drill enters ore in a running watercourse, the cuttings being washed away to such an extent that the record may be bad while the ground is really good. Still another case where churn-drilling proves inadequate is in disseminated deposits in limestone. Here the impact of the drill steel reduces the rock to impalpable powder, and the softness of the limestone, together with the likelihood of the ingress of surface water or water from an upper stratum, makes it highly probable that a great deal of the limestone is taken into solution or held in such finely comminuted particles that any samples taken give too rich a sample and the prospector is misled.

Other reasons now operating against the churn-drill in the Joplin district are the loose methods employed, speed being the main idea of the contracting driller. Most of the work here is done by contract. Inadequate cleaning of the hole, improper casing, or none at all, improper sampling, too much drilling between clean-outs, and finally, the inability to preserve the samples so that the geological formations may be recognized at all times, make churn-drilling valueless except as a mere indicator of the presence or absence of ore upon a tract of land. This is being recognized quite generally, and, while all operators agree as to the rapidity of churn-drilling, its inaccuracy offsets this advantage.

It seems possible to make use of this good feature of the churn-drill and combine with it the good features of the core-drill. If this can be done, and it certainly appears feasible from the work so far accomplished, the cost of drilling will not be greatly increased over the prevailing rate, and at the same time accurate records of the ore deposits can be secured. By utilizing the churn-drill down to an ore deposit and then casing the hole, the core-drill could be introduced to take out a core of the ore deposit, and, as the deposit is usually but a few feet thick as compared with the amount of barren rock penetrated to get to it, the proportion of high-cost drilling to the low-cost drilling will be small. For example, consider a hole 180 ft. deep to the ore deposit and with a body of 20 ft. of ore. The churn-drilling at 90c. will amount to $162, the core-drilling of 20 ft. at $1.25, to $25; a total of $187 for the 200 ft., or 94c. per foot. The extra cost is negligible as compared with the greater reliability of the prospecting. This has so appealed to mine operators that within the year several such prospecting campaigns will be put under way. One is scheduled to begin in the north Webb City field, and another west of Joplin in the disseminated-ore field. In southeastern Missouri diamond-drills have long been extensively used, as also in the Lake Superior copper and iron districts. In the latter churn-drills and diamond-drills are used together. In zinc districts churn-drills only have generally been used.

Potash Investigation

An investigation into possible sources of potash salts in the United States is being made this year by the United States Geological Survey under an appropriation by Congress of $20,000 for the current year. One of the possible sources from which potash may be derived is in association with saline deposits left by drying up of large bodies of salty waters, such as are known to have existed at one time in many of the now desert areas of southwest Oregon, Nevada, southeast California, in Utah, and elsewhere. It is hoped that by testing these saline deposits some may be found sufficiently rich in potash to have a commercial value, and that there may even be located some large and important deposits.

As a part of this work the Survey will soon fit up a temporary laboratory at Fallon, Nevada, for the purpose of testing samples of salines from the Great Basin or desert areas. Samples of such alkaline salts will be tested at this laboratory free of charge if a definite statement of the locality from which they were obtained be sent with the samples. The location should be given by section, township, and range, if possible, otherwise by distance and direction from the nearest post-office or settlement. Samples should be addressed to Hoyt S. Gale, United States Geological Survey, Fallon, Nev. Upon receipt of a request, small sample sacks for sending the material by mail will be forwarded from the above address. If so requested at the time that a sample is submitted for test, the accompanying information concerning the locality of the deposit will be treated as confidential; and the evidence thus obtained is not to be used for the purpose of making land withdrawals.

Coal and Oil in California

California's production of coal in 1910 was 11,164 short tons, with a spot value of $18,336, according to E. W. Parker, of the United States Geological Survey. In 1909 California showed the largest percentage of increase among the coal-producing States. In 1910 it showed the largest percentage of decrease. Both changes were due to fluctuations in the operations of the Stone Canyon Con. Coal Co., in Monterey county. For two years preceding 1909 this company had expended large amounts of money in developing its property and in building a 25-mile railroad to connect its mine with the Southern Pacific railroad. Unfortunately, unforeseen difficulties were encountered, and one misfortune followed another until the resources of the company were exhausted, and, as it was unable to procure additional capital, a receiver was appointed, and work was suspended in October 1909. In the nine months from January to September of that year the Stone Canyon mines had produced 75% of the State's output for the entire year. No coal was produced at this mine in 1910. All of the coal produced in 1910 came from Amador and Riverside counties, principally from the Ione mine in Amador county. This coal is lignite. The Stone Canyon coal is a non-coking bituminous coal of good quality and should make an excellent domestic fuel. It stands exposure and with favorable freight rates would compete successfully with foreign coals in the markets of San Francisco and other cities of the State.

The small production of coal in California is offset by the enormous increase in the production of petroleum, most of which is used for fuel. The oil produced in California in 1910 aggregated between 65,000,000 and 70,000,000 bbl., which, on the basis of 3½ bbl. of oil for each ton of high-grade coal, would be equal to a production of nearly 20,000,000 tons of coal. The use of petroleum by the transportation and manufacturing industries of California has practically eliminated coal as a steam-raising fuel in the State. Oil is also used in the manufacture of gas which is employed for cooking and for heating residences as well as for lighting. Oil is now also coming into use as a fuel for household purposes.

Lake Superior Mining Institute

The sixteenth annual meeting of the Lake Superior Mining Institute, which began at Crystal Falls, Michigan, resolved itself into a three days' tour of the principal producing iron mines of the Menominee range, in Iron and Dickinson counties, and an examination of improved equipment recently erected, including hydro-electric plants. The members and their guests, numbering nearly 250, occupied two trains of Pullman sleeping-cars, which, with the aid of automobiles for cross-country runs, carried them rapidly from one point of interest to another.

The first visit was to the Hollister mine of M. A. Hanna & Co., of which Frank Scadden, of Crystal Falls, is manager. Here interest centred in an ore-dryer, 6 by 35 ft., made by the Atlas Dryer Co., Cleveland, Ohio. It receives the crushed wet ore from the shaft and reduces its moisture from about 15 to 4%. The present plant, which was erected as an experiment, has a capacity of 150 tons daily. At the Bristol mine, owned by Oglebay, Norton & Co., where the next stop was made, E. W. Hopkins, of Commonwealth, Wisconsin, the manager, is sinking a new steel-lined shaft, with four compartments, to replace the old 960-ft. shaft now used, and which was started when this property was known as the Claire. The mine is now a large producer, having yielded nearly 3,000,000 tons to date. There are two grades of ore, one of which runs over 3% manganese. The company also operates the Chatham and Berkshire and owns the Quinnesec.

Crossing to the Tobin mine of Corrigan, McKinney & Co., the visitors clustered about Alvin Richards, son of W. J. Richards, the general manager for this district, while he explained the device originated by the company for arresting the descent of a cage or skip in case the cable breaks. This was recently tested when, with 17 men in the cage, it fell, but none was injured. The same company owns the Dunn, Armenia, and Tully mines, which are active, and the Great Western, Crystal Falls, Kimball, Fairbanks, and Baker, which are idle. Electric haulage is used underground and on the stockpile. Near these are the Hiawatha and Chicagoan Lake mines of the Munroe Mining Co., of which G. L. Woodworth, Iron River, is manager. The same company also owns the Munroe and Rogers mines.

A barbecue at 'Idlewild', the summer home of the president of the Institute, W. J. Richards, and a business session at Crystal Falls, closed the first day. Among the papers presented at the latter, the one on 'Safety Devices of the Oliver Iron Mining Co.' aroused the greatest interest, showing the strong trend of feeling in that direction. This was presented by Alex. M. Gow, of Duluth.

On the forenoon of the second day the Baltic and Caspian mines of the Verona Mining Co., at Palatka, Michigan, were features of interest, and considerable attention was given to the company's welfare work. The manager, Charles E. Lawrence, of Iron Mountain, Michigan, had prepared a paper on the 'Social Surroundings of the Mine Employee.' This company also operates the Fogarty, Hemlock, Vivian, and Calumet mines. Following a business session at Iron River, other properties were visited, including the new steel head-frame at the James mine of the Mineral Mining Co., E. F. Brown, Iron Mountain, manager. The same company owns the Wauseca, Osana, Nanimo, Konwinzki, and Breen mines. The day ended with a clam-bake at Sunset Lake, near Iron River, provided by the Foster Construction Co. of Milwaukee, Wisconsin.

For the third day, Dickinson county was the scene of a rapid succession of visits to mines. At the Loretto and Appleton shafts of the Loretto Iron Co., managed by J. W. Amberg, Chicago, the delegates saw where the Sturgeon river had been diverted from its course by a deep canal. The river formerly passed over the main orebody traversing the two properties, and mining by the room-and-pillar system was carried on to a depth of 800 ft. Operations now include mining out the pillars by a top-slicing and caving system, described in a paper by W. A. MacEachron, of Iron River, Michigan. The company, in diverting the river, was chiefly moved by the desire to avoid loss of life from a 'drown-out' such as that which occurred under similar conditions at Crystal Falls some years ago.

The first important event of the day was the visit to the water-power plant and the several shafts of the Penn Iron Mining Co., Vulcan, Michigan, under the guidance of William Kelly, manager, and Frank H. Armstrong, the company's engineer. For the preceding business session the latter had prepared a description of the 'Electrical Operating Plants' of the company; and inspection revealed the most complete motor-driven system in the district. The properties include the Vulcan, Norway, and Curry mines. At Vulcan about 60 delegates descended to the 1200-ft. level to see in operation two 8-stage electrically driven Worthington centrifugal pumps, working against the high head. These were in a neat concrete station. The hydro-electric plant at Loretto includes two alternating-current generators of 3500 kw. combined capacity, driven by water-turbines. The head averages only 25 ft. Automobiles then took the party to the 5000-kw. hydro-electric plant of the Peninsular Power & Development Co. under construction at Twin Falls on the Menominee river, from plans prepared by D. W. Mead, of Madison, Wisconsin. This plant will supply current to mines in the vicinity of Iron Mountain, at 66,000 volts transmission.

Returning by the Chapin mine of the Oliver Iron Mining Co., the visitors were first taken to the huge Cornish pumping-plant at the Ludington C shaft, which is unique of its kind. This was built 15 years ago by the E. P. Allis Co. for the D shaft, and recently enlarged in capacity at the shops of the Allis-Chalmers Co. prior to placing it in its present position. The pump has a capacity of 3000 gal. per minute from a depth of 1500 ft. There are 8 lifts, 6 sets being each 192 ft. apart and 2 sets 170 ft. It is driven by a compound steam-engine with cylinders 50 by 100 in. by 120 in. stroke. The 40-ft. fly-wheel weighs 160 tons. In height the engine is 54 ft. from the floor line. It was stated to the delegates that the entire product of the mine now comes to the surface through this shaft, and nearly all of the pumping is handled here. The shaft is 10 ft. 4 in. by 21 ft. 3 in., is steel lined, and is down to the seventeenth level, or 1522 ft. At present all of the machinery of the mine is operated by compressed air, with steam and electric units held in reserve. The compressor plant was originally built in 1882 at the Upper Quinnesec Falls on the Menominee river, about 3 miles from the Chapin mine. In 1903, and subsequently, the wooden flume was replaced by a steel flume 382 ft. long, 16 ft. deep, and 22 ft. wide, supported by concrete pieces 5½ ft. apart. New air-cylinders of the Corliss type have also replaced the original ones with poppet valves. These consist of 3 pairs 34 by 60 in. and 1 pair 38 by 60 in. Each pair is driven by 50-in. special twin horizontal water-turbines. A pipe-line 24 in. in diameter and 16,665 ft. long conveys the compressed air to the mine. It is built in 58-ft. lengths of ¼-in. riveted wrought plate iron.

The Oliver Iron Mining Co, representing the steel corporation, also operates the Aragon, Mansfield, Michigan, Dober, and Cundy mines in Iron and Dickinson counties, and owns the Youngstown, May, Cuff, and Forest, which are idle. O. C. Davidson is the general manager for the company on this range. In caring for the visitors on this occasion he was assisted by his son, W. F. Davidson. The tour concluded with inspection of the mines of the Pewabic company, also at Iron Mountain. This company is the third largest producer and one of the oldest companies on the range. E. F. Brown is manager.

Papers prepared for the business sessions, which are not referred to above, included the following: 'Accidents in the Transportation, Storage, and Use of Explosives,' by Charles S. Hurter, Duluth; the 'Tobin Mine Sub and

Caving System,' by Fred C. Roberts, Crystal Falls, Michigan; 'Square-Set Mining,' by Floyd L. Burr, Vulcan, Michigan; the 'Check System of Time-keeping,' by Jas. D. Vivian, Crystal Falls; 'Boiler Setting and Coal Handling,' by J. S. Jacka, Crystal Falls; 'A Diamond-Drill Core-Section of the Mesabi Rocks—No. IV,' by N. H. Winchell, Minneapolis, Minnesota; 'The Relation of Mining Interests to Forest Fires,' by Thomas B. Wyman, Munising, Mich., and 'Surveying and Sampling Diamond-Drill Holes,' by Edwin E. White, Ishpeming, Michigan. The last named paper attracted particular attention.

Mines of the district not mention in the foregoing, but whose present status was a matter of interest to members of the Institute are the Youngs property of the Huron Iron Mining Co. and the Groveland mine of the Groveland Mining Co., both managed by F. W. Youngs of Iron River; the Traders of the Antoine Ore Co., Iron Mountain, under the control of C. T. Fairbairn, Duluth; the Millie of the Dessan Iron Co., S. J. McGregor, manager, Iron Mountain; the Norway mine of the Saginaw Mining Co., which has been operated by C. W. Jones, Iron Mountain; the property at Norway of the Few Mining Co., E. C. Eastman, manager, Marinette, Wisconsin; the Zimmerman of the Spring Valley Iron Co., O. P. Doty, manager, Iron River; the mine of the Bates Iron Co., directed by Felix A. Vogel, Florence, Wis.; the Gleason of the Davidson Ore Mining Co., R. Erickson, manager, Iron River; the mine of the Florence Iron Co., E. S. Dickinson, superintendent, Florence, Wisconsin. Development is also being carried on in various parts of the district by the Wisconsin Steel Co., Rogers Brown Ore Co., Cleveland Cliffs Iron Mining Co., Republic Steel Co., Wickwire Steel Co., Iron River Ore Co., Michigan Iron Co., Blair & Gibbs Exploring Co., and others enumerated above among the active operators.

The meeting was unanimously referred to as the most successful and profitable one ever held. Everything went off exactly on schedule time—a most unusual thing for annual gatherings—and there was absolutely nothing to mar the occasion. As successor to the president, W. J. Richards, the Institute elected F. W. Denton, Houghton, Michigan, who is general manager for the Copper Range Consolidated Co. This means that the 1912 meeting will be held at Houghton. The new vice-presidents are George H. Abeel, Ironwood, Mich.; Graham Pope, Houghton, and W. H. Jobe, Palatka, Mich. Managers for the ensuing year will be M. H. Godfrey, Coleraine, Minn., and J. E. Jopling, Ishpeming, Mich. E. W. Hopkins, Commonwealth, Wis., and A. J. Yungbluth, Ishpeming, Mich., were re-elected, respectively, as treasurer and secretary.

Western Australian mining companies have been investigating fire risk, and the following recommendations are contained in an interim report of the committee appointed by the Council of the Chamber of Mines:

1. That the mines be requested to provide suction tanks at suitable points as suggested by the district officer of the Fire Brigades Board. The sizes of pipes to be ascertained and the mine engineers to consult the district officer as to the best methods to be followed.

2. That each mine be furnished with the particulars of annual charge for connection with the Boulder fire station by electric fire-alarm.

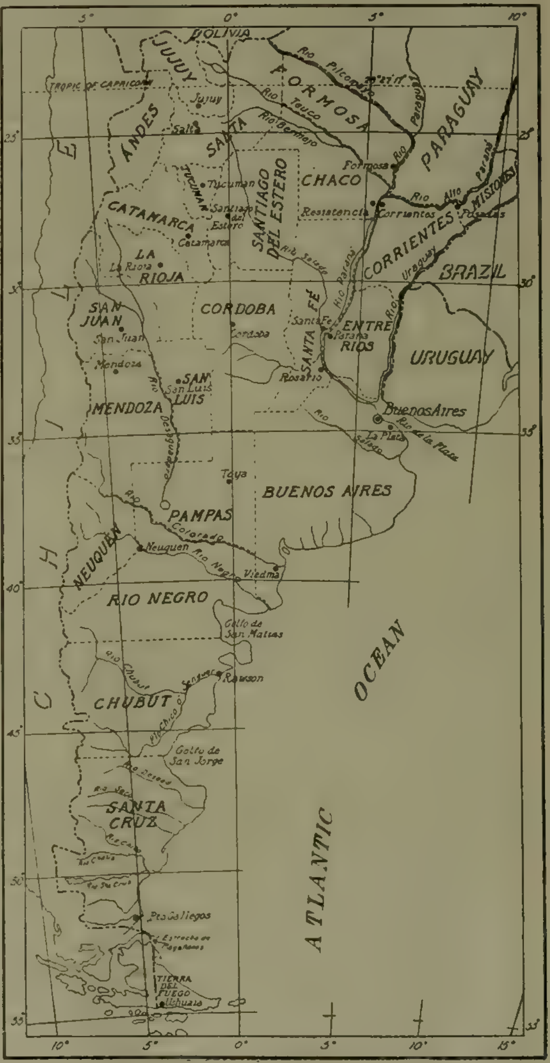
3. That in case of fire in a mine, instead of one long continuous whistle, the alarm be given by a series of short whistles.

4. That all high-voltage electric currents be cut off on the outbreak of fire.

Tin cans are in demand at the lead smelters of the Joplin district. One man makes more than a comfortable income by gathering them, frequently selling $5 to $10 worth of cans a day to the Galena lead smelter. His record day was $42. The demand for cans at this and the lead smelters in Webb City and Granby, Mo., is always excellent, the cans being used for fluxing purposes. Old scrap iron of any description also is employed.

Oil in the Argentine Republic

Little has been known of petroleum in the Argentine Republic, as practically all of the product has been imported in a refined state, and, until quite recently, no interest taken in the industry. In the States of Mendoza, Salta, and Jujuy, and the Territories of Neuquen and Chubut, oil has been discovered in paying quantities, and these districts are now under extensive and systematic development. Surface indications were most encouraging at Comodoro Rivadavia, Chubut, and, after three years of persistent exploration, several producing wells have at last been brought in, at depths ranging from 770 to 1835 ft., and a spring of petroleum at 1738 ft. The product is an excellent grade of petroleum, comparing favorably with that from the famous fields in Pennsylvania and Ohio. The Argentine Government and one private company are now operating in this district. A high-grade petroleum has also been struck by an English company at San Rafael, Mendoza, at a depth of 705 ft., and it is reported by experts that the well is flowing consistently at the rate of 80 barrels daily, and that other wells can be sunk within 125 to 150 ft. of this location and yield similar results.



STATES OF THE ARGENTINE REPUBLIC.

One per cent of the water of the ocean would cover all the land areas of the globe to a depth of 290 feet.

Mining in Papua

By Hugh Mahon

*British New Guinea and its adjacent islands contain some 850 white settlers and 300,000 aboriginal natives. The latter contribute nearly 70% of the £50,000 annually raised by taxation, the customs tariff being wisely adjusted to that end. The exports last year totaled £101,100, of which gold (16,151 oz.) accounted for £60,000, and copra £24,500. But for a fortunate discovery of alluvial gold on the main island, at a place called Lake Kamu, the gold yield would have been the lowest for the last 14 years. Even this place would not pay if worked under Australian conditions, but the bulk of the labor is performed by the natives at from 10s. to 20s. per month and their food. Operations at Milne Bay and Kiveri have been abandoned, and little is now heard of the Yodda, Gira, and Aikora fields. Now that the placers have been almost exhausted, more systematic prospecting for veins must be undertaken. In the Astrolabe ranges, behind Port Moresby, copper lodes are still being worked, but the output has fallen from 137 tons in 1909 to 72 tons last year. No fresh details are available respecting the discovery of coal in the Gulf country, but it may prove of first importance, owing to its proximity to the Torres Straits passage, where a coaling station would be invaluable.

The only goldfield visited by the Federal party was that at Woodlark Islands, a group to the northeast of Papua, about 450 miles south of the equator. The native name of the island is Marua, and the aborigines are of a good type, working freely for the miners for £6 per year and under, one year being the term of engagement. The island is mostly of coral formation, the southern end being very mountainous. The port of entry to the Woodlarks is called Bonagai. Only small craft can approach Bonagai, deep-sea ships being obliged to anchor some few miles out. As this necessitates the transhipment of all cargo into lighters, the cost of handling is considerably increased. The chief mining centre of the Woodlarks is at Kulumadau, about two miles from the coast. The mine is reached by a good, if somewhat narrow, pathway, coated with coral, which winds through a gorge, choked on either side with tropical vegetation. After emerging from the steamy atmosphere of the ravine, visitors are refreshed by the cool, bracing breezes which play around the hilltop. Mining is not retarded at Woodlarks by the absence of water, for the average rainfall there is 15 ft. per annum.

The Kulumadau mine is held by a Charters Towers syndicate, and employs 40 white men and some 240 natives, 60 of whom are engaged in mining operations. The remainder are employed in cutting and hauling wood and stores to the mine. White miners receive £5 per week, or £1 per day in shaft-sinking, and 16s. 8d. in the stopes and levels. The mine has been worked for about 11 years. An old shaft, down 420 ft., was abandoned owing to defects, and a new one started, which is now 309 ft. deep. The property is well equipped with machinery, which includes a Huntington mill, two hoisting engines, boiler, air-compressor, and cyanide appliances. There is also a tramway from the bay to the mine, worked by mules, which is shortly to be discarded for a locomotive. The company is duplicating the battery and adding to its other plant.

In the early stages the Kulumadau hill was worked for surface gold, and material from an open-cut is still being put through the mill. It carries a fair amount of gold—up to 20 dwt. to the ton. The company is working a huge lode on which coral is superimposed, and when calcite is found gold is met in heavy patches. The output averages 250 tons per week, but this should shortly be increased. Everything that comes up is put through the mill, and the yields vary from 18 to 25 dwt. The concentrate is worth £50 per ton.

Much richer, if less developed, properties than Kulumadau are being operated in the immediate vicinity. In every case the prospectors are working alluvial formations as well as the reefs. Some of the returns so far obtained would be regarded as phenomenal in Australia, and cannot be expected to continue. For instance, at Karavakeen, seven miles distant, McLeish and party have crushed with a small Huntington mill 20 tons with a yield of 600 oz. Slater and party, in the same locality, won 728 oz. from 80 tons. McLeish holds 21 acres; he put one shaft down 110 ft., but was driven out by the water, having no appliances to cope with it. From this shaft 150 tons, estimated to be worth 3 oz. to the ton, have been taken. The vein in this shaft is from four to five feet wide. The high grade ore crushed by Slater came almost wholly from the surface. He has driven 270 ft. into the hill, where the vein is said to be 20 ft. wide, and worth an ounce per ton. Slater's property was discovered eight months ago, but he has a good deal of ore already waiting the advent of a 25-head mill now on its way to the mine. Three or four others are at work in the same locality, but developments are not sufficiently advanced to express any opinion as to their prospects.

At Busai, some five miles from the port, Wickley and party are working both veins and placers, for Busai is rich in the latter. They have a 5-head mill. Several veins have been worked down to water-level, where the ore was worth 13 dwt. per load, but a hoisting plant is essential to any additional exploration. In the same locality George Jones has a promising property, which has already given 33 dwt. per ton from 300 tons of ore. The shoot of gold is 200 ft. long and 4 ft. wide.

At another place, named Wonai, ten miles southeast from Kulumadau, alluvial gold is still the mainstay of the prospectors. The veins so far opened show profitable prospects. Here, as at Busai, and Tinkarai, the country rock is mostly metamorphic and igneous, showing occasionally large fissure-veins.

During our stay at Woodlark, I had an opportunity of meeting E. R. Stanley, a graduate of the School of Mines and University of Adelaide, who was recently appointed Government geologist. As Mr. Stanley had been only a month on the island, he avoided offering any pronounced views of its auriferous potentialities. But, speaking generally, he had seen sufficient to make him sanguine as to the future. Most of the alluvial miners, he said, were doing excellently. The general trend of the lodes was northwest, but the subsidiary lodes were rather irregular. The country rock appeared to have undergone primary fracturing, thus forming a certain amount of breccia with subsequent impregnation of quartz containing the gold. The sulphides partly replaced the quartz and vein stuff by a process of metasomatism. The rocks are of metamorphic and igneous origin; and on these (which contain the metalliferous lodes) is superimposed the coral limestone. Several of the hills are survivals of what were formerly islands in the coral sea. Others again, older rocks from which the coral capping has been denuded, are now being worked for gold, while alluvial deposits are found both above and beneath the coral. "These ridges," said an intelligent prospector of ten years experience in the island, "must at one time have been islands. Between them you find the coral country. Wherever the country rock outcrops there—with few exceptions—you find gold. Sufficient work has not yet been done in tracing the veins under the coral to speak definitely as to their ultimate value. The creeks in the coral country where gold has been found have invariably 'headed' from gold-bearing country rock."

The importance of the Woodlarks to Papua may be inferred from the fact that 43% of the total gold won in the territory has come from these islands. The gold is unfortunately not up to standard, the highest price being £3 9s. per ounce. If mining in Papua advances, the Government will need to appoint an inspector of mines and machinery. At present there is no officer specifically charged with the duty of seeing that shafts, stopes, and drifts are safe, or that the safety appliances are in good

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*Abstract from the *Australian Mining Standard*.

order. Such supervision is apparently left to the mining wardens, already overladen with administrative functions, few of whom have any practical knowledge of mines or machinery. Doubtless this appointment will be made as soon as practicable, for the resources of the Government are slender, and are being drained by the many imperious calls made by the pioneer settlers, as well as by the needs of the native population.

Time did not permit of an inspection of the extensive Gira and Yodda goldfields, where hundreds of prospectors at one time found profitable occupation. Speaking to an experienced Government official who had just left that locality, I was assured that fortunes await those who introduce modern methods. He states that claims have been worked over and over again, and yet remain profitable. The miners are unable to work the creek beds when the water is low, a freshet suspending operations indefinitely; and when claims are located away from river or creek, time is lost at every spell of dry weather. An expert who recently tested the district was equipped with only a hand-pump, which was quite inadequate, owing to the volume of water to be contended with. It is understood that he will shortly return with a dredge, results having satisfied him of the prospects of dredging and hydraulic sluicing. My informant adds: "A little trouble was lately experienced on the Yodda field, owing to miners' boys being attacked by men from one of the adjacent villages; but, on account of the measures taken by the Government, it may now be considered perfectly safe to allow 'boys' to go almost anywhere alone. Any miner working with, say, ten 'boys' will consider that times are extremely bad if he cannot make an ounce of gold per working day, despite the fact that his total working expenses do not come to a third of that sum."

Under the existing conditions, only the banks and shallow portions of the rivers can be worked, and it is only natural to suppose that a large amount of gold must remain in the deeper water, which has never been touched. As soon as definite news of the result of the trial dredge is obtainable, it may be confidently stated that a great impetus will be given to the industry. Hydraulic sluicing would also appear possible at profit. The country is eminently suited for it. In many places—notably in the Upper Aikora district—sufficient power can be obtained to raise water to any required height. In other places steam pumps would be required. There is no doubt that profitable gold exists over a large area. Hundreds of men in the past have made good livings there. The reason for the exodus of miners is the report of extremely rich returns from the Lakekamu field. The few men remaining are all well satisfied with their returns. The only drawback to the country is the fever. This is rather bad. As it is mostly only ordinary malaria, there is not much to worry about. Blackwater fever is rare. On the whole, capitalists desiring to help forward a good paying industry might do worse than make inquiries from the Government of Papua concerning the Gira and Yodda goldfields.

ELECTRIC ARCS and high-tension discharges through gases are capable of producing some chemical compositions and decompositions which are very useful, and profitable to operate. This is a branch of electrochemistry which has not been as thoroughly studied as some others, its phenomena are not as thoroughly under control as electrolysis and electro-thermal reactions, and its possibilities are not as thoroughly understood or utilized.

TUNGSTEN was found in 1898 at Trumbull, Connecticut, and it was worked at a profit for five years. The ore is along the planes of contact between crystalline limestone and two bodies of hornblende and schist. The tungsten occurs as wolframite and scheelite. A modern mill was built containing Blake crushers with a capacity of ten tons per hour, Cornish rolls, revolving screens, Wolf gyrating screens, and dry-concentration by the Hooper pneumatic concentrator.

Segregation of Solids in Liquids

By M. P. Boss

Drop a pebble in a pool of water and with it will follow a limited zone of liquid impelled by pressure in front, skin friction, and suction from vacuum behind. Two pebbles dropped in contact tend to keep together because in the wake of one is the line of least resistance and because of the difference in resistance the hindmost will press upon the one forward. If they have unequal and flat faces it is possible for them to be deflected into separate paths. A cluster of pebbles dropped together will tend to hover to the same path and are individually less exposed to deflecting influences and thus a zone of pebbles and liquid moves downward. If light material is enveloped within that zone every tendency is for it to remain there in the downward course, unless some exterior interruption occurs. If, instead of into a pool, a mixture of heavy and light grains is dropped into a body of water having an easy flow at near horizontal, the agglomeration will sag as it drifts, giving a lengthened path of travel and an exposure to disturbance of the zone aggregation by the flow of water across the gravitation path and a segregation of the light material from the heavier is affected. Because of these principles, settling and segregation are better accomplished with an easy lateral flow than when the flow is vertical, as with a cone where the inflow is central, either upward or downward. An easy rotary movement imparted to the content will facilitate segregation and better accomplish settling. Further than this, a cone centrally fed with an overflow of the lighter material, without lateral movement, must needs overflow evenly throughout its circumference, or efficiency will be curtailed in ratio to that part of the circumference which does not overflow, as that represents a segment of the cone not in action.

A liquid body at absolute rest holding in suspension very fine and light solids deposits those solids more slowly than if there is a mild movement, or changing of relative positions. It has not been rare to observe in a tank of exceedingly light slime, after it has stood for days, a top stratum of clear water overlying a slime still in suspension. It is probable that such a condition is due to confined air cells, the aeration having been effected in the crushing, though it is not possible with all methods of crushing.

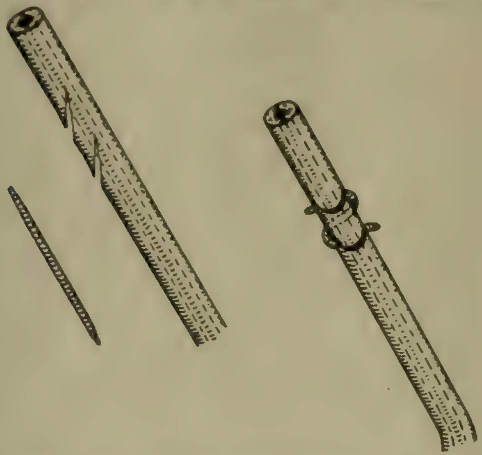
The flow of liquid through a tank or within confines develops a current of unequal activity, it naturally moving faster away from the walls and being the most quiet at the corners.

Interposed baffle plates, when there is a movement not too violent, have a marked effect favorable to precipitation. This is well exemplified in dust-laden gases seen in smelter or roaster settling-chambers. It would be futile to attempt to depict all the complex reactionary currents in a body of liquid through which a current passes, but it is well understood that a current passing a quiet pocket will create a 'whirlpool eddy.' If a high-pressure nozzle of water be submerged in a quiet pond, it will set into movement a large mass, increasing in width and decreasing in force with increasing distance from the nozzle. This propelling of water from its place of rest would create a vacuum only that there is an inflow from behind which is compensated by the circular return of the outgoing flow, thus creating a whirlpool eddy on either side of the outflow from the nozzle. This principle of current compensation enters into all conditions of flow of slime or pulp laden liquid, from a Wilfley table top to a large settling vat, and what has here been called a 'whirlpool eddy' may have a vertical axis or its axis may be inclined or horizontal. If baffle plates are of the type called 'over and under,' that is, where the current passes over one baffle and under the next, the axes of the whirlpool eddies generated would be horizontal. On the other hand, if the baffles are staggered right and left with vertical openings between a plate and the opposite side, the eddy axis would be vertical. In one case the precipitating material would pass diametrically through or from a rotating zone, while in the other case precipitation would parallel the axes. It is easy to believe that the latter would be the most highly efficient for settling purposes or for classification.

New Method of Lighting Fuse

By E. M. Weston

*I cut two nicks in the fuse about ¼ in. apart. I then open a stick of gelatine and cut from it very thin strips about the size of whip cord and from 1½ to 1 in. long. I then insert one end of this small strip into one cut, and twist it round the fuse so that it cannot be accidentally detached, and insert the other end into the other cut. Then I close both cuts. It will be seen that I am using a minimum quantity of gelatine, about a fifteenth of a gram. One gram will be sufficient to fire a whole round of holes. There is practically no vitiation by fumes, and I have this advantage also, that I have two chances to light the core if the gelatine in the first nick should fail to light. To light these fuses which are primed with this small amount of gelatine, I do not employ a 'cheesa stick.' The miner who carries a 'cheesa stick' inhales the maximum amount of the most poisonous fumes possible to generate in a mine. If a miner burns even the half of one small stick of gelatine he vitiates the air to an alarming extent. Nearly every miner is supplied with tobacco bags (that goes without saying), and if he will only take the trouble to take a tobacco bag and wrap it round a candle, tying it with numerous separate pieces of string, he will have a torch which is very hard to put out and which gives a more convenient light. It will last half a dozen or more times, and if required it can be bound by wire to the end of a stick. With the fuse made up in the manner indicated, it may be taken that he can absolutely depend, even more than with a 'cheesa stick' on getting the holes efficiently lighted.



Hydrocarbons in Brazil

Although an abundant supply of bituminous shale, containing about 40% of carbon, has been gathered in various places in the vicinity of Bahia and employed for many years in the manufacture of candles, paraffine, and commercial oils, it was generally believed that petroleum would never be found in paying quantities in Brazil except, perhaps, in the valley of the Amazon. An official report from Santos states, however, that petroleum has just been discovered at Ibitinga, São Paulo, and that a company is now being organized to develop the industry in that district. A low-grade asphalt is found in Bofete, São Paulo, bituminous shale at Taubate, and vast clay deposits of a sedimentary character along the Parahyba river, which consist of interstratified shales, containing about 21.11% of carbon, and have been used to a limited extent in the manufacture of gas and oils. At Camamu, on the Marahu river, rich and extensive deposits of lignite are found, from each ton of which it is estimated three barrels of oil can be manufactured. Lignite is also found in great abundance at Gandarella and Fonseca, Minas Geraes. An expert examination of the lignite from Gandarella shows that it contains 40% volatile matter and 48 of fixed carbon, and that 200 lb. of the product will produce 850 cu. ft. of gas.

Kalgoorlie Production in June

Below are the month's returns from the principal mines.

Name.	Tonnage.	Value.	Profit.	Dividend.
Associated	10,041	$76,000	$10,700	......
Associated Northern ..	1,475	14,500	......	......
Burbanks Main Lode..	1,607	24,000	......	$8,500
Chaffers	3,123	21,500	350	......
Golden Horse-Shoe ...	21,802	174,000	20,000	......
Golden Ridge	2,806	32,200	14,000	34,700
Gt. Boul. Perseverance	19,788	124,500	15,800	......
Gt. Boul. Proprietary.	17,867	240,000	125,000	328,000
Great Fingall	10,383	87,400	25,400	62,500
Hainault	5,030	30,500	1,150†	......
Ivanhoe	19,306	200,000	90,000	......
Kalgurli	10,790	116,500	52,000	......
Lake View Consols....	7,785	8,050	1,900	......
Lake View & Star.....	13,028	82,000	6,300	......
Oroya Black Range...	4,500	68,500	36,500	......
Oroya Exploration....	10,849*	7,600	380	......
Oroya Links	6,623	36,000	14,500†	......
Sons of Gwalia.......	14,015	122,500	49,000	105,000
Sons of Gwalia, South.	2,040	14,200	1,800	......
South Kalgurli.......	9,320	58,500	8,100	......

*Final clean-up from a residue dump of over 500,000 tons. †Loss.

Chilean Nitrate in 1910

According to a report by A. A. Winslow appearing in the *Daily Consular and Trade Reports*, the production of nitrate during 1910 broke the highest record, reaching the high-water mark of 50,781,331 quintals (a quintal weighs 101.61 lb.), against 46,579,656 for 1909. The consumption for the year ended June 30, 1910, was 51,981,561 quintals, against 40,263,282 for the previous year. The increased consumption was largely due to the work of the Nitrate Propaganda backed by a working fund of $601,070, of which the Chilean Government paid $194,640. The United States consumed 12,672,262 quintals during 1910, against 7,988,121 for 1909. Shipments of nitrate to other countries in 1910 were as follows, in quintals: United Kingdom, 19,010,443; Germany, 10,653,573; Belgium, 2,126,128; Netherlands, 1,220,576; France, 1,810,993; Italy, 1,154,569; Sandwich Islands, 425,412; Japan, 369,600, and British Columbia, 97,822. The exports of nitrate for the first 45 days of 1911 exceeded those for the same period in 1910 by 2,507,648 quintals. During the year more American capital was invested in the nitrate fields of northern Chile, and negotiations are under way for several additional properties.

Copper in Urals

The quantity of metallic copper smelted in the Urals in the first four months of this year amounted to 6,440,335 lb., or about 1,083,300 lb. more than in the corresponding period of last year. The leading copper producer was the well known Bogosloff concern, which contributed 2,420,000 lb., followed by the Kyshtim company with 2,020,000 lb., the Visk company with 725,000 lb., the Pyshmin-Klyutchievsky company with 620,000, and the Polievsky company with the same. The Paschkoff smelter in the Verchotur district was closed.

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*Abstract from *Jour. Chem. Met. & Min. Soc. South Africa.*

Appraisal of Copper Mines

By J. R. Finlay

[*]This report is a calculation of the value of mines to the permanent owner for the production of minerals. It is based on three factors: (1) average cost; (2) average prices; (3) an estimate of future life. The first two factors are determined by experience. The third factor, the life of the mine, is based partly on undeveloped ore and partly upon an assumption of continuance of known orebodies beyond the present bottom levels of the mines. The assumption of continuance is based mainly upon the extent to which the continuity of the deposits has been proved for the district and for the type to which the mine belongs. It will be seen that these factors are quite as definite as those upon which calculations in the world of business are generally founded.

The future value of a series of dividends is reduced to a present value by the annuity method: that is, a sum is calculated upon which the series of dividends will pay 5% interest and also provide each year a sinking fund instalment which, invested each year at 4% interest, and added to prior instalments similarly invested and reinvested, will equal the sum taken. This sum is the amount which an investor can afford to pay for the property.

Table of Present Values for a Series of Dividends.—The following is a simplified table showing the present value on the above basis of a series of dividends for different periods.

A single dividend of $1 payable at the end of a year is worth	$ 0.95
A dividend of $1 continuing—	
Two years	1.85
Three years	2.70
Four years	3.50
Five years	4.26
Ten years	7.50
Fifteen years	10.00
Twenty years	11.96
Twenty-five years	13.51
Thirty years	14.74
Thirty-five years	15.73

Unprofitable Mines Have No Value.—The reasoning from these factors is pursued to its consequences. No definite value can be placed on any property for which any of the factors cannot be determined. Whenever the working of a mine proves that expenditures will equal or exceed receipts from products at average prices, the property has no value at all, and it is appraised at zero.

Stock Market Valuations Not Considered.—It will be observed that this method makes no mention of quoted values. It may be asked, and is asked, why it is that if the products of mines are valued by the process of purchase and sale, the mines themselves should not be so valued? If the price of wheat, copper, and iron is fixed by the sales on an exchange, why not mining stocks? My answer is that wheat is good to eat. Like copper and iron, it is a staple and necessary article, tangible and definite. The value of these commodities is universally recognized, whether they are quoted on exchange or not, and prices fluctuate only with the varying pressure of demand. Mining stocks do not represent anything definite. Some pay dividends, in which case their quotations are comparable with those of other securities, but in the majority of cases mining stocks represent nothing more tangible than hopes. They fluctuate wildly as these hopes rise and subside. The very fluctuations make these stocks useful for gambling. People buy them not as serious investments, but as temporary speculations; often knowingly paying far more than they are worth, on the chance of selling them to somebody else for still more. In many cases this sort of thing has been organized into a business which depends not on any intrinsic value in the properties, but wholly upon gambling. For this purpose the stocks are prized not because they are stable, but because they are unstable. A notable instance of this is that of the famous Comstock mines of Nevada, which have scarcely paid a dividend in thirty years. On the contrary, the assessments have reached astounding figures, probably over a score of millions. The assessments paid by stockholders merely take the place of prizes paid by lotteries, serving no purpose except to perpetuate the gamble. The public, of course, is fed with tales of the marvelous possibilities of these great mines and their past record is pointed to often enough. Still it is doubtful if many of these shares are sold to a gullible public. They are mainly bought and sold by seasoned gamblers, with whom it is a case of 'dog eat dog.' While this is an extreme case, it is wholly true that gambling forms an element to be reckoned with in every district where trading in mining stocks has become established. The copper district of Michigan is no exception. There are in it cases of terrific fluctuations in stock values. The Arcadian mine was valued at one time at $12,000,000; a few years later at $60,000, by stock quotations.

These reasons make it evident that the use of stock quotations in a serious appraisal of mining properties is illogical and beneath the dignity of a sovereign State. But, if the method is illogical, it is certainly impracticable, because in Michigan the ownership of mines by stock companies, whose shares are traded in, is confined to a single district—the copper mines. The much more important iron mines are owned mainly by outside corporations or partnerships simply as so much private property. No available quotations apply to them even remotely. It is obviously necessary to use a method that will apply fairly to all properties throughout the State.

Valuation of Mineral Lands on Which Workable Deposits Are Not Developed.—It is plain that where no deposits have been worked and none have even been proved to exist, the definite factors which can be applied to the valuation of an active mine are lacking. In this case no definite appraisal can be made. A figure only represents a guess. I can see no way to come to any conclusion about such lands, other than to attempt such an analysis of the facts as may limit the range between which guesses will be reasonable. In this connection it seems desirable to discuss one or two points of difference between mining and other forms of business.

The mining business may properly be distinguished on the ground that an essential preliminary is the discovery of a deposit in the crust of the earth that is inherently valuable. A sufficient quantity of rich gold ore in the remotest desert is valuable as soon as it is discovered. The *discovery* is valuable. The commercial problem of utilizing the ore can so certainly be solved that no one is much concerned about it. Such a deposit can only be valuable because it is limited in extent, consequently its size and the time it will last are points of great concern and a most essential factor in the value that can be put upon it. With minerals less valuable and more common—less valuable *because* they are more common—the commercial circumstances of a discovery play relatively a more important part. A copper mine in the interior of Alaska is not valuable unless it is large enough and rich enough to pay for a railroad to reach it. An iron mine in the middle of the Sahara would have no value at all, even if a railroad ran across it. In other words, an iron discovery, to be valuable, must be within the range of certain commercial conditions. The value of coal is still more a question of mere environment. It is so abundant and can be mined at so many places that the question of an assured market is far more vital to commercial success than the discovery of a seam of coal. When we come to still more common minerals, such as limestone, salt, gypsum, and brick-clay, we find that they are so enormously abundant that the discovery of them excites no comment whatever. It is doubtful whether the discovery of salt, for instance, is of any value. The ocean is full of salt. Deposits are known in Michigan which would apparently supply the whole world for thousands of years. The utilization of such minerals, therefore, is wholly a commercial question, and I am disposed to draw a line between mines and other industries on the simple ground of whether the mineral rights on which they are based have value or not.

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[*] Abstract from a report to the Board of State Tax Commissioners of Michigan.

Many industries, which no one thinks of calling mines, use minerals and even mining processes. The Pennsylvania railroad has for years been conducting the mining operations of shaft sinking and tunneling for the purpose of developing its terminals in New York City, but nobody calls the railroad a mine or New York a mining camp. Similarly, we do not find a sufficient reason for calling the brick-maker and the cement manufacturer miners because the first digs clay and the second dredges marl. If, however, brick clay were a limited product valuable enough to make the mere hope of its discovery on a tract of land a sufficient reason for placing a higher value on that land than it would otherwise have, then we might properly call brick-making, mining. Some distinction of this sort appears absolutely necessary in order to differentiate intelligently between mining and a vast group of manufacturing industries that use minerals.

There are in Michigan large tracts of land highly prized for their possibilities of containing valuable mineral deposits. These lands are mostly in the iron and copper regions of the Upper Peninsula. It has been a large feature of the work connected with this appraisal to tabulate the ownership and distribution of such lands, and attention has been given to the problem of working out a scheme of valuing them on a rational basis. The results will be taken up later in connection with the specific reports on the iron and copper fields. It is only worth while to point out here that the iron and copper ores of the Upper Peninsula have proved so valuable that their mere discovery carries a high commercial value. The mere chance of making such a discovery on a given tract of land is distinctly an asset. This is particularly true in the iron regions where the ores occur in masses of rock which are so unique that they can be instantly recognized, and in which the probability of discovery of merchantable ore is considerable. The finding of the 'iron formation', therefore, can be considered a part discovery of ore, and it is undeniable that lands containing it have in the aggregate a large commercial value; a value that is not speculative but actual. But since I am now speaking of lands on which no merchantable discoveries have been made, it must be admitted that a valuation which may be reasonable for the aggregate of such lands may be wholly mistaken when applied to any particular tract.

Mining Plants Not Appraised.—The value of a mine depends wholly upon the ore; that is, the equipment of a mine has no value except as applied to the ore. It is, therefore, useless to appraise mining plants as if they were in themselves an asset. It is true that a mine cannot be worked without equipment. A mine fully equipped is more valuable than a mere orebody without equipment, but this fact is fully taken into consideration in all appraisals. The point to be especially borne in mind is that mining equipment in itself is of no value; when the ore plays out the equipment is mere junk, no matter how costly it may have been in the first place; and this junk is so likely to be unsaleable that it is fully as likely to entail expense for watchmen and insurance as it is to yield any salvage. This fact may be surprising to many people, but a little consideration will show that it is true. The equipment of a mine consists largely of structures that cannot by any possibility be moved. The shafts and all other excavations are a part of the equipment. The buildings and machinery may occasionally yield some salvage, but necessarily a small amount. It must be borne in mind that a large part of the expense of any installation of machinery consists of labor and materials for foundations, housing, and erection. This is wholly lost when it is proposed to move the machine. Furthermore, the value of a machine depreciates rapidly on account of mere age.

Meaning of Appraised Values.—The valuations in this report are intended to cover the value of the mining business of a company in each case. It includes all value that can be put on mineral lands and mining, milling, and smelting equipment and mining supplies. It does not include property that can be valued for purposes other than mining, such as surface rights of any kind, agricultural or timbered lands, houses, stores, merchandise, or cash.

Price of Copper. For the purpose of appraising the copper mines, I have decided to apply to the future a price of 14c. per pound. This is considerably above the price ruling during the summer of 1911. The Calumet & Hecla Mining Co. states that the actual sum received for all copper produced by that concern, from 1878 to 1910, inclusive, has approximately been 13½c. per pound. For the 20-year period from 1890 to 1909, inclusive, the average price of a given amount of copper sold each year by the Quincy Mining Co. was approximately 13.7c. per pound. As there seems to be some evidence that the Quincy secures a slightly higher price than the other Lake companies, this would give ground for taking 13½c. as a fair figure.

My own belief is that the average price of copper is tending to rise. It appears that for the last fifty years the price has fluctuated widely. Periods of high prices have occurred at an average interval of about eight years, separated by intervening periods of lower prices. Following the high price of 1899 the average fell in 1902 to 12.16c., but in 1910, following the much more severe panic and depression of 1907, the average price has gotten down only to 11c. It remains to be seen what the average of 1911 will be. One might assume from these figures that the price has risen at least 3c. per pound since 1904 because, following the panic of 1907, the price has not fallen to within 3c. per pound as low as it fell in the depression following the panic of 1893. It is also probable that another wave of high prices will culminate about 1915. The trend of these figures is such that the stockholder in a long-lived copper mine has reason to hope that the average price for the future, taking a period of ten to twenty years, will be, perhaps, 15c. per pound. My conclusion in 1909, after making a rather exhaustive study of the copper mining business, was that the average price for the ten years following would be 15½c. per pound.

Much stress has been laid on the overproduction of copper due to the bringing in of numerous mines during the past few years. The situation, however, is far from terrifying, as consumption is increasing at the rate of one hundred million pounds per year. It appears that at the beginning of 1911, the expected increase of production from new mines would amount to some three hundred million pounds per year. This is only sufficient to meet the increase of demand for three years. After that period is passed the prospects for a scarcity of copper are fully as good as that new sources of supply will be added. The discovery of new deposits has practically ceased on the North American continent. Even the so-called porphyry deposits which have been opened in the States of Utah, Nevada, Arizona, and New Mexico within the past ten years, are not strictly new. Their rapid exploitation has been rather the result of finding how to treat them successfully. Since that was accomplished an urgent search has been made for further deposits of this type (which is not essentially different from that of the Lake Superior copper mines), but with no success. Claims have been widely published by the promoters of these porphyry mines that they could produce copper cheaper than older mines in other districts. This claim will not stand analysis. So far as costs are concerned, the porphyry mines are in essentially the same situation as other mines. Some can produce copper cheaply and others cannot. It is highly doubtful if their average cost will be even as low as that in the Lake Superior district.

I recite these facts, not to cast any doubt on the value of the new mines in the West, for they undoubtedly contain the greatest reserves of available copper known in the world today. But it is easy to overestimate their effect. They are not likely to disturb the copper industry as did the discovery of the Mesabi range, the iron.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE first railroad steam-shovel in the United States was built in 1882 by the Bucyrus company and was still in use a few months ago.

CAPACITY of grinding pans varies greatly but at Kalgoorlie a 5-ft. pan working on 30-mesh feed will crush 12 tons per day so that 90% will pass 150 mesh.

FIRE CLAYS may be analyzed by any chemist, but for final determination of their value a burning test is desirable. A number of works are equipped for making these tests.

ANTIMONY is not now smelted in the United States and only small lots of ore are produced. Sample lots may be marketed through the smelting and metal-buying companies.

FULMINATE of mercury is never used commercially as a blasting agent on account of its prohibitive price and the extreme danger in handling it. It is only handled in homeopathic doses and with the greatest care.

PHOSPHATE rock can be tested by any reputable chemist, as the principal point to be determined is the amount of phosphorus present. Sale of a phosphate property, like any other, is a matter of individual bargaining.

NEWFOUNDLAND, in the vicinity of Port au Port Bay, has large and promising asbestos deposits, but is prevented by its inaccessible location from participating in the rapid development now in progress in the Canadian field.

SODIUM BICARBONATE statistics are not available except as to imports. These in 1910 amounted to 73.2 tons valued at $4472. Figures of domestic production are veiled in general statistics of the industry. The imported salt is worth about $80 per ton of 2000 lb. at the wharf.

CALIFORNIA has a mining law which took effect July 1, 1909. It supplements the Federal mining law as to delinquency of a co-owner and the making of a record thereof and in other particulars, but it does not affect nor abolish any mining district nor the rules and regulations thereof.

FULLERS EARTH is used mostly by refiners for decolorizing oil. Small amounts are employed for various other purposes, but as is true of a number of the earthy minerals, control of a market is more important than control of a deposit. Consumers buy direct from producers or own their own deposits.

THE ROOF STRATUM over most coal seams is shale, which when hard, is called slate by the miners. Shale generally weathers badly and in a majority of coal mines, the entries must be timbered more or less continuously. If the shale were protected from the action of the ventilating currents it would require little support.

VALDEZ is situated at the head of Valdez bay, an extreme northerly indentation of Prince William Sound, on the southern coast of Alaska. The bay is the farthest north port in the world, free of ice the year round. It is a deep-water harbor, twelve miles long and three miles wide, entirely landlocked except the entrance.

SHAFT LANDINGS or bottoms in European collieries are usually built with masonry side walls and arched roofs, both for fire protection and for permanence. Such arched passages or drifts contain from two to four tracks, and where double-decked cages are employed, are sometimes arranged with corresponding upper and lower stages requiring considerable height.

NITRATE OF SODA is derived from caliche deposits in Chile which, as worked, contain 18 to 50% nitrate. These are concentrated by methods described in detail by S. H. Loram (*Mining and Scientic Press*, January 15, January 29, 1910). The material is refined to a strength of 95% or over $NaNO_3$ before exporting. The material is sold through brokers, and prices vary as in other commodities. At present, in San Francisco, nitrate is quoted at $2.07 per hundred, future delivery in the harbor.

ASBESTOS occurs in two varieties, the serpentine (chrysotile) and the amphibole. The former is the more valuable. Georgia and Vermont are the chief asbestos producers among the United States; the former ships amphibole and the latter chrysotile which is reported by manufacturers to compare favorably with that imported from Canada. The production in Wyoming and Idaho has advanced, but in those States the industry is still in the development stage and has not become permanently established.

DOUGLAS FIR, a common Western species, yields lumber that has many defects. These may be classified as pitch seams and shakes, cross-grain, and knots. Practically, these are the basis of all grading rules, and their number and character largely determine the use to which the product of the sawmill is put. Material which is free from them is usually manufactured into finish, flooring, and other high-grade products, in which the appearance of the wood is of prime importance. Also, it is generally believed that, aside from their effect on the appearance of the wood, these defects influence greatly the strength and other mechanical properties of the timber in which they occur.

WHEN a vein is discovered that seems worth development, the locator will do well to locate claims on either side of the original location, if mineral in place can be found on which to base a discovery. These side claims will 'protect' the original location from encroachment by others. Particularly is this desirable in the case of unusually wide lodes. Occasionally a mineral vein or zone is wider than the limits of the claim, and this fact has been the occasion of several law suits. In one of these a Territorial court decided that the prior locator having the apex, took the whole lode, even though it extended beyond the side line. In the Coeur d'Alene were several such cases, and others in Utah.

SALT in air-pipes was suggested recently for the purpose of taking up the water. Responding to a request for criticism, E. A. Rix says: "There is such a large amount of water condensed under ordinary conditions that it would require a large amount of salt, which cannot be well introduced into the pipe itself, and if it was introduced in a separate drum there are other materials which are better than salt, such as chloride of calcium. It would be certain that some of the air would finally reach the rock-drill impregnated with salt, which would ruin the machine, so I would not consider this a desirable method. My experience with compressed air has been limited to mild climates where there is little trouble with freezing of pipes and therefore I do not feel competent to discuss the subject. If I were, however, to undertake to solve the problem I think I would pass the air after leaving the compressor through a bath of cold water, the colder the better, for the cooler the air the less moisture it contains. I feel sure if the air after leaving the bath was the same temperature as the water there would be no tendency for the air to further deposit moisture in the pipes. In fact the pipes would probably be warmer than the water which cooled the air, and thus the tendency would be to take up the moisture in the pipes rather than to deposit it."

Special Correspondence

LONDON

Alluvial Tin at Goss Moor. Lead Mining in the North of England.

A year ago I mentioned in this column that a new venture had been started for the purpose of working the alluvial tin deposits at Goss Moor in mid Cornwall. As we are in the midst of the vacation season, it is appropriate to say that this district is midway between Newquay on the north coast and Fowey on the south, the former noted for golf and the latter for yachting. It is reached by the railway that passes through the beautiful Luxulyan valley. It is on the northern side of the granite outcrop associated with the china-clay industry. Here are great tracts of swampy land that contain stanniferous clayey gravel. From time immemorial they have been worked in a desultory way, and records show that quite 50,000 tons of cassiterite has been recovered at one time and another. The nature of the gravel, however, was against permanent success on any large scale. J. H. Collins, the Cornish veteran, has always been in favor of the application of modern dredging methods, and he is now a director of the company that has been formed to work the property under the technical management of C. G. and F. M. Lush. The method adopted is to dig a pit and build a barge containing sluice-boxes, then break down the gravel by means of monitors, and elevate the débris from a sump by means of a suction pump to the sluice-boxes. When the bank of gravel has been removed for a certain distance and the barge is too far away from the face, the pit is flooded and the barge floated to another position. This method is the ordinary Australian practice. When the plant was first erected at Goss Moor, gas-engines were employed for the generation of power. For some unexplained reason these have been reported to be unsuitable to the work, and have been replaced by steam-engines which went into commission last month. The area belonging to the company covers 800 acres, and much of it has been sampled by boring. From the results obtained, it appears that the recovery is $1\frac{1}{2}$ lb. of cassiterite per cubic yard. The total cost, including royalty, is estimated at 6d. per cubic yard, so that a profit will be made whenever metallic tin is over £60 per ton. At the present price, two-thirds of the proceeds of sales would be profit. The plant can treat 40 cu. yd. per hour, or 220,000 cu. yd. per annum. If estimates are borne out by results, other barges are to be built.

The district where the counties of Cumberland, Durham, and Northumberland meet has long been a producer of lead and zinc ores. It is in the high ground at the northern end of the Pennine chain which runs from the Cheviot hills on the Scottish border southward through Lancashire, Yorkshire, and Derbyshire. At the northern part, the rock is chiefly Carboniferous limestone, and the valleys of Tynedale, Allendale, Teesdale, Weardale, etc., have in days gone by been populous with miners and smeltermen. At the very highest point is Alston and Nenthead, well known names in mining records. In Weardale, on the Durham side, are many lead mines that are still being worked by the Weardale Lead Co., which, though its office is in London, is controlled by Newcastle people. The Boltsburn mine is the chief producer of galena, and others are the Stanhopeburn, the Sedling, and the Wolfscleugh. At the Boltsburn, production is temporarily reduced because of the extra development that is being done, so that the results for the twelve months ended June 30 are not so favorable as for the previous year. The actual amount of ore and concentrate from all the mines that was sent to the smelter during the twelve months was 3129 tons, yielding 2664 tons of pig lead selling for £12 15s. 6d. per ton, as compared with 4199 tons yielding 3402 tons of lead during the previous year. An interesting point in connection with this group of mines is that fluorspar has been extensively worked of recent years since the demand from steel manufacturers increased. During the past year over 16,000 tons was sold, bringing an income of £7,500. The larger part of it came from the Stanhopeburn mine. The company distributed £1800 as dividend for the year, being at the rate of 5%, as compared with 10% the year before. The extra work and expense of development at the Boltsburn has been well worth the while, and in succeeding years the output should substantially increase. The manager, Errington Thompson, to whom is due the present excellent position, resigned recently and was succeeded by H. S. Willis. It is of interest to note the announcement made by the board that Herr Professor Doctor Henry Louis of Newcastle-on-Tyne has been appointed technical adviser.

SALT LAKE CITY, UTAH.

Equipment of Ohio Copper.—Park City.—Tintic.

While the financing of the Ohio Copper Co. has been progressing slowly, and not altogether satisfactorily, the operating end has been making strides. The latest step has been the signing of a contract with E. A. Wall, whereby the latter will complete the erection of crushing machinery giving the concentrator a capacity of 3000 tons daily. A further increase to 6000 tons will be possible without increasing the roof space of the mill. The company has been using Gates rolls, each taking the product from Blake crushers and handling 400 tons per day. For about three months a set of Wall corrugated rolls has been taking the product from the Blake crushers and treating an average of 1000 tons daily. It is stated that the applied horsepower was 18, as against 38 for the other type of machinery. Another set of the corrugated rolls has been doing the work of a small Blake crusher and the Gates rolls combined. The contract calls for the erection of 10 corrugated and 10 vertical, fine-crushing rolls, which should be completed in three months. The mill has been treating a total of 1500 to 1700 tons of ore per day, and the improvements will practically double the capacity. According to men connected with the ownership of the property, the mine now has 12,000,000 to 14,000,000 tons of ore developed, with probable additional tonnage, partly developed, of 5,000,000 to 6,000,000 more, averaging 1.5% copper. In addition, there is a large amount of virgin ground. The mill recovery is said to be better than 70%. Following recent meetings here between large interests in the Ohio Copper, the statement is made by local shareholders that F. A. Heinze will retire from all connection with the company, and that the bond issue will be subscribed. With the reorganization completed and the mill in operation at 3000 tons per day, the Ohio should be turning out 20,000,000 lb. of copper annually.

OHIO COPPER CO. MILL.

Action will be taken by stockholders of the Daly company, September 20, and the Ontario company, October 10, on the proposed consolidation. These two companies have been controlled by allied interests ever since the Daly was organized, and they have many holdings in common. It is proposed to form a new corporation with 300,000 shares, par \$5. Of this stock, 150,000 shares are to be exchanged for Ontario stock, share for share, and 75,000 shares for

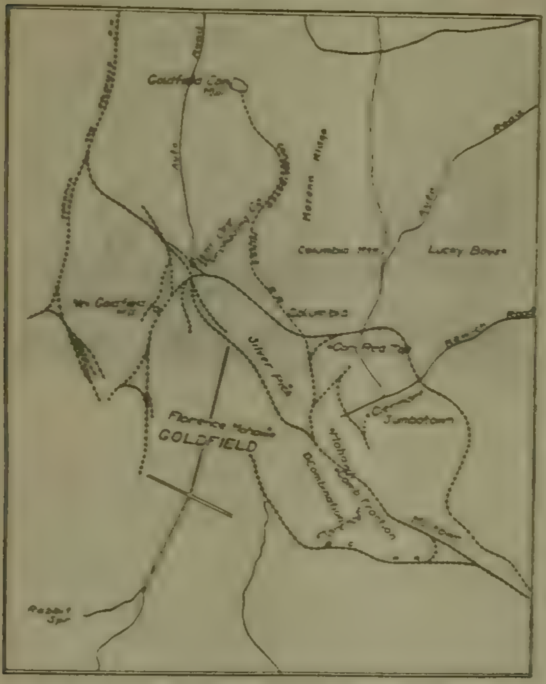
Daly stock, on the basis of one share in the new company for two of Daly. This will leave 75,000 shares, and about $136,000 cash in the treasury.

In the Tintic district the May Day mine, as a result of the new smelter charges, is shipping slime from its mill dump as well as ore which has been left in the mine for years because it would not pay to ship. The Yankee Con. also has closed a contract which has resulted in the company beginning shipments of about 15,000 tons of ore from its mine dump, running as low as $9 per ton in silver, lead, and gold. The Scranton mine, at North Tintic, has run into a big body of lead carbonate, in addition to other favorable developments. It shipped 950 tons in August. Most of the ore runs high in zinc, but the new ore shows a higher percentage of lead.

GOLDFIELD, NEVADA

CONSOLIDATED DISBURSEMENTS. — AUGUST PRODUCTION. — IMPROVEMENTS AT FLORENCE GOLDFIELD. — GOLDFIELD BELMONT.

Total dividend disbursements of the Goldfield Con. Mines Co. will have reached the sum of $18,146,183 upon the payment of dividend No. 13, at the rate of 50c. per share quarterly and amounting to $1,779,574, declared last week at the meeting of directors in San Francisco. This dividend is the regular quarterly payment of 30c. per share with an extra 20c., and is the eighth consecutive quarterly payment of like amount. It is payable October 31 to stockholders of record September 30. According to preliminary estimates, the production in August was 30,580 tons, or nearly 1000 tons daily, with a gross recovery of approximately $800,000 and net profits of $500,000. This is the largest tonnage produced in any month of the company's history. The average of the ore was $20.60 net, as against $18.80 for July. Some of the richest specimens of high-grade produced by these mines have been taken from the 1000-ft. level of the Clermont and from the intermediate level, 100 ft. below on the incline of the vein, and some exceedingly rich ore is said to have been exposed on the 1200-ft. level of the Grizzly Bear. Milling ore is being taken from the old Jumbo workings, which have been repaired and equipped with a 50-hp. electric hoist and compressor. This affords the Consolidated seven producing shafts, all well equipped.



The Florence Goldfield mill is treating 170 tons daily and has shown a notable improvement in point of recovery since the elimination of concentrators and vanners and the introduction of Akins classifiers and a Dorr thickener. Reduction is now effected almost entirely by amalgamation and cyanidation, much of the elevating has been done away with, the process of feeding is performed automatically to a large degree, and many important economies have been effected, the saving in the item of labor alone being placed at $25 daily. On the 500 and 650-ft. levels new cross-cuts are nearing points where the downward extension of highly productive orebodies should be found. Sinking has been temporarily suspended a short distance above the 900-ft. level in order to straighten timbering that has been slightly displaced by swelling ground and to prepare the station on the 800-ft. level and start lateral work on this level. The shaft will be continued with but little delay to the 1000-ft. level, and from the 900-ft. or tenth level a main drift will be driven to the north to open the bonanza Reilly ore-shoot some 1200 ft. from the shaft.

Engineers of the Goldfield Belmont company state that on the 300-ft. level they have exposed 3 ft. of $200 ore, containing seams of high-grade that carry in some places $10 per pound and an undetermined quantity of good milling ore. This is said to be the downward extension of the ore-shoot from which lessees shipped a good tonnage of $75 to $100 ore from the 50 and 150-ft. levels. Assays of $1400 per ton gold were obtained in the winze sunk from the 150-ft. level. The company has started to sink at a point over 1500 ft. southeast of the old shaft.

JOHANNESBURG, TRANSVAAL

STATISTICS FOR FIRST HALF OF YEAR.—PRODUCTION SATISFACTORY.—DIAMOND INDUSTRY.

According to the returns issued by the Mines Department the value of the mineral output of the Transvaal during the month of June was £3,064,526, this not including diamonds, the details of which are only issued half yearly. Of this total, gold constituted £2,912,484, coal £87,745, and other metals and minerals, consisting of principally tin, silver, and copper, £65,197. To obtain this output of gold 2,061,525 tons was milled. The Rand alone yielded 658,121 oz., valued at £2,795,550 from a crushing of 1,995,525 tons. Coal has now become so cheap in the Transvaal that in the principle centres where it is now being produced it only realizes 4s. 5d. per ton at the collieries. Despite these low prices, however, the output of coal is steadily increasing. Among base metals and minerals tin continues to occupy the leading and most promising position, the amount produced in June being £34,971, while copper showed a record monthly output valued at £8718.

The issue of the June mine records by the Transvaal Mining Department enables a comparative statement to be compiled, showing what progress has been made during the last twelve months in the Transvaal. The following figures are interesting because they show the progressive nature of the gold industry since the war:

Year ended June 30.	Oz.	Value.
1903	2,372,075	£10,075,926
1904	3,475,311	14,762,184
1905	4,322,577	18,361,144
1906	5,199,935	22,087,937
1907	6,271,697	26,640,590
1908	6,711,436	28,508,368
1909	7,294,711	30,985,966
1910	7,308,551	31,044,753
1911	7,848,872	33,339,891

With regard to the growing use of machine-drills on the Rand, it may be pointed out that during the last 12 months the average total number in use has increased from 3577 to 4286. The output of silver as a by-product from the gold mines reached, during the year ended June 30, a total value of £94,533, being, like gold, a record output. Although the diamond-mining industry during the last six months has shown a marked improvement, it has not yet reached the standard attained during the previous five years, the total number of carats produced in the Transvaal being for the year ended June 30, 1,795,007, valued at £1,266,992, as compared with 2,098,527 carats, valued at £1,317,479 during the previous year. The highest output obtained was in the year ended June 30, 1908, when 2,184,490 carats were produced, valued at £1,879,551. The previous year, however, had the record value of £2,203,511, with an output of only 1,545,335 carats.

ALPINE, TEXAS

K. C. M. & O. Extensions.—Van Horn Silver Mines.—Discovery of Cave Springs Mine.—Iron Mining Beginning.

The authoritative announcement that the Kansas City, Mexico & Orient railroad has made financial arrangements for the immediate construction of the division of its line between Alpine and the Rio Grande, a distance of about 80 miles, is stimulating mining, prospecting, and development in the mountainous territory adjacent to the route. While it has long been known that the Chisos mountains contain copper and silver, the remoteness of the region from railroad transportation has retarded the exploration of these minerals. The Llano Gold & Rare Metal M. Co., which recently erected a 50-ton mill at its Heath mine near Llano, shut down the plant after a brief run. The trouble is said to have been due to the water that was being used. In order to provide a better supply a pipeline is being laid from the mill to the Llano river, two and one-half miles, and the company expects to soon have the plant in regular operation again. It claims to have large quantities of gold ore blocked in the mine, and development operations are being steadily conducted. The holdings of the company embrace about 200 acres of mineral land. J. C. Hoy is preparing to reopen the San Panzo mine in the Van Horn district. The Black Shaft mine, also in this district, and which was formerly well known as a producer of rich copper and silver ore, has been taken over by a syndicate of Minnesota men, and it will soon be again producing. The workings extend to a depth of 300 ft. T. H. Lewis, who recently acquired a silver claim in the Davis mountains, is preparing to start development. Two mining prospectors recently discovered what is said to be the lost Cave Springs gold mine, situated 12 miles from Alpine. Rich specimens of ore were taken from the ancient shaft. The exploration that was made of the workings indicates that the property was at one time worked on a large scale. This mine was a producer in the early days when hostile Indians roamed this part of the State. It was an attack by Indians and the massacre of all employed and connected with the mine that caused it to become 'lost.' L. F. Serdell and associates, who recently acquired several cinnabar prospects in the Terlingua district, will soon begin development. They plan to build a furnace when the mines have been brought into the proper producing state. The Texas Brown Ore Mining & Development Co. is erecting an iron-ore crushing and washing plant of 1000 tons daily capacity at its mines near Ore City, Cass county. The plant will be finished about October 1, by which time the Port Bolivar Iron Ore railroad, now being constructed from Longview to the mines, will be finished. The company is doing extensive development work at the mine.

MOTOR WAGON USED FOR TRANSPORTING ORE IN TEXAS.

TORONTO, CANADA

New Townsite. Dome Find. Rea. Cobalt News.

The Porcupine branch of the Temiskaming & Northern Ontario railway will immediately be extended across the Pearl Lake district, following the contour of the lake through the Hollinger property to the Campbell Veteran claim, where a new townsite has been laid out. The town will bear the name of Timmins and will begin with a considerable population. A sale of lots by auction is announced for September 4. Building in South Porcupine is active; fully 150 buildings are in the course of erection and more are being planned. A sensational discovery has been made on the Dome property. Trenching operations carried on about 600 ft. east of the present workings disclosed a quartz vein 18 to 20 ft. in width with showings of free gold said to greatly exceed in richness anything hitherto found in the district. The patches of gold interspersed in the quartz are described as varying in size from a pinhead to a dime. The speculative character of the find has created much excitement, though it has singularly failed to infuse any activity into a very dull stock market. The vein has been followed for 72 ft. and is believed to run into the Dome Extension. At the Hollinger two new veins have been uncovered on the north lot. One of them varies from 2 to 9 ft. in width and has been traced for 350 ft.; the other, 15 ft. wide where struck, is being followed. Both show free gold. The Imperial has opened up a good vein 5 ft. wide on the northwest corner of the property, and a 7-ft. vein has been found in driving at the 100-ft. level. No. 3 shaft of the Dobie is down 50 ft., and it is expected that the vein will shortly be reached, as several stringers carrying gold have been found. The Plenarium is sinking two shafts, one on the north and the other on the south side of Pearl Lake. A plant comprising an 11-drill compressor, a 200-hp. motor, and an auxiliary steam-plant has been ordered. The Porcupine Reserve has uncovered a new vein 35 ft. wide on the Birke location for 500 ft. and satisfactory assays have been made. The West Dome has purchased the half interest owned by Elijah Woodward and associates in the two Kertz claims immedately adjoining. The Bewick-Moreing company has been requested to resign the management of the Rea mines on the ground that the company has the services of a high salaried engineer, rendering the Bewick-Moreing management a needless expense. C. Plumer Hill, president of the Rea, has issued an interim report stating that the underground situation has improved somewhat. At the 200-ft. level the ore-shoot is 50 ft. longer than at the outcrop. The 200-ft. level has been driven for a distance of 310 ft., and it is intended to sink to 325 ft., and to continue the west shaft, which is now down 137 ft. At the Pearl Lake the diamond-drill has struck mineralized schist at the 400-ft. level, assaying $19 per ton. The new goldfield of West Shining Tree, 40 miles north of Gowganda Junction, is attracting large numbers of prospectors. Many claims have been taken up and free gold is said to be plentifully in evidence. The most notable property is the location staked by Alfred Gosselin, the pioneer of the camp, who has a 10-ft. vein of quartz showing free gold throughout.

The difference in the policies of the two leading Cobalt companies, the Nipissing and the La Rose, in the matter of dividend payments, has been a frequent subject of comment. While the former has been distributing its liquid assets freely and depending on its ore reserves as a means of keeping up the rate, the La Rose has been conservative in the extreme in the accumulation of a large cash surplus, now approximately amounting to $1,400,000. There is no reason to suppose that this policy will be changed. Differences of opinion on this question are assigned as the cause for the resignation of D. Lorne McGibbon, of Montreal, president of the La Rose, from the Nipissing directorate. The amalgamation of these companies was at one time regarded as assured, but recently the boards represent a diversity of interests which shows them to be farther apart than ever. The refining plant of the Nipissing is now in successful operation, treating most of their first-class ore, and when existing contracts have run out will refine all of it, at an estimated saving of $30,000 per year. Experiments are being conducted to find out whether the second-class ore can be profitably treated at this plant. The new 20-stamp concentrator of the Cobalt Lake will be in operation in a few days. At first it will treat some 75 tons per day, the full capacity being 100 tons. The McKinley-Darragh has declared the regular quarterly dividend of 3% with a 7% bonus, and the Weltlaufer has declared a quarterly dividend of 2½%, with an extra dividend of 2½ per cent.

NEW YORK

Estimates of Copper Production.—Market Situation.—Nevada Hills.—Pioche.—Greenwater.

Discussion of the copper situation seems futile at present, in view of the market developments. July figures showed a reduction of some twenty million pounds in stocks on hand. In the face of this apparent movement, the metal market weakened and copper shares have shrunk until the quotations show a staggering total loss. The figures for August do not promise to make any material change in the situation. Exports are estimated to total about 62,000,000 lb. for the month and domestic deliveries about 60,000,000 lb. The refinery output is more uncertain. July output was light, owing to intense heat, which curtailed operations. August will undoubtedly show higher figures, though the present copper situation will hardly be affected one way or the other. One of the factors militating against any advance in the mining-share market is the plight in which the Lake coppers find themselves. The original appraisals made by the Calumet & Hecla committee and also by J. Parke Channing were unsatisfactory to many holders in the smaller companies. The pending litigation and the ensuing deadlock have brought trading in the Boston copper share market to a standstill. The general impression now seems to be that if the Calumet & Hecla directors can find an excuse that will allow them to declare the whole merger plan off and at the same time save their dignity, they will be very glad to drop the whole project. J. R. Finlay predicts much higher prices for copper within the next few years. If, as he seems to think, the next decade is to see a rapidly declining production of Lake copper, then the overtopping strength of the developing porphyries seems not to be so much of a menace to higher prices for the metal. In the meantime Ray Con. and Chino are making progress daily. The former is just putting into commission the fourth unit of the mill and a tonnage of 3200 per day is being handled. The mill is making an extraction of 70%, and the four units are expected to turn out concentrate containing 100,000 lb. of copper each day, or 36,000,000 lb. annually. This production, little more than one-third of what is expected from the property eventually, has already placed Ray on a comfortable profit-earning basis. One of the queer market phases is that, now when real results are being obtained daily, the shares have no followers in the market and sell for less than one-half the price quoted a year and a half ago. Chino is sending ore to the bins in readiness for the starting up of the first unit of the concentrator some time during the first of the current month. Three sections of the mill are to be running before January 1 next.

The patience with which the followers of Nevada Hills have held on is apparently soon to be rewarded. The 120-ton mill which the company is erecting is to go into commission within a few days. When Goldfield Consolidated 'went inside,' which is the street phrase for admission to the New York Stock Exchange, it was hoped that the Goldfield interests would make of Nevada Hills another market leader for the Nevada issues. The trading has, however, been quiet, and while earnings of $600,000 annually are now reasonably assured, there has been no sign of improved mine conditions reflected in the market.

The Nevada-Utah situation has not cleared as yet. It seems almost impossible for anything to go through with Nevada-Utah without becoming involved in endless complications. E. R. Woolley, who was made president last year, has resigned, and Robert G. Mead has been elected to fill his place, while representatives of L. Vogelstein & Co. have been placed upon the boards. Mr. Mead was recently chosen as head of the Amalgamated Pioche M. & S. Cor., and it is said that litigation is expected because of a refusal on the part of the officials to recognize any obligation on account of certain Amalgamated Pioche bonds. The Nevada-Utah organization long ago became too complicated for analysis by any except skilled accountants, and the present snarl will only add a further touch to the general scheme.

PRINCE CON. SHAFT, PIOCHE, NEVADA.

The Greenwater Copper M. & S. Co., a concern into which were merged nearly all the companies organized on the strength of the copper showings at Greenwater, has utilized a small cash balance remaining in the treasury in securing a long-time working lease and option on a group of 27 claims at Dale, Colorado. The Greenwater boom enlisted a multitude of followers in the East, and for each penny now invested in Colorado there were dollars put in.

BUTTE, MONTANA

August Copper Output.—Production Stationary.

The copper production of the Butte mines for August is estimated at 23,030,000 lb., as against 23,132,045 lb. for July and 22,691,200 for June. The daily record for August, showing tons of ore mined daily, pounds of copper per ton of ore, and total pounds of copper produced for the month, is shown in the following table:

	Tons ore mined daily.	Lb. per ton of ore.	Lb. copper.
Boston & Montana.....	3300	63	6,444,900
Anaconda	3800	60	7,068,000
Butte & Boston.......	400	61	756,400
Washoe	310	60	576,600
Trenton	400	60	744,100
North Butte	900	62	1,729,800
Butte Coalition	850	68	1,791,800
Tuolumne	150	140	651,000
East Butte	310	120	1,153,200
Original	1100	62	2,114,200
Total			23,030,000

General Mining News

ALASKA

FAIRBANKS

An interesting occurrence of platinum-bearing rock has been found on Rose creek, a tributary of Gilmore. The platinum is found in a green basic rock, probably diabase, which carries 0.1 oz. of the metal per ton. The find was made by Brown & Flynn. A shaft is now being sunk on the Ryan Lode, by the owners of the property. Dave Thomas is in charge of the work. If the showing warrants the expenditure, a mill will be ordered later. This property is between Eva and St. Patrick creeks. A new vein has been found near the head of Ester creek by Tyndall & Finn, after considerable hard work at tracing. The overburden is deep at this point, making prospecting slow.

SEWARD

The U. S. S. R. & M. Co., in opposition to the Guggenheim interests, has sent experts to the Seward district to investigate properties. D. D. Muir, in the employ of the company, has visited quartz properties along Willow creek.

PRINCE WILLIAM SOUND

James Galen, reported to be a representative of the Guggenheim interests, has bonded the Big Climb, Big Climb No. 1 and 2, and Pioneer No. 1 and 2 claims. The price is said to be $30,000. The present owners are William Mattson, H. B. Cooper, and E. Evans. Of the price, $600 is to be paid before November 1, and the final payment is to be made before January 1, 1914.

The Ibex Extension M. Co., capitalized at $1,000,000, has been incorporated to develop claims on the glacier adjoining the Ibex M. Co.'s property. John Beckman, formerly of Nevada but now of Valdez, Ben Silverman, and G. M. Fay are the incorporators.

The rich vein discovered on the glacier, on the Valdez M. Co.'s property, is persistent in depth, according to latest reports. William and Joseph Crary found the vein 120 ft. from the surface and 50 ft. from the upper adit.

ARKANSAS

BOONE COUNTY

In the Arkansas district, great activity is noted in the zinc mines, and reports of good shipments are heard. A new mill just put into commission in that region is operated by Shortz & Sons. It is in Boone county near the Missouri & North Arkansas railroad. Several other mills are under course of erection. One in particular, that of the Morning Star Co. at Yellville, is deserving of note. It is to have a capacity of 250 tons and will be the largest zinc plant in the North Arkansas field.

ARIZONA

GILA COUNTY

W. F. Goodsell and Thomas Leonard, leasing the U. & G. Copper Co.'s Geneva group, shipped their first carload of ore to the smelter. The ore assays from 10 to 12% copper, according to report.

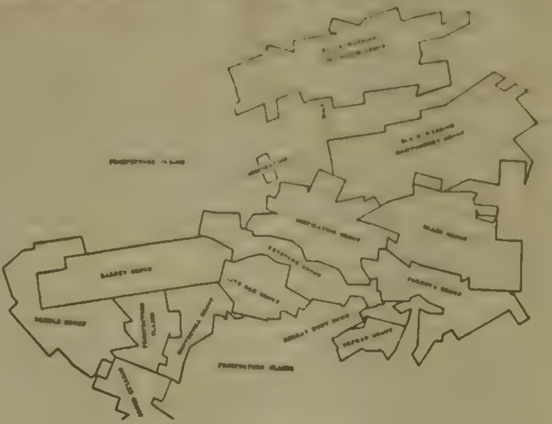
Operating three and a half sections of its mill, the Miami Copper Co. is now producing about 1,800,000 lb. per month, states the *Boston News Bureau*, at a cost of about 9c. per lb. f. o. b. New York. It is the expectation of the management to be able to have the remaining half of the No. 4 section in commission by October 1, and by the end of the year, or early next year, to have the entire six sections in commission, when the Miami should be able to produce about 40,000,000 lb. per annum, at a cost of about 8c. per pound.

(Special Correspondence.)—It is rumored here that the consolidation of the Live Oaks. Dev. Co. and the Inspiration company is contemplated. Five drills are in operation at the former property, and two more are being taken there from the Inspiration.

Miami, September 5.

MOHAVE COUNTY

The Tennessee mine, operated by the Needles M. & S. Co., has penetrated the orebody on the 700-ft. level. The new Oro Plata mill is under construction, and will have a complete equipment. From the 180-ft. level to the bottom level of the Oro Plata property, in Tood basin, large bodies of high-grade ore are in the stopes, according to newspaper reports.


PORTION OF GLOBE DISTRICT.

PINAL COUNTY

The Douglas Copper Co. has been formed to develop 14 claims adjoining the Ray Con. The incorporators are T. C. Fredericks, W. Isher, and Fred L. Mason.

CALIFORNIA

ELDORADO COUNTY

(Special Correspondence.)—The Stanton Mining & Roasting Co., capitalized at $200,000, has been formed here to manufacture apparatus invented by George A. Stanton for a process designed to prevent the discharge of destructive fumes by smelters. The company will use the apparatus first in connection with its mines near Placerville before attempting manufacture on a commercial scale. The incorporators are C. G. Sebring, S. H. Maginess, E. L. Anderson, George A. Stanton, O. E. Bailey, R. E. Marshall, A. T. Johnston, and I. E. Stacy. Principal place of business is Placerville.

Placerville, September 4.

KERN COUNTY

The Honolulu Con. Oil Co. has developed a 20,000-bbl. gusher on section 10, East Midway field, state newspaper reports. The new well is said to be deeper than the gas well near which it is drilled. The oil is under control and is being pumped into steel tanks. It is of high grade and is near the apparatus for extracting gasoline from natural gas which recently was placed on the property.

MARIPOSA COUNTY

(Special Correspondence.)—The Mountain King mine is blocking ore for its stamp-mill. Ten stamps are dropping at present. William S. Thomas is superintendent for the company.

Mt. King, September 2.

(Special Correspondence.)—The 5-stamp mill of the Mariposa Mining & Commercial Co. is milling high-grade ore from the leases on the Mariposa Grant. F. T. McGuire is planning to sell the Grant mine.

Bagley, September 3.

NEVADA COUNTY

(Special Correspondence.)—The Pennsylvania Mining Co. is arranging for the heaviest production in the history of the property. The 10-stamp mill formerly at the Morning Star mine has been purchased, and will be immediately placed in position. This will give the mill a total capacity of 30 stamps. The adit at the Le Duc has been advanced 1000 ft. and is expected to soon intersect the main orebody. Cross-cuts are being extended to prospect cross-veins. A 14-hp. gasoline engine and compressor have been installed. The 10-stamp mill at the Union Hill is nearly finished. It is planned to send the shaft deeper and open new levels. Good ore is blocked out at several points. It is rumored that J. M. O'Brien and associates of San Francisco are negotiating for the You Bet gravel property, owned by Goodwin & Nichols, of Dutch Flat. The property is situated near the old hydraulic mining town of You Bet, and was formerly a noted hydraulic producer. Several years ago Chinese worked the property by drift methods, and extracted large amounts of gold. The Pacific Gas & Electric Co. will construct an immense storage reservoir in the upper portion of the county and will build a hydro-electric plant which will furnish power to mines above Nevada City.

Grass Valley, September 4.

SIERRA COUNTY

(Special Correspondence.)—In the North Fork mine, near Forest (George F. Stone, manager), the bottom of the old Uncle Sam incline has been reached, and one of the old North Fork drifts is being followed. The operators expect to penetrate quartz in a short time which is probably a continuation of the Tightner vein at Alleghany. This mine is being watched with considerable interest, as the old North Fork company, in early days, when little was known of quartz mining, took out $100,000 in specimen rock passing through this lead.

Considerable excitement has been caused lately, in Alleghany, by rich discoveries made in the Red Star mine, now controlled by San Francisco mining men; $25,000 has been taken out during the past week in specimen ore and rich arsenical sulphides. One piece of rock was shown weighing 26½ lb. and valued at $2500. This ore is being taken out at the 'grass roots.' A long adit, to tap the vein several hundred feet deep, is being run by machine-drills along the Tightner vein, of which the former is known to be a continuation. The Tightner is controlled by the same interests.

A compressor and drills are now being put in at the Kate Hardy mine below Forest City, and systematic development is being started. This vein is about 20 ft. wide and reputed to run $4 per ton average outside of the rich shoots.

Nevada City, September 4.

TUOLUMNE COUNTY

(Special Correspondence.)—The machinery for the additional 20 stamps to be placed in the Dutch mill is on the ground, and grading will be completed in a month. Concrete motar blocks on the old 20 stamps now in place will be one of the improvements. Charles Segerstrom, of Sonora, is manager of the mine.

Stent, September 2.

(Special Correspondence.)—As the result of extensive tests at the 40-stamp mill at Black Oak Flat, the flow-sheet of the Black Oak M. Co. is to be changed from amalgamation and concentration to fine grinding and final treatment by agitation in an improved Pachuca (Brown) tank. Two central lift-tubes with auxiliary air-jets will be used. R. S. Knox is superintendent of the mill.

Soulsbyville, September 4.

(Special Correspondence.)—Several members of the company which is to operate the Wards Ferry gravel claims, on the Tuolumne river, inspected the property recently. It is said to have been decided to procure a dredge and begin active work as soon as possible. It is reported a company is being organized to operate the Crystalline mine, which for some time has been in the hands of C. E. Shafer.

The Bonita G. M. Co. has sold the Bonita mine and mill-site to Charles S. Neal and William Angus. The Contention mine, in the Knights Creek district, has been assigned to the Rio Tagus M. Co. by Albert B. Dodd and J. S. Silva, who receive as consideration 399,750 shares of the capital stock of the company. An option on claims two miles northeast of Sugar Pine has been given by W. N. Sledge to Perry Tyer, who will conduct prospecting operations on the property. The price is $10,000, payable within two years.

Tuolumne, September 2.

YUBA COUNTY

Sensational showings of gold are reported on the Last Chance vein at Dobbins, 30 miles from Marysville, the nearest railroad point. The Last Chance shaft is down about 25 ft. The vein of high-grade ore has been followed for 20 feet.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence.)—The West Bellman mine on Bellevue mountain is yielding about one carload of smelting ore daily. Returns on the last shipment were 2.68 oz. in gold per ton. Owen & Lowell are operating under lease. The Kate S. property at Alice has been leased by Peter Sweeney to Fred Bigelow. Stoping is in progress on a 12-in. streak of ore that mills 5.70 oz. gold per ton. The Waltham mill that was recently remodeled started up last week upon custom ore. W. S. Leebrick is owner. David Jones, leasing on the Gem Extension property, has opened a 20-in. streak of ore that mills $28 per ton in gold and silver. Bunny & Co., leasing on the Beaver mine on Chicago mountain, are sending out shipments of ore that mills $62 per ton in gold and silver.

Idaho Springs, September 2.

GILPIN COUNTY

The Sun Tunnel Mining & Transportation Co. has been formed with a capitalization of $1,000,000, to develop about 50 properties, all in one group, on South Boulder creek between Rollinsville and Tolland, near railroad points. E. T. Butler is manager. William A. Jordan, Galesburg, Ill., and D. T. Davis, Findlay, Ohio, are officers of the company.

OURAY COUNTY

The Revenue Tunnel M. Co. has granted a lease to the Cimarron, Bradley, Memphis, and Ophir claims, lying on the Cimarron and Memphis properties, to the Cimarron M. Co., which has just been organized with W. H. Gay as superintendent. The lease originally was granted to H. M. Adkinson, who interested New York and Chicago capitalists. The 40-stamp Cimarron mill and compressor are included in the lease. An aerial tram from the Crane washer to the mill will be built.

(Special Correspondence.)—A. A. Kelsey, secretary of the Camp Bird, Ltd., of London, in a report to the stockholders at a meeting in London, states that the "extracted profits" of the Camp Bird mine in the Mt. Sneffles district for the year ended April 30 were £227,000 and that the ore reserve at that date was estimated at £85,000. He also stated that negotiations are under way to secure nearby property available for the mill. The company also is interested in the Santa Gertrudis company of Mexico.

Ouray, September 4.

SAN MIGUEL COUNTY

Mining for radium, in connection with vanadium and uranium, has brought the United States Steel Co. and other powerful interests into keen rivalry in western Colorado. Options have passed on practically every group of promising claims, so great is the demand for the ground; and although the development up to the present time has not been extensive, 20 four-horse teams are kept busy hauling ore from the Paradox valley, fifty miles, to Placerville, the nearest railway point. From Placerville it is taken 200 miles over a narrow-gauge line, transferred to broad-gauge cars, shipped to Galveston, and thence by water to Liverpool.

TELLER COUNTY

Members of both companies deny a report circulated last week that the Portland G. M. Co. and the United States R. & R Co. were to consolidate. The Portland company is changing its mill from the chlorination to the cyanidation process, but this action, which has been under way for five months, is merely in accordance with old plans.

IDAHO

Idaho County

(Special Correspondence.)—At the Moscow mine, in the Big Creek district, owned by M. E. Moore, there has been opened on three sides a vein of free milling gold ore 200 ft. wide and 3000 ft. long, to the depth of 70 ft. The ore assays from $5 to $12 per ton. A 5-stamp mill which yields by amalgamation $40 per stamp has been built. The owner has bought a 10-stamp mill, and intends to use the cyanide process.

Charles Ellison, owner of the Red Metal mine, has discovered a vein of gold-silver ore, not free milling, assaying on the average $1000 per ton. The property is in the Big Basin district. The Iavada M. Co. has opened a vein assaying over $200.

The Eagle M. Co., near Edwardsburg, will start its new 10-stamp mill in a short time. The company has about 5000 tons of $30 ore opened, and is driving a 500-ft. adit to cut the vein at 350 ft. The company has expended about $125,000.

Warren, September 2.

Shoshone County

The Espirito M. Co., capitalized at $1,000,000, has been formed at Wallace. The property consists of six claims on the north side of Bear gulch, about six miles east of Murray. It is claimed the ore shows wire-silver. Officers are H. H. Wilmot, president and manager; W. M. Myers, vice-president; and H. H. Reeves, secretary-treasurer. All live in Murray.

GENERAL VIEW OF WALLACE, IDAHO.

Articles of incorporation for the Edna-May M. Co. have been filed at Wallace. The company is capitalized at $500,000. Directors are D. W. Peeples and J. M. Scott of Wardner, and R. P. Scott, of Newport, Washington.

The semi-annual report of the Stewart M. Co. shows concentrate returns for the six months ended June 30 to be $299,435; ore returns were $21,373; miscellaneous revenue, $57; interest and exchange, $242; patents, $200; total, $321,109. The total operating expenses were $170,608, and the total sundry expenses were $9904. The net profit for the period was $140,796, or an average of nearly $25,000 per month. Preparations are being made to drive a long adit which will give greater depth on the orebody and lessen the cost of production. It is said that the indebtedness has been wiped out and that the proposed adit will assure dividends, if, indeed, they are not declared before its completion.

MAINE

Cumberland County

Oil has been found near Portland. Drilling is being done with the expectation of finding a basin of petroleum with coal deposits overlying it.

MICHIGAN

Houghton County

While only once before last March did the monthly output of the Mohawk M. Co. exceed 1,000,000 lb. of refined copper, present indications are that in the future the production seldom will fall below this figure, according to recent reports. For several months the recovery has been 16 lb. refined copper per ton. Improvement is general throughout the mine, but the greater importance is attached to the young shallow southerly shafts, as the northerly shafts are down 2000 ft. No. 6 of the former group commands about 150 acres. The extraction through No. 2 and 4 shafts permits dismantling No. 3 shaft.

The August output of the Franklin M. Co. exceeded the monthly record of the past two years by about 100 tons, according to preliminary estimates. The lower levels show more heavy copper than the upper levels, it is affirmed. With the new hoist and 32 new tables, it is stated, the company can treble operations and show a profit on a 12½c. market. It is believed that in a few months the mill will be stamping 1200 tons of ore per day, instead of 400 tons as at present. The new equipment has a capacity of 2500 tons per day.

A director of the Quincy M. Co. is quoted anonymously at Boston as stating that the company will continue its present dividend rate of $4 per annum if the price of copper does not drop below 12c. The present cost of production is 10¼c. per pound, and it requires $440,000 to pay dividends on the stock at the present rate.

The Calumet & Hecla company has declared a quarterly dividend of $6 per share, making a total of $116,050,000 paid in dividends by the company since its formation.

The Wolverine Copper Co.'s July output was the smallest for several months, 790,399 lb. The average recovery was 24.21 lb. per ton. The ore stamped was 32,645 tons, from 34,000 tons hoisted, against 35,000 tons hoisted the previous month. The yield in 1906 was 28.32 lb. and has been receding to an average of 24.75 lb. for the year ended June 30. The Stanton management estimated a life of from 20 to 25 years remaining. The Finlay report, based on an average annual production of 9,000,000 lb., estimates its life at nine years.

MINNESOTA

St. Louis County

(Special Correspondence.)—At the invitation of the School of Mines Alumni Association, George E. Vincent, president of the University of Minnesota, members of the Board of Regents, Deans and Faculty members of the Minnesota School of Mines and Engineering Colleges, made a trip over the Mesabi range, August 11 and 12. After looking over the Fayal mine at Eveleth, the party was taken in ten automobiles to Virginia and Hibbing. At Hibbing, the Oliver Iron M. Co.'s famous 'seeing the mines' cars were placed at the disposal of the visitors, and the Hull, Rust, and Mahoning mines were visited. After the sight-seeing tour, a general reception was held at the Oliver Club and the club parlors were filled with people. Frank A. Wiles, State Inspector of Mines, delivered the address of welcome. After speeches by members of the Board of Regents and others, Mr. Vincent responded with one of his characteristic addresses in a way that pleased the hearts of all who heard him. Mr. Vincent feels that he has accumulated something worth while by his visit, having seen the largest iron mining operations in the world and incidentally met the prominent mining men on the range.

Hibbing, September 1.

MISSOURI

Jasper County

The Golden Rule Zinc & Lead Co., capitalized at $8000, has been formed to develop the old Lincoln mine northwest of Joplin.

W. S. Brown, State Mine Inspector, has petitioned the Circuit Court for an injunction against mining operations being done by Thor Relling and A. G. Dixon in a mine near Chitwood. He alleges the drifts are cut too wide and that there is only one shaft. The injunction is asked under a law empowering mine inspectors to close such mines when petitioned by persons employed there on the ground that the mine is unsafe. It is said other mines have similar conditions, but have two shafts to provide escape in case of cave-ins.

Newton County

The Lion M. & M. Co. will have a 100-ton mill, if present plans are carried out, on its property at Seneca. The work heretofore has been done with a hand-jig. Lead, blende, mundic, and silicate are found in large quantities. F. V. Wasserman is in charge.

Development in the Saginaw, Missouri, camp, is attracting attention. Recent discoveries of rich 'chunk' lead, occurring near the surface, have spurred prospectors to activity, and more than a dozen new shafts are being sunk on the St. Paul Mining Co.'s land, the Saginaw Investment Co.'s land, and on various farms in that vicinity. Among the richest strikes was that made by D. O. Neely on the St. Paul property. Neely employs two men and labors himself, and his weekly profits range from $50 to $75.

MONTANA

Lincoln County

(Special Correspondence.)—Negotiations are in progress here on a deal which means that the Howard placers, south of Libby, will be operated on a large scale. W. Dickerson, a mining engineer of Helena, has completed a thorough examination of the property, which consists of 840 acres of land near Howard lake. If the deal goes through, which now seems almost sure, a large hydraulic plant will be put in at once. Arrangements have already been made with J. Y. Ownbey and G. F. Hinton to take their steam drilling machine to the property and prospect it thoroughly. The drill is now being operated on the Criderman-Town placers, upon which it is proposed to install a dredge.

It is reported that a find of good ore has been made in the Victor-Empire mine on Granite creek, twelve miles from town.

The owners of the Big Eight mine, near Troy, are building a road from the mine to connect with the county road, preparatory to beginning operations. There is now on hand about 100 tons of shipping ore ready to be sent to the smelter. The vein is about 6 ft. wide, with about 3 ft. of shipping ore, and has been extensively developed. The ore is mostly zinc.

Libby, September 1.

Silverbow County

Five miners were killed in the shaft of the Black Rock mine of the Butte Superior company last Sunday, while riding upon the cage when it was being used to haul dull steel to the surface. It is thought that their crowding dislodged the steel. The men were fearfully cut and their bodies were swept into the sump. Riding on the cage at the time was in violation of orders. The men thought to save time in reaching the surface.

The Butte Central's Ophir shaft is passing through a large vein at a depth of 950 ft., state press reports, fulfilling Superintendent McConnell's forecast of a year ago that the vein would be found at a depth of about 1000 ft. He believes that it is the Rarus fault fissure, running northeast and southwest through the district, and that it will be rich in the Ophir ground.

VIEW OF BUTTE, MONTANA.

(Special Correspondence.)—Some of the independent mine owners have been in consultation recently considering a proposition to invest a considerable amount of money in the East Butte company with a view to having the company enlarge the Pittsmont smelter for the treatment of the ore of all independent companies. This is a substitute scheme which has been started up in place of the one proposed more than a year ago to build an independent smelter. Among the mine owners there seems to be some intimation that any reasonable proposition backed financially will be well received by the East Butte people, but those who are promoting the movement in Butte will not go into details. One of the independent mine owners said that the Washoe smelter and the Pittsburg smelter were giving every satisfaction in the treatment of custom ores, but that there was a fear that should the mines belonging to the companies controlling the smelters increase to their full capacities, the custom ores might not receive the attention they are getting now, and therefore it was deemed advisable to be prepared for the emergency. When asked if the Butte-Alex Scott company had been invited to join in the movement for the independent smelter, Mr. Hugo said that while he had heard of the scheme proposed, his company had not been officially approached. "However," he said, "if the scheme goes through I guess we will join with the rest of the companies." At the present time the only independent mines producing any copper are the Tuolumne, the Elm Orlu, the Poser, and the Butte-Alex Scott. The Tuolumne is at present sending its ore to the Washoe under a contract which expires next spring, while the ore from the Poser and Elm Orlu is also going to the same smelter. While the latter is W. A. Clark's zinc property it has of late been hoisting considerable copper ore. The Butte-Ballaklava and the Pilot Butte are among the properties expected to join the producing class by next year. The East Butte is, of course, in the producing class, but the company owns the Pittsmont smelter and therefore is not taken into account when considering the mines likely to go into the agreement to enlarge the Pittsmont and subscribe for a certain amount of stock.

Butte, September 2.

NEVADA

Esmeralda County

(Special Correspondence.)—The Goldfield Con. M. Co.'s net yield for July was $582,021, about $19.89 per ton, from a production of $848,129, an average of $29 per ton. The net recovery averaged $27.42 per ton, and the cost of production $7.66 per ton. During the month 29,253 tons of ore was milled, against 28,540 in June, and 29,150 tons in May. The development work for the month amounted to 4078 feet.

(Special Correspondence.)—The Goldfield Con. M. Co., at its quarterly meeting at San Francisco, August 31, declared a regular dividend of 30c. per share and an extra dividend of 20c. per share, payable October 31 to stockholders of record on September 30.

Goldfield, September 4.

(Special Correspondence.)—The Milwaukee Gold & Copper Co., capitalized at $1,500,000, has been organized to develop three claims 15 miles south of Goldfield. The property has a 160-ft. shaft. J. W. Evans, of Goldfield, is president and general manager.

Goldfield, September 2.

Humboldt County

A pair of bandits recently held up men guarding high-grade ore in the assay office of the Mammoth mine at National and stole $3000 worth of ore. One of the outlaws was wounded. The ore subsequently was recovered.

Orson Smith, general manager of the Utah Nat. Dev. Co.'s property at National, is quoted in the press as stating that the company has taken over the claims, which consist of 60 acres adjoining the Mammoth and Birthday. The property is known as the Shiloh group. It has been operated by the Utah Nat. Dev. Co. for the last six months under lease and bond.

Nye County

A part clean-up was made last week at the War Eagle mill, about 1000 tons having been treated. Two bars of gold bullion weighing 46½ lb. avoirdupois, and an 11-lb. bar shipped the previous week make a total production of 838.35 oz. troy, valued at $11,653. The returns from the zinc precipitate sent to the Selby smelter have not been received. It is estimated that the mill-run will amount to 1800 tons, according to late newspaper statements.

The Tonopah-Belmont Dev. Co. has declared a dividend of 25%, payable October 2 to stockholders of record on September 15.

Storey County

The assessment list for the Comstock mines, as announced in San Francisco September 5, is as follows: Challenge, No. 56, July 15, 5c.; Savage, No. 21, July 17, 10c; Hale & Norcross, No. 28, July 28, 5c; Best & Belcher, No. 96, July 31, 5c.; Overman, No. 36, August 7, 5c.; Con. Virginia, No. 18, August 9, 25c.; Exchequer, No. 20, August 15, 5 cents.

White Pine County

Four units of the Steptoe concentrator at McGill have been closed on account of lack of water, and work probably will not be resumed until the fall rains start.

The Giroux Con. M. Co. has been delayed in making ore shipments, it is reported, through the failure to obtain favorable rates from the Nevada Northern to the Tooele smelter. The recent rate decision of the Interstate Commerce Commission, it is said, is effective only to Cobre on the Southern Pacific, and does not affect the rates on the Nevada Northern. The Giroux shaft will reach the 1600-ft. level before the new year. A large station will be cut there. About 75 men are employed.

(Special Correspondence.)—The Giroux shaft, in which a fire occurred August 23 with the result of the death of seven miners, was opened last week and the body of Dan Drea, which was in the mine when the shaft was sealed, was recovered. The damage to the shaft is reported to be comparatively slight.

Ely, September 4.

NORTH CAROLINA

Montgomery County

(Special Correspondence.)—The Uwarra Mine Co. has been formed, as a reorganization of the Montgomery M. Co., and the mine, which has been idle for some time, has been pumped out. The 10-stamp amalgamation mill on the property will be enlarged. Percy E. Barbour is manager for the company.

Candor, September 2.

WASHINGTON

Ferry County

(Special Correspondence.)—The Ben Hur Leasing Co. has laid off some men, being short of water to run the steam boilers. The usual supply is piped from Mud lake, but the piping has been choked by water snakes. At the Black Tail mine the Hope company has sunk the shaft on the cross-vein 38 ft. From off the winze, on the 300-ft. level, the drift on the east-west vein is in 40 ft., being run in the foot wall, to avoid taking out ore until the Granby smelter resumes operation. The last sample assayed $33 per ton and the last previous to that one assayed $43.90 per ton. The San Poil Con. company has laid off several men, as the smelters have quit buying custom ore for the present. The Rathfon Reduction Works has received a vanner table, for use in the cyaniding plant. At the North Washington Power & Reduction Co.'s mill operations have been again delayed for want of lumber.

Republic, September 2.

CANADA

British Columbia

The Hall mines smelter, the well known plant at Nelson, was destroyed by an incendiary. The loss is about $350,000. The plant had been idle for some time. A dozen other fires, which destroyed the brewery and other structures, are believed to be the work of the same man.

Ontario

The Jowsey-Wood claims, near the three-mile post on the base-line of Carscallen and Denton, have been acquired by A. D. Miles, consulting engineer for the Canadian Copper Co. Through the seven claims runs a rich quartz dike with a showing of free gold. Assays range from $93 to $224 per ton. The price is reported to have been $250,000.

It is reported that a survey party at the Big Dome recently discovered an unusually rich vein, the showing being slightly over 2 in. wide and 18 in. long. The vein has been stripped for 125 ft. The slab first discovered is reported in the newspapers as being nearly solid gold and will be exhibited in various cities. During prospecting at North Dome a vein was discovered which is said to assay over $2900 per ton. The vein was concealed by a slate capping and is believed to overlie rich sulphides.

N. L. Griswold, a mining man of New York, has acquired the Vendetta, Legree, and Kirkland claims in Carman, Porcupine district. They are a mile from Nighthawk lake. Assays run from $5 to $30.

(Special Correspondence.)—Late reports of the recent discovery of high-grade gold ore on the North Dome are that the vein has been uncovered for 50 ft. and is from 6 to 7 ft. wide between well defined walls. The vein when first sampled assayed at $2932 per ton.

Porcupine, September 2.

JAPAN

With a production for 1910 of over 100,000,000 lb. of copper, Japan scored a record, states the *Boston News Bureau.* The leader was the Ashio mine, with 19,500,000 lb. of copper. Sixteen mines had a production of more than 1,000,000 lb. each, and a combined production of 101,602,616 lb., against 80,313,051 lb. in 1909.

PHILIPPINE ISLANDS

(Special Correspondence.)—A deal for 1000 acres of dredging ground in the Paracale district was closed in July. The purchasers are capitalists from Melbourne, Australia.

Manila, July 25.

Company Reports

AMERICAN SMELTING & REFINING COMPANY.

The twelfth annual report of this company, for the year ended April 30, 1911, shows that the net earnings from the operation of smelting and refining plants was $7,600,931; to which must be added earnings from mines owned by the company, amounting to $331,334; miscellaneous earnings amounting to $243,218; income from investments amounting to $2500; and interest and commission, $577,697. From this total must be deducted ordinary repairs and replacements, $862,710; corporate and excise taxes, $9977; administrative expense, $375,076; and depreciation credited to property account, $461,638, leaving a net income of $7,046,278. Dividends amounting to $5,500,000 were paid, and the balance, $1,546,278, was transferred to profit and loss account. During the year 122,490 shares of common stock of the American Smelters Securities Co. were acquired; all the common stock of this company is now held by the A. S. & R. Co., and is carried upon its books at a valuation of $60 per share, or a total of $18,000,000. During the year the outstanding preferred shares of the United States Zinc Co. were also acquired and the entire stock, both common and preferred, is now held by the A. S. & R. Co. Similarly, the stock and bonds of the National Metallurgical Co. of Mexico were acquired and all but unimportant amounts are now held. The last payment of $131,000 upon the bonds of the Omaha & Grant Smelting Co. was made during the year and the issue is now completely retired. January 5, 1911, an increase in the common capital stock of the A. S. & R. Co. from $50,000,000 to $65,000,000 was authorized by the shareholders. The American Smelters Securities Co. has issued $15,000,000 of 6% 15-year gold debenture bonds which are convertible into common shares of the American Smelting & Refining Co.; this entire issue has been acquired by the A. S. & R. Co., the A. S. S. Co. thus repaying advances made to it and discharging its floating indebtedness. Through this transaction it is expected that the A. S. & R. Co. will eventually receive $15,000,000 additional cash capital, which added to the present cash capital will make a total of $27,000,000. The ores and metals in process of smelting, supplies on hand, and investments, represent a total of $23,000,000, so that the preferred stock of the company thus has its face value offset by cash and quick assets. The common stock is represented by property to the value of $86,000,000 and $17,751,000, par value, of common shares of the American Smelters Securities Co. The bonds mentioned above are convertible, at any time prior to 1918, into common shares of the A. S. & R. Co., at par, and after February 1, 1915, are subject to redemption.

The mines owned by the company are in Mexico and are operated to assure the necessary supply of ore to the smelter at all times. The profits of these mines are credited to the purchase price and development expense until these are liquidated, after which the profits are credited to surplus, $105,618 having been so credited during the year. As these mines are not carried upon the books of the company as an asset, no provision need be made for depreciation. Metals in process of treatment are inventoried at fixed prices, 50c. per ounce for silver, 12c. per pound for copper, and 3.8c. per pound for domestic lead. The profits of the company are a commission upon the metals bought and sold by the company. There is paid to the mines the daily market price of the metals in the ores bought, the only fixed factor being the working charge, which is made sufficient to cover the smelting, refining, transportation, and profit. The company therefore acts virtually as the agent of the mines. The ordinary net income of the company during the year under review was approximately the same as the preceding year, though this period was one of business depression and restricted consumption. The smelting capacity of the various plants owned by the company is now 5,500,000 tons per annum, the refining capacity 460,000 tons per annum, and through its connection with the American Smelters Securities Co. it has an additional interest in a smelting capacity of 2,650,000 and a refining capacity of 190,000.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS.

CONVEYANCE OF MINERAL RIGHTS BY PERSON IN ADVERSE POSSESSION

The mere execution of a deed by one in the adverse possession of coal land and mineral rights therein does not operate as an abandonment of the possession. Until he does some act of surrendering the possession, he is regarded by the law not as abandoning the possession, but as holding the possession for the benefit of the grantee as his tenant at sufferance. And such conveyance does not operate as a severance of the estates of the surface, or agricultural rights, from the mineral rights.

Black Warrior Coal Co. *v.* West, (Ala.) 54 Southern, 200. Jan. 1911.

RECOVERY OF VALUE OF ORE CONVERTED—PROOF

In an action against a mining company to recover for ore mined by it and converted to its own use, from a vein owned by the plaintiff, proof of the value of similar ore taken from the same vein nearby is admissible on the part of the plaintiff, as a method of proving the value of that converted by the defendant. The reason of the rule is that it is within the power of the defendant to show the actual value of the ore taken if that shown by the plaintiff's evidence is excessive. The measure of damages in such case is the amount which will compensate for all the detriment proximately caused thereby, and the detriment caused by the wrongful conversion of personal property is presumed to be the value of the property at the time of its conversion with interest from that time.

Montana Mining Co. *v.* St. Louis Mining & Milling Co., 183 Federal, 51. Oct. 1910.

ASSESSMENT OF MINING CLAIM FOR DAMAGES

Where the locator of an unpatented mining claim uses the surface for townsite and building purposes, it may be assessed for taxes and such assessment is on use of the ground for the town site and building purposes, and not on an unpatented mining claim. And a decree of the court enjoining the collection of taxes on the parcel of ground designated as a mining claim until the claim is purchased from the Government, on a complaint alleging that the assessment was unlawful because the legal title was in the United States, merely adjudges the mining claim as such, not subject to taxation because the legal title was in the United States, but does not determine and settle the question of the right to tax the surface ground where it is used and as a separate and independent value for other than mining purposes.

Cobban *v.* Meagher, (Mont.) 113 Pacific, 290. Jan. 1911.

RIGHT OF CREDITOR TO EXAMINE AND INSPECT MINING PROPERTY PRIOR TO EXECUTION SALE

A judgment creditor has no right to an order permitting him to examine and inspect mining property, though he has caused an execution to issue against the debtor and to be levied upon his property. To enable a person to make an examination of mining property for the purpose of protecting and preserving his possession, title or interest therein, it is necessary for him to allege and show a bona fide claim to possession, title to, or interest in the property sought to be examined and inspected, or otherwise the court has no jurisdiction to make an order giving him such permission. And a judgment creditor has no such interest in property levied upon and does not show any necessity for the granting of an order permitting him to examine and inspect the property levied upon prior to the execution sale. In such case the claim to possession, or title to, or interest in, a mining claim must be an actual right, and real interest.

Bacon *v.* Federal Mining & Smelting Co., (Idaho) 112 Pacific, 1055. Dec. 1910.

Book Reviews

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

OIL FUEL. By Sidney H. North, revised by Edward Butler. Pp 248, Ill., index. Charles Griffin & Co., Ltd., London, 1911. Price $2. For sale by the *Mining and Scientific Press*.

This is a new edition of a standard work well known and highly valued. It covers the supply, composition, and application of oil fuel and has been substantially enlarged since the appearance of the first edition in 1905. While the book deals with European conditions and practice it contains much of value everywhere.

THE MINERAL INDUSTRY, 1910. Edited by Albert H. Fay. Vol. XIX. Pp. 904, Ill., index. McGraw-Hill Book Co., New York, 1911. Price $10. For sale by the *Mining and Scientific Press*.

This indispensable annual follows in style the preceding volumes of the series with reviews for each mineral and revised statistics. The special chapters are: 'Sulphur Smoke in Metallurgical Works,' by Herbert Lang; 'Dredging'; 'Mining Practice in 1910,' by Albert H. Fay; 'Propress in Ore Dressing and Coal Washing in 1910,' by Robert H. Richards and Charles E. Locke; and 'Assaying and Sampling,' by Donald M. Liddell.

PUMPING MACHINERY. By A. M. Greene, Jr. Pp. 703, Ill., index. John Wiley & Sons, New York, 1911. Price $4. For sale by the *Mining and Scientific Press*.

This is a treatise on the history, design, construction, and operation of various forms of pumps and is the outgrowth of a course of lectures which is given as one of the required courses to students of mechanical engineering at the University of Missouri. While intended for the use of those who have studied hydraulics, mechanics, and the strength of materials, its usefulness is by no means limited to such persons. The elements of pumps for all purposes are given and the principle available types are described. The book forms an excellent basis for a study of pumps. If it could be supplemented by another on operation a marked gap in existing engineering literature would be closed.

Recent Publications

COMPOSITION OF TEXAS COALS AND LIGNITES, AND THE USE OF PRODUCER GAS IN TEXAS. By Wm. B. Phillips, S. H. Worrell, and Drury McN. Phillips. Bull. Univ. Texas, 189. P. 134. Austin, 1911. A general report prepared by the Bureau of Economic Geology and Technology, of the University.

ADVANTAGES OF MAINE FOR ELECTROCHEMICAL INDUSTRIES. By C. Vey Holman. Reprint from Trans. Amer. Electrochem. Soc., Vol. XIX, 1911. 8 pp. Attention is called to favorable geographical situation as regards transportation, to abundant water-power, and to undeveloped minerals.

THE UNITED STATES GEOLOGICAL SURVEY has recently distributed the following new publications: Foxbury-Clarion Folio, Pennsylvania, by E. W. Shaw and M. J. Munn; The Mount McKinley Region, Alaska, by Alfred H. Brooks, Prof. Paper No. 70, pp. 234, ill., index, maps; Water Supply Papers 267, 268, 273; Mineral Resources of the United States, 1909, part 1, Metals, part 2, Non-Metals (bound volumes); Mineral Resources, 1910, separates, Barytes, and Strontium, by E. F. Burchard, Coke, by E. W. Parker, Anthracite Coal, by E. W. Parker, Phosphate Rock, by F. B. Van Horn, Talc and Soapstone, by J. S. Diller, Bauxite and Aluminum, by W. C. Phalen, Mineral Paints, by E. F. Burchard, Peat, by Charles A. Davis; Results of Spirit Leveling in West Virginia in 1909 and 1910, Bull. 477, 54 pp.; Results of Spirit Leveling in Texas, Bull. 468, 127 pages.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

E. R. BUCKLEY is in Montana.

F. B. WEEKS was in San Francisco recently.

M. K. RODGERS was in San Francisco this week.

THOMAS KIDDIE was in San Francisco last week.

K. P. SWENSON has been visiting Manchurian mines.

W. F. ENGLEBRIGHT visited San Francisco last week.

L. J. REYERSBACK was in San Francisco over Sunday.

ERNEST LEVY has returned to Rossland, B. C., from London.

F. A. SIZER returned to San Francisco from Grass Valley Monday.

GEORGE OTIS SMITH will attend the A. I. M. E. meeting at San Francisco.

R. Y. HANLON is in Korea examining placer deposits for Australian investors.

S. J. WEIS, who has been on the West African gold coast, is visiting San Francisco.

PERCY E. BARBOUR is manager for the Uwarra Mines Co., at Candor, North Carolina.

R. H. ERNEST, superintendent for the Round Mountain M. Co., is visiting San Francisco and Los Angeles.

RAYMOND C. BENNER has gone to the University of Pittsburg to study the smoke problem with R. K. DUNCAN.

WILBUR A. HENDRYX has gone to London, from which point he will sail for South Africa to erect a Hendryx plant on the Rand.

W. KAEDING has been appointed superintendent of surface departments for the Consolidated Mines Co. at Goldfield, Nevada.

LEO F. ARNOLD has resigned as general superintendent for the Casa Diablo G. M. Co., at Bishop, California, and returned to Chicago.

FAYETTE A. JONES has severed his connection as consulting engineer for the Oriole Gold Mining Co., and is now in British Columbia.

L. D. HUNTOON has resigned from the Sheffield Scientific School and opened an office at 42 Broadway, New York, for practice in mining engineering.

EDWARD M. RABB, JR., has resigned as chief engineer for the Moctezuma Copper Co., and will be engaged in professional work with headquarters at 3535 W. 24th avenue, Denver, Colorado.

WILLIAM T. MCDONALD, who has been acting as assistant superintendent of the Magna plant of the Utah Copper Co., has been appointed superintendent of the Chino mill, and will leave shortly to take up his new duties.

Information is desired regarding BARTHOLOMEW SWIFT, a native of Ireland, born about 1846. He is supposed to have worked in the mines of the Pacific Coast for several years, and was in San Francisco prior to 1901. Property belonging to him is unclaimed.

RALPH D. BROWN has been appointed instructor in civil engineering at the Missouri School of Mines. Mr. Brown is a graduate of Miami University and of the civil engineering department of the University of Ohio. Since 1909 he has been in the employ of the O'Gara Coal Co. at Harrisburg, Illinois, as assistant engineer.

SIDNEY S. SCHMIDT, a graduate of the Missouri School of Mines, and at present a chemist at the Washoe smelter at Anaconda, Montana, has been appointed assistant in mineralogy at Northwestern University. He will take the place of A. J. ELLIS, who resigned to accept an appointment on the United States Geological Survey.

Market Reports

LOCAL METAL PRICES.

San Francisco, September 7.

Antimony	12—12¾c	Quicksilver (flask)	48½
Electrolytic Copper	14—15¼c	Tin	47—48⅜c
Pig Lead	4.75—5.70c	Spelter	7½—8¼c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50—9.75; large $7.50—8.50

METAL PRICES.

By wire from New York.
Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Aug. 31	12.32	4.50	5.87	52¼
Sept. 1	12.32	4.50	5.87	52⅜
" 2	12.32	4.50	5.87	52⅛
" 3	Sunday.	No market.		
" 4	Holiday.	No market.		
" 5	12.32	4.50	5.87	52⅜
" 6	12.32	4.50	5.87	52⅜

ANGLO-AMERICAN SHARES.

Cabled from London.

	Sept. 7. £ s. d.
Camp Bird	1 8 9
El Oro	1 3 3
Esperanza	1 15 0
Dolores	1 5 0
Oroville Dredging	0 5 9
Mexico Mines	6 15 0
Tomboy	0 17 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing prices, Sept. 7.		Closing prices Sept. 7.
Amalgamated Copper	$ 58⅝	La Rose	$ 4¼
A. S. & R. Co.	70¼	Mason Valley	7⅝
Braden Copper	4¾	Miami Copper	19
B. C. Copper Co.	3⅝	Mines Co. of America	5⅛
Butte Coalition	15	Nevada Con	17½
Chino	19¼	Nevada Utah	⅜
Davis Daly	⅞	Nipissing	8⅛
Doble	1	Ohio Copper	1⅜
Dolores	4½	Ray Central	1¼
First National	1	Ray Con	14
Foley O'Brien	1	South Utah	⅝
Giroux	4	Superior & Pittsburg	14½
Goldfield Con	5¾	Tenn. Copper	34
Greene-Cananea	6⅛	Trinity	3½
Guanajuato Con	½	Tuolumne Copper	4⅛
Hollinger	10¼	United Copper	1½
Inspiration	6¾	Utah Copper	43¾
Kerr Lake	4	Yukon Gold	3¾

COPPER SHARES—BOSTON.

	Closing prices, Sept. 7.		Closing prices Sept. 7.
Adventure	$ 4¼	Mohawk	$ 38
Allouez	25	North Butte	23¾
Calumet & Arizona	50½	Old Dominion	38½
Calumet & Hecla	410	Osceola	88
Centennial	9	Parrot	9½
Copper Range	52½	Santa Fe	¾
Daly West	5¼	Shannon	8½
Franklin	7⅛	Tamarack	23
Granby	29	Trinity	3¼
Greene Cananea, ctf.	6	Utah Con	12¾
Isle-Royale	13¾	Victoria	2
La Salle	3½	Winona	5
Mass Copper	5¾	Wolverine	99

(By courtesy of J. C. Wilson, Mills Building.)

NEVADA STOCKS.

San Francisco, September 7.

Atlanta	$ .19	Mayflower	$ .04
Belcher	.65	Mexican	3.47
Belmont	6.60	Midway	.25
B. & B.	.17	Montana Tonopah	.80
Booth	.10	Nevada Hills	2.90
Chollar	.13	Ophir	1.65
Combination Fraction	.11	Pittsburg Silver Peak	.85
Con. Virginia	.62	Round Mountain	.65
Florence	1.17	Sandstorm Kendall	.04
Goldfield Con	5.75	Savage	.21
Gould & Curry	.11	Tonopah Extension	.91
Jim Butler	.24	Tonopah of Nevada	6.50
Jumbo Extension	.20	Union	1.47
MacNamara	.19	West End	.59

(By courtesy of San Francisco Stock Exchange.)

A New Line of Centrifugal Pumps

The Goulds Manufacturing Co. of Seneca Falls, New York, has just placed on the market an entirely new and improved line of centrifugal pumps. These are furnished in both the single-stage single-suction, and the single-stage double-suction types. Either type may be arranged for belt-drive or direct connection to electric motor, gas, gasoline, or steam-engine, steam or hydraulic turbines. The single-suction, as well as the double-suction pumps, contain many special features, which are described below.

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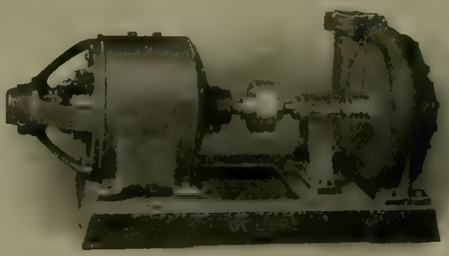
SINGLE-STAGE DOUBLE-SUCTION GOULDS CENTRIFUGAL PUMP WITH CASE OPEN.



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EDITORIAL

ENGINEERS interested in various phases of lighting problems will meet at Chicago, September 25 to 28, when the Illuminating Engineering Society will be in session. The program, however, is far from being light.

IDLE CARS afford a good index to current business, and, amid all the signs of discouragement now current, it is worth noting that on the first of August the number idle was less than at any time since the first of this year.

LARGEST production does not necessarily mean largest dividends. In 1910 the Amalgamated Copper Company produced 233,808,546 pounds of copper and paid $3,065,750 in dividends. Phelps, Dodge & Company produced 116,888,000 pounds, paying $4,500,000, while the record of the Utah Copper Company was 84,502,475 pounds and $4,619,000 dividends.

ACTION is being taken to clear up existing claims in the Matanuska as well as the Bering River coalfields. Mr. A. C. Frost of Chicago and his associates, among whom we note the name of Mr. Bion J. Arnold, have been cited to show cause why their claims should not be cancelled. Mr. Frost proved to be an adroit promoter in connection with the Chicago & Milwaukee Electric railway and entangled a number of excellent men.

SALE of the Golden Gate mine of Chichagof island near Sitka, Alaska, to the DeGraff Mining Company is announced. This brings under one management two neighboring mines that, while small, have been unusually profitable. The Golden Gate is reported to have approximately 125,000 tons of ore worth $14 per ton in reserve, with excellent prospects of more being developed. The vein is well defined and the ore is easily treated. Doubtless now that the two mines are owned by one company a large mill will be built.

GOOD progress is being made in preparing for smelting at the Hidden Creek mine on Observatory Inlet, British Columbia. It is estimated that 12,000,000 tons of ore containing 1½ to 3 per cent copper is available here, and the plan of treatment involves direct smelting. It is so common to hear of large milling operations in connection with the copper mines now being opened that the fact that mills are unnecessary at some is overlooked. The new property of the Granby company is fortunately in the class that requires no mill. Record low costs are anticipated.

DURING the six months ended July 30, 1910, the Balaklala Consolidated Copper Company paid $42,233 in settlement of claims for smoke damages. During the last year and a half that the company operated, its plant at Coram was closed three times in connection with the erection of the Cottrell equipment and ran at about one-third capacity between times. The precipitating apparatus was built at a cost of $107,589. The Balaklala ore is of low grade, containing approximately a dollar per ton in gold and silver and about 2½ per cent of copper. Despite the low price of metal and other discouragements the company earned $127,326 in the period mentioned. This indicates unusually good technical work, and, in fact, the plant is known to have made a record in pyritic smelting, though no details are available.

AUSTRALIAN copper production in the first seven months of 1911 amounted to 32,668,240 pounds, as against 29,500,000 pounds in the corresponding months of 1910. The Mt. Elliott property was forced temporarily to suspend operations, but the other great properties produced as follows: Mt. Morgan, 9,546,880; Mt. Lyell, 10,056,160; Great Cobar, 9,662,640; Great Fitzroy, 3,402,560 pounds. This copper no longer comes to the United States to be refined, but is now handled by the Electrolytic Refining Company of Australia, a concern controlled by L. Vogelstein & Co. Formerly Australian copper was an important factor in keeping up the refinery output of the Atlantic States.

UNUSUAL occupations, as exhibited in recent census reports, are discussed by a daily contemporary. We note with interest 'dock walloper,' 'scabber,' 'flosser,' and 'dubber,' but the list is evidently incomplete, for 'scrammer' is omitted. In the Lake Superior iron region where caving methods are extensively employed, the miners say that it is necessary to serve a long apprenticeship as an ordinary miner before becoming a qualified 'scrammer.' It is interesting to note also that the method, which appears to have no distinctive name other than this colloquial one, is now being applied to the mining of a large body of low-grade copper ore in the Ohio mine at Bingham, Utah, at a cost unofficially stated at 35 cents per ton.

EXISTING rights in Mexico are promised scrupulous protection in a letter written by Mr. Francisco I. Madero recently. There have been intimations that Mr. Madero occupied close relations to the Standard Oil Company, and that in fact the revolution in Mexico was but an after effect of the war between the Waters-Pierce and the Pearson oil interests. Lord Cowdray called upon Mr. Madero to discuss the matter and was assured in positive terms that he would use all his undoubted influence to prevent any change in the settled Mexican policy of exact fulfillment of any guarantees given foreign companies, and also that he would welcome further investment of foreign capital. This was to have been expected, but this explicit statement is none the less gratifying.

ECONOMY results from the introduction of petroleum as fuel on shipboard, not only because of the greater calorific power of the fuel, but because of incidental savings. When the steamship *Mariposa,* running between San Francisco and Tahiti was changed to an oil-burner, a reduction of 16 men was made in the engine-room force. The *Mauretania* carries 312 firemen, whereas it is estimated that if oil were burned, not more than 30 would be needed. The extra men require wages, food, and room, all of which are important on shipboard. Oil fuel requires less space per heat unit than does even the best coal, and 36 cubic feet of oil is equivalent to 67 cubic feet of coal as usually stored in ship bunkers. The ships burning oil have larger cargo space available. In the case of warships this permits heavier guns or a longer steaming radius, either of which might prove decisive in a great national crisis. The Liquid Fuel Board which in 1902 studied the problems of oil fuel for the navy reported adversely on the ground of the limited supply of petroleum available. Since that time, however, the annual output of the United States has practically doubled, and adequate supplies are now available on both coasts. Oil is being introduced on some of the warships and an increasing number are likely to be equipped for its use.

CRITICISM has been leveled at Bewick, Moreing & Company for having sold its interest in the Hollinger mine almost as soon as it was acquired. The fact seems to be that the announcement that the firm had purchased the property sent the shares up so rapidly that there was more profit in selling than in holding them. The firm accordingly sold, and thereby realized the money needed to finance its other ventures at Porcupine. The net result is that speculators have furnished Bewick, Moreing & Company with approximately a half million dollars and that this money will be spent in testing additional ground.

PLANS are being discussed at Cripple Creek, Colorado, to prevent the Western Federation of Labor from regaining a foothold in the district and for control of ore-stealing. Unfortunately the two go together at Cripple Creek. There, as in San Francisco and at a number of other points, the good cause of union labor is being used to advance the personal fortunes of men of no character. Doubtless in time the miners' union will obtain a standing corresponding to that of the Brotherhood of Locomotive Engineers and other reputable organizations. It will not do so, however, until its character and leaders warrant the same measure of respect. The more rapidly it can be accomplished the better it will be for the industry.

Industry and Art

A recent volume published in Munich bears the depressing title *'Die Kunst Stirbt.'* It is discouraging to have the demise of art announced from the city generally regarded as its chief place of abode, and we would be correspondingly grief-stricken were it not that the arguments which the author advances to prove that modern progress has slain artistic ideals awake vague reminiscences of the Latin and Greek poets who mourned the passing of the Golden Age some two thousand years ago. It is quite true that the dreamer needs to look out that the advance of industry does not overrun him; this has always been true, but that there is now less opportunity for the play of imagination is the reverse of true. Romance has its proper environment; only when we try to mix it with reinforced concrete we get an unsatisfactory product. Once mankind had little more than romance, ideals, and a bare living. Now the average man has so much more than a bare living that material comforts bulk larger in the scheme of living than was once the case. Art is capable of larger things nowadays and the skill that once exhibited itself in the painting of miniatures now has opportunity to display itself in the control of energy so adroitly that a giant crane deposits a twenty-five ton casting in its place as accurately as a jeweler adjusts a watch. Recently we referred to the dramatic aspects of steam-shovel work in mining—some twenty shovels at work both in the sunshine and under the glare of searchlights at night, stripping bare the mountainside at the rate of fifty thousand tons a day and exposing workings but a short while since slowly conducted with much effort in the depth of the mine. Most men take such achievement much as a matter of course nowadays—no one has written an epic poem on the Panama canal, yet as an example of great human achievement it far outranks the subject of many a great poem. And this leads us to the explanation. Where once a few men led lives of achievement, full of romance, a few others wrote songs about them, and most people were perforce content to merely hear about the deeds of others, now a life of achievement and romance is within the reach of the average man. Naturally he prefers his romance first hand, and the trade of the singer has declined. Art is not dead; rather men prefer to live art than to see art or to hear art. And who can say we are not the gainers thereby?

A First Step in the Solution of the Alaskan Problem

AN EDITORIAL SUGGESTION

That present conditions in Alaskan coalfields are extremely unsatisfactory is widely recognized. Large areas of excellent coal within a few miles of tidewater remain unopened, while railroads and other enterprises import coal at a cost of $7 to $9 per ton on the dock. In the interior, the price of coal is practically prohibitory, and development of any industry requiring handling of large tonnages is impossible except at the seacoast. Industry in Alaska always will be at a disadvantage owing to the difficulties and expense of navigation along its coasts, and of transportation into the interior. This, however, is all the more reason why full advantage should be taken of any favorable local feature, such as abundant and excellent coal.

In examining the matter of the opening of the Alaska coalfields, two distinct questions must be considered. The first, and more pressing, is, how to get coal on the market quickly in quantities sufficient to satisfy immediate demands. The second is, what disposition shall ultimately be made of the coal lands, and under what condition coal shall be mined in the future. Both questions involve railway problems and are complicated by existing rights of coal-land locators. It is extremely unlikely that any satisfactory solution of the second problem will be found immediately, and we have no desire to discuss it at the present time. The ramifications of the matter reach such varied interests, and so many things must be taken into account, that a quick determination might well prove a wrong determination. The first problem, however, that of promptly furnishing Alaskan coal in such quantity as is really needed, seems to us capable of speedy and safe solution.

It has been estimated by Mr. A. H. Brooks that there is a present potential market for 1,000,000 tons of Alaska coal per year. Whether or not we agree that these figures are correct, it is undoubtedly true that there is an important market awaiting the opening of the mines. At present all the high-grade coal used on the Pacific Coast comes from the East or is imported. The Navy, for strategical reasons, uses only the best grade of Pocahontas coal, and when the fleet goes to sea it is followed or preceded by a long string of colliers carrying Eastern coal. At all times there is a procession of boats traveling around South America in order that the battleships and cruisers shall have smokeless coal. Necessarily much coal is burned in bringing this fuel to the ships, and, necessarily also, the cost of the coal delivered is greatly above that at Eastern tidewater ports where it has already been raised by the several hundred miles of railway haul from the mines. In case of war, the supplying of ships in the Pacific with Eastern fuel would be extremely difficult and expensive. Even now the Navy is dependent upon foreign tramp steamers. So far it has not seemed wise to convert the whole fleet into oil-burning vessels, because of the difficulty of buying oil in foreign ports. In the opinion of experts, the Bering River coalfield of Alaska can furnish a grade of coal excellently adapted to naval use, and the opening of mines there is important in order to afford an adequate and at all times accessible source of supply. The Navy uses ordinarily about 150,000 tons of coal per year on the Pacific Coast. Possibly the other departments of the Government use as much more. In addition, there is a local market in Alaska now supplied from British Columbia and Washington at considerable expense. Beyond is a strongly competitive market in which the dominating features are the abundance, low price, and high heating value of California crude oil. In the three Pacific States together, in 1910, imports and local production of coal amounted to 1,600,000 tons. Mr. E. W. Parker has estimated that in the same year fuel oil displaced 12,000,000 tons of coal in these States. To what extent Alaska coal can enter this competitive market is uncertain, but the non-competitive market is not unimportant alone. In it, owing to naval requirements, the Government is the largest factor. The obvious thing to do would seem to be for the Government to open its own mine and supply its own coal, at the same time meeting the local demands of the non-competitive market by selling the surplus coal at a small advance on the cost of production. The opening of a mine by the Government in no way prejudices any future settlement of the larger problem of final disposition of the lands. It will, however, remove any fancied necessity for a hurried decision of the main matter, will relieve the local fuel situation, will lead to just as much development and the employment of just as many men, as if some private syndicate undertook the work, and it will permit the Government finally to act on the larger questions involved with exact knowledge based upon actual experience under the conditions to be met. It has long been customary for large coal users to maintain a coal mine or to have an interest in a coal mining company so as to have full information regarding costs when making their yearly contracts. For years the Chicago, Milwaukee & St. Paul railroad ran a small coal mine on this basis, and the information it obtained was worth many times the risk of loss. Why should not the Government safeguard the people's interest as carefully as a board of directors for a company looks after those of the stockholders?

Various suggestions have already been made as to how the Government should proceed in case it be decided to open a Government mine in Alaska. An independent commission has been proposed, but this appeals to us as unnecessary and probably expensive. It has also been suggested that the Army be placed in charge, and the merit of this lies in the fact that the people have entire confidence in the non-political character of the Army and the honesty of its officers. It is also true that to meet a similar scarcity of coal in the Philippines, the Army opened a colliery there and conducted it not only ably, but in such a manner as to demonstrate the value of the coal and of the field, and this led ultimately to the opening of private mines. The Army, however, has other work than mining coal, and no good purpose is served by diverting its officers from their own sphere. Aside from that, the Government has in the Bureau of Mines a corps of men especially well qualified to handle this particular matter. In this Bureau are all the experienced men necessary to man a colliery, from pit boss to general manager. Attracted by the opportunity for travel and study, an unusually capable and well trained lot of engineers has joined the service. A better manager for the proposed enterprise probably could not be found than Mr. George S. Rice, now chief coal-mining engineer for the Bureau. A graduate of Columbia, Mr. Rice has seen extensive service in the coalfields of Colorado, Iowa, and Illinois, having served as engineer, superintendent, general superintendent, and consulting engineer for a number of large companies, including, among others, the Colorado Fuel & Iron Company, Whitebreast Fuel Company, Cardiff Coal Company, and Illinois Collieries. He has opened, equipped, and run a number of collieries as large or larger than any needed in Alaska, and is thoroughly familiar with coal mining, not only in every part of the United States, but in England, Germany, and France. There are other men in the Bureau who have had valuable if not as extensive experience, and they are all men of high character, of just the sort to place in charge of a difficult enterprise. Put the matter in their hands with sufficient capital and adequate authority, and the mine will be well and honestly run. Incidentally, it will furnish the Bureau an excellent opportunity to test each new discovery made in its laboratories, and to try out on a working scale under commercial conditions, its various recommendations for increasing safety and decreasing waste in mining. To the objection that will promptly be made—the high cost of Government work—it may be urged that the facts by no means point conclusively to a necessarily higher cost. The Reclamation Service has repeatedly built on force account at prices below bids from contractors, and the great Los Angeles aqueduct is being built by the City Engineers, and well built, at a cost quite as low as any firm or corporation has ever attained on similar work. On one division the work was done for approximately $2,000,000 less than the lowest bid. Get good men and give them reasonable support and they will build as cheaply for the Government as for a corporation. The common notion to the contrary rests on the excessive cost of jobs let to favored political contractors.

In opening a Government coal mine in Alaska it is important that conditions be made as nearly as possible identical with those under which a private company would have to work; otherwise one of the large purposes of the enterprise, the obtaining of exact information regarding mining costs and other conditions, will be defeated. A definite amount of land should be reserved by the Secretary of the Interior and allotted to the project. Since 2560 acres is the amount permitted one company under the law of 1908, the same acreage might well be set aside for the Government mine. If it is too small for the Government, it is likewise too small for a private company, and if large enough for one, it is certainly sufficient for the other. A definite amount of capital should be allotted to the project, and the coal furnished to the Navy and other departments should be credited to the enterprise at the same rate as if sold to individuals. In figuring costs, depreciation should be fully taken into account, since the plant will need to be renewed from time to time. A sinking fund should also be accumulated and in every particular the enterprise should be run on a business basis.

Since the coal is valueless unless it be brought to the coast, transportation problems must enter largely into any solution of the coal problem. This is true whether the Government or some company mines the coal. To reach the Bering River coalfield, the one most easily accessible, a number of surveys have been made. There are, however, only two routes that need to be considered. The first is a direct line approximately 25 miles long to Controller bay or Katalla. This requires the making of a harbor, and any estimate of expense of shipment by this route must take this into account. Eventually we believe one or more such lines will be built, but for the present the cheapest route would seem to be the longer one to Cordova. This requires a road from the mines almost to Katalla, then north to a junction with the Copper River & Northwestern railroad. The distance is longer, 58 miles, but of the total, 33 miles form part of the main line of the road already built, and the cost of an extra harbor is avoided. This we believe to be the more feasible route for the present. It would have the advantage of permitting through shipment to the copper mines of the interior, while the other would require transfer to boats at Katalla and retransfer to cars at Cordova. A considerable part of the local benefit to be derived from opening the mines would be lost if connection were not made with the Copper River & Northwestern. The tonnage that would be furnished by the Government's own coal requirements would probably be sufficiently attractive to cause one or the other of these roads to be built by private capital. The Secretary of the Interior or the Director of the Bureau of Mines should be authorized to negotiate for transportation to the sea on a basis of an agreed annual tonnage determined by naval requirements, and fixed rates reviewed by the Interstate Commerce Commission. If, on these terms, private capital be not forthcoming for a railway line, the latter could well be built by the Government and operated as a part of the coal-mining enterprise. The cost of the road would be less than that of colliers to bring coal to the Navy from the East, and the cost of operating the whole enterprise, granted that the worst estimates of the excess cost of Government work prove true, would be less than the excess price now paid on the Pacific Coast for Eastern coal. It is taken for granted that arrangements would be made for the Navy and other Government departments to use the Government coal on the Pacific coast. It would probably be necessary to establish supply stations at the tidewater terminals, on Puget Sound, and perhaps elsewhere, and to deliver coal to them either by contract or by using Government colliers. If any coal be sold outside Alaska, and as to the advisability as well as possibility of that there would be much question, the cost of transportation should of course be added to that of mining.

Whatever be the decision as to Government ownership and operation, leasing or any other method of opening the Alaskan fields, existing rights must all be adjudicated as promptly as possible. Under the terms of the Cunningham decision, if they be adhered to, we doubt whether many, if any, of the claims ever go to patent. In any event, final decision can not be expected promptly; and what is needed now is prompt opening of one or more mines. At least one application for patent under terms of the law of 1908 has been made: The Alaska Hard Anthracite Company, for which Mr. F. A. Morrow is the active agent, advertised this summer for patent on 1267 acres in the Bering River coalfield under this law. We know nothing direct of the land or the company, but we sincerely trust that the claims may be well founded and patent promptly granted. It will be remembered that the law of 1908 contains a strong anti-monopoly clause and was enacted on the advice of Mr. J. R. Garfield. As the Cunningham claimants were at one time offered patent under the terms of this law by Mr. Garfield, it may safely be assumed that all possible rights of the people in general are adequately safeguarded in it. If the Morrow claims go to patent, the way would seem to be clear to open at least one private mine which would supplement the Government colliery and permit the latter to be devoted practically to furnishing coal for the Navy and other Government departments. The potential competition of the Government mine would prevent any unreasonable increase in local prices even in the event that actual competition of oil did not operate to do so.

The adoption of the plan outlined would, (1) make the Navy independent as to fuel supply in the Pacific; (2) furnish coal at reasonable cost to local industries needing it; (3) permit the Government to determine the exact facts as to costs and conditions of mining; (4) give the Bureau of Mines an excellent field for testing its theories and recommendations; (5) permit adequate time to be taken to adjudicate existing claims and formulate a really satisfactory policy of handling the coal lands of Alaska.

The Peon and the Kaffir—A Comparison

By T. Lane Carter

I have had an intimate acquaintance with both of them the peon and the kaffir. My association with the black man commenced when I was born, as I was brought up in a part of the South where the negroes outnumbered the whites by twelve to one. I have been employed in parts of Central Africa where there were a handful of white men among thousands of kaffirs. In working with the peons of Spanish America I have often compared them with the kaffirs of Africa. They differ in many ways, and perhaps a paper comparing the two races may be of interest to those not acquainted with both.

The first thought that comes is the importance of these laborers to the mining industry. Without the kaffirs the gold industry of the Transvaal would be impossible on its present huge scale. While the white man has furnished the brains, the black man has furnished the muscle in the development of the gold and diamond wealth of South Africa. In Mexico it is the same way. With all his faults, it is the peon who has done the hard work in the development of the mineral wealth of that country which has been called the 'Treasure House of the World.'

A KAFFIR. A PEON.

One advantage the kaffir has over the peon. The black man has not so much liberty. The main thing that liberty has done for the peon in Mexico is to give him every facility to drink himself to death. One can get intoxicated in Mexico cheaper than in any other country in the world. To my mind, the most serious question there, is not whether the peon shall have full political rights, but how to prevent the excessive use of alcohol. For ten cents gold a man can buy enough of the native liquor to stay drunk for a week. About 40 years ago the beverage which is now the greatest curse of Mexico was introduced. The manufacture of *tequila*, the peon's whisky, commenced in the State of Jalisco, at a town now called Tequila. The industry has now spread to such an extent that peons can buy the liquor everywhere. Not only is the drink highly alcoholic, but it contains an injurious oil. One great authority has asserted that unrestricted use of *tequila* would in time wipe any race from the face of the earth. Unless something is done to reduce the traffic, it is probable that in a couple of centuries the working classes will be killed off by *tequila*, just as the ancient Toltecs of Mexico were silently and mysteriously exterminated by the excessive use of the drink *pulque*, which they discovered. The problem of restricting the use of *tequila* is a difficult one. In the first place, the vested interests controlling the trade are so strong that it would be dangerous for any government to disturb them. To place such a tax on the liquor as to make the cost to the peon excessive, is out of the question. The plant from which this drink is made grows on rocky soil, unfit for any other purpose. Thousands of acres of land formerly useless have been made valuable by its cultivation. The liquor is produced very cheaply. Large sums of money are made by growing *tequila*. When the planter also owns his distillery, he generally makes a fortune. It is curious, though, how often they or their sons become victims of the habit and are killed by drink.

Many thoughtful Mexicans realize the curse of *tequila*. Recently I met a high minded Mexican who refused to buy a *hacienda* where *tequila* was the staple crop, because he did not care to be associated in so nefarious a business. Had he bought the plantation he could have made a fortune, but he preferred earning money in some more honorable way. In some parts of Mexico fully 60% of the people use the liquor freely. Among the poorer classes it is sometimes bought in place of food, on account of its stimulating effect. Grog-shops abound, and women and children have every chance to get the drink. Much of the inefficiency in mining in Mexico is due to drink. Managers dread the *fiestas*, not so much on account of a day or two holiday, but because the men when they return to work are more or less incapacitated by the liquor. Examine the crime record of Mexico and you will find that most of the murders committed in the country are perpetrated by peons while under the influence of *tequila*. The liquor seems to inflame their passions, and a man should be careful how he deals with a drunken peon.

How different is the lot of the kaffir! He never gets any *tequila*, not because he would not love the drink, but because a wise paternal government keeps it away from him. Could he buy *tequila*, I believe the kaffir would drink the peon 'under the table.' This Mexican drink would suit him even better than whisky. But the law prohibits the sale of intoxicating liquors to kaffirs, and hence the black man is prevented from drinking himself to death. The peon can get out and yell, *'Viva libertad!'* and drink as much *tequila* as he wants. But the kaffir knows nothing of liberty and fraternity. He must drink water. Although he enjoys less liberty than the peon, the kaffir has the great advantage of being protected, much against his will, against the ravages of alcoholism. There is no race in the world that is being guarded better than the black men of South Africa. Under this paternalism they are growing strong, and are greatly increasing in numbers.

Another advantage the kaffir has over the peon, and that is that the black man carries practically no burden of taxation, while the peon keeps Mexico going. Save that he cannot get in the middle of the street and yell, 'Hurrah for liberty!' the kaffir has a fine time. He can gather what to him is a competency in one-tenth the time required by the peon, and when he has made his fortune, and bought his wives, the amount he pays to the government is very small. The peon is heavily taxed; the kaffir scarcely at all.

Curiously, the principal food of the kaffir and the peon is the same, namely, corn. It is prepared differently in Mexico than in Africa. In Mexico the ubiquitous *tortillæ* is made by mixing the cornmeal with water and a little salt, and then baking the thin cakes on the hot coals. The black man prepares his 'mealie pap' by mixing the corn with water and boiling the material, making a porridge. The fact that in both Mexico and Africa the natives do most of the work on corn is a proof of the excellence of this cereal as a food. The diet of the peon is more [illegible] than that of the kafir, but corn is his standby. [illegible] among the Mexicans.

At the mines of South Africa the kafirs are better housed than are the peons of Mexico. Where a large body of men is working, as on the Rand, the scheme of a compound as used in Johannesburg and Kimberley [illegible] Central America and Mexico [illegible] the inhabitants [illegible] In the compounds of Africa there is [illegible] for the black man, and it is easy to enforce sanitary regulations, but in Mexico and Central America [illegible] is not so easily understood.

As a laborer the peon excels the kafir in some ways. Mining in Spanish America has been going on for several centuries, and there has grown up a class of workers who are accustomed to underground labor from their childhood. The native methods of mining in Mexico are not suited to modern conditions, but it is not difficult to [illegible] the methods necessary for a company and teach them the difference between 'gophering' and mining. Compared with the number of white men necessary to supervise the kafirs, very few are required in the mines of Mexico. It has been my experience in Spanish America that better work can be obtained by relying on competent Mexican supervisors who are thoroughly acquainted with the ways of the peons than by using a large number of white men. On account of the far higher intelligence of the peons, [illegible] superintendence necessary in working kafirs.

If the kafirs were as intelligent as the peons, the accident death rate would be far lower than it is to-day in the Transvaal. In reviewing the high accident death rate of the Rand, [illegible] of the trouble is due to the low intelligence of the kafir. The mines of Mexico are more dangerous than those of the Rand. There is far more attention paid to the safety of the mines in Johannesburg than in Spanish America. Many mines in Mexico are worked with [illegible] and if kafirs were the workers instead of peons, the death rate from accidents would [illegible] be nearly double.

The peon responds to the [illegible] better than the kafir. When he gets over his first [illegible] and sees the [illegible] of his work [illegible] results. Experience has shown that the only way to work the peon is on contract basis.

In mining the peon has different methods than the kafir. Go through an African mine and you will find the drillers [illegible] If you inspect a mine in Mexico, you will notice that all of the men are working [illegible] one striking and the other holding the drill, and you will find the holes are [illegible] The kafir [illegible] It would be difficult to [illegible] a large number of [illegible] in Mexico. [illegible] the conditions.

There is not a great deal of difference between the cost of labor to the mining companies of South Africa and Mexico. [illegible] I recently found that the wages paid to the natives working [illegible] In South Africa the [illegible] South Africa the mining companies [illegible]

In Mexico it is impossible to [illegible] in South Africa. [illegible] in Spanish America. [illegible] there would [illegible] be [illegible] against such [illegible]

And yet the indentured kafir of South Africa is better off than the free peon of Mexico. At the end of his service the black man has saved enough money to buy one or two wives, and becomes a gentleman of leisure for life. You do not find many peons that have any money.

There is this difference between the two races. The peon spends his money freely, the kafir hoards his savings. I have seen hundreds of kafirs at mines in Africa pass by the store and never go in to buy a single article. It would, of course, be an easy matter to induce the black man to loosen up on his money. Just introduce tequila among them, and they would break up all their savings.

The tastes of the peon are far more elevated and refined than those of the black man. When he gets money he frequently buys pictures of saints or statues. He is passionately fond of music, and one can not travel far in Mexico without seeing a guitar. The kafir in his kraal does not believe much in clothes. The height of the peon's ambition is to buy an enormous sombrero gaily decorated with silver and gold braid, so that he can appear as a gentleman on Sundays. In out of the way mines in Mexico it is no uncommon thing for the peon to spend all his money at the company's store.

The kafir is the most docile being in the world. He will stand more abuse from his white boss than any other laborer in the world. I have seen miners in South Africa kick and strike kafirs with no retaliation on the part of the black man. Had these white men treated the peons in the same way, the chances are the Mexicans would have killed them later on. One of the first things to learn in dealing with the peon is that it is not safe to hit him, as it is a kafir. If his offense is not great, all the boss has to do is to quietly inform him that his services are no longer required. For some bad breach, such as theft or fraud, the peon should be arrested. The peon is far more averse to a jail sentence than is a kafir.

To get the maximum amount of work out of either class of labor is an art. Experience is the great teacher, but there are several points that might be mentioned. In the first place, it is necessary to know how to talk to the laborers. As scarcely any of them can talk English, it is essential to learn the black man's lingo, and in Mexico to talk to the peons in Spanish. Even if you are not directly over the men but are a 'big boss' it is an advantage to know the language, for it increases their respect for you. To the raw kafir or peon it is almost incomprehensible that a man cannot understand their talk. I have seen Mexicans [illegible] at foreigners [illegible] even after they were informed that the visitor did not understand a word of Spanish. In South Africa they have evolved an extraordinary jargon called 'kitchen kafir,' which is the means of communication between the two races. The majority of black men, especially the [illegible], this dialect is [illegible] Thousands [illegible] of distant tribes come to the Rand to work with a language of their own, and for a time 'kitchen kafir' is unintelligible to them. The languages of the various tribes are as different as [illegible] I have often seen a white man familiar with [illegible] languages act as interpreter between a Zulu and a [illegible] Now and then one finds a Hollander in charge of a compound who by years of contact with the tribes has learned [illegible] of the native languages, but as a rule the [illegible] 'kitchen kafir.' In Mexico one can [illegible] Spanish from a book, but in Africa one must pick up the jargon by word of mouth. Three or four hundred words are about all that are required. One could not very well hold a philosophical discussion with the black man by means of 'kitchen kafir,' as grammar is lacking, but the lingo answers the purpose as well as 'pigeon English' does with the Chinese.

The peon is a better miner than the kafir, and has a [illegible] to break ground. Physically he is not as strong as the black man, but he has great powers of endurance. [illegible] the peon would be a better miner than the kafir. As it is, there is not much choice between the two.

There is one point in common which every one who has employed the two classes of labor has noticed, namely, the tendency to waste labor because it is cheap. I have often seen a white mechanic in South Africa look for a kaffir to carry his coat and tools, when he left the shop to work on the outside. In Mexico it is even worse. The tendency is to have two men at work where in other countries with high-priced labor, one would be sufficient. In the homes at the mines in Mexico you will find double the number of servants that you see elsewhere. Where labor is cheap it is generally inefficient, and this is probably the reason that mines with these two classes of 'cheap' labor cannot, as a rule, show lower working costs than where high-priced, highly efficient help is employed. In Mexico the wages paid the peons have doubled in the last twenty years. The tendency is for the wages to go still higher. No doubt this marked increase in pay is due to the advent of the foreigner. It is a well known fact that the peon will frequently work for a Mexican master for less wages than he earns from a European. There is a considerable difference in the wages paid the peons in northern Mexico, where the influence of the high pay of the United States is felt, and the amount earned by the workmen in southern Mexico, where the foreigner is not so conspicuous. In Africa it is customary to pay the kaffirs at the end of thirty shifts worked. This system does not suit at all in Mexico, where the peons like to be paid every week. It is the usual custom to pay them every Saturday or Sunday in Mexico.

KAFFIRS OPENING THE PREMIER DIAMOND MINE.

The kaffir is generally considered a heathen, and the peon a Christian, but when it comes to superstititon the Mexican is far more affected by signs and wonders than is his phlegmatic brother of Africa. Around every old mine in Spanish America there has grown up a number of legends and myths; spirits and goblins often are seen or heard underground, while the devil himself is warded off by the frequent use of crosses and candles. Possibly the kaffir is not far enough advanced mentally to have the vivid superstition of the peon.

The man who is responsible for the handling of these laborers should study most carefully their idiosyncrasies. By knowing how, he can frequently increase the efficiency of the workmen from 15 to 20%. He has need of much patience and observation to obtain the best results. The mining industry owes a great deal to the peon and the kaffir, and any time given to their advancement and betterment is that much gain to the industrial world.

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A NEW SHAFT-SINKING RECORD is reported in *Mines and Quarry*. During the thirty days between April 21 and May 21, the Live Oak Development Co., at Globe, Arizona, sunk its No. 2 shaft vertically 205½ ft., the miners doing their own timbering in addition. This is a double-compartment shaft, 4½ by 5 ft. in size. Three shifts, of four men each worked. All drilling was done with two U S 2¼-in. Sullivan rock drills, driven by air furnished by a class WB straight line two-stage Sullivan air compressor, with 16 by 16-in. steam cylinders, and 18 and 11 by 16-in. air cylinders. Shafts have been sunk farther than this in South Africa in thirty days time, notably that of the Van Ryn Deep in July and August 1910, 279 ft. This shaft was 7½ by 20 ft. in size, but was comparatively flat, being driven at an angle of only 22° from the horizontal. This work was done with six 3¼ in. drills. From May 1 to May 31, the Live Oak shaft was driven 183 feet.

Concrete for Oil Reservoirs

*Considerable experience has now been had in the Southwest in the use of concrete for oil reservoirs and other purposes where the asphaltic oils of that section of the country remain more or less continuously in contact with concrete. The railroad companies are large users of oil, and among these the Santa Fé is a leader in such practice.

On the Albuquerque division, the division engineer, E. E. Ball, reports that concrete-lined reservoirs have not been affected by oil. Some slight effect had been noticed on the concrete floors and foundations of boiler-shops and pump-houses, where the dripping of oil on the concrete apparently caused it to disintegrate somewhat. This might be due, it was said, to the action of the oil, or it might be due to the fact that the concrete was placed during cold weather and was frosted during setting.

On the San Joaquin valley division, William L. Bradley directs attention to experience with a reservoir at Rheem, near San Pablo, belonging to the Standard Oil Co., which was burned in the early part of 1910. This reservoir had a concrete lining on the sides and bottom. The lining was laid off in slabs about 3 ft. wide, with a joint extending from the surface several inches into its body. These joints were intended to offset the cracking by shrinkage and apparently answered the purpose well. During the fire the oil burned down so that when it was extinguished and the basin was visited by Mr. Bradley, there was only about 2 or 3 ft. depth of oil and water in it. This left practically all of the sides exposed, and an examination of them showed that possibly some of the joints had been opened wider than otherwise by the action of the fire, but there were only a very few small irregular shrinkage cracks elsewhere than in the joints, the concrete being in excellent condition. Although Mr. Bradley reported that the concrete lining was in good condition, it is understood that the Standard Oil Co. has discontinued the use of concrete for lining its reservoirs in that part of the country for the reason that it believes the oil gradually enters the concrete and disintegrates it, and that this is particularly noticeable in the case of reservoirs or basins holding distillate, which apparently injures the concrete far more rapidly than oil. So far as the experience of the valley division itself is concerned, several concrete linings have been used for oil reservoirs and sumps, and no special effect of the oil has been observed.

A number of tests have been made on the Arizona division of the railroad under the direction of W. H. Oliver. Concrete-lined oil sumps are there used and the penetration of the oil into the concrete has been practically *nil*, no noticeable detrimental effect of the oil having been discovered. At one place the depth of penetration of the oil into the concrete was only about the thickness of a sheet of ordinary letter paper.

At the pumping stations of the Arizona division, concrete service-storage reservoirs for fuel oil have been used. Although the oil is at a comparatively high temperature on this division, the concrete in the sumps has not shown any sign of deterioration. While the quantity stored in any sump is small, the penetration of the liquid into the concrete would be just as rapid as in a much larger basin, in all probability.

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*From *Engineering Record*.

The Paying Copper Mines of Michigan

By J. R. Finlay

[*]Only nine copper companies in Michigan have made money during the past five years. Their actual earnings were $50,937,690 with copper averaging 15.3c. per pound. Had the metal averaged 14c. the earnings would have been $41,200,000. This would be $8,240,000 per year.

If it could be assumed that these mines would last forever the investor would probably be satisfied with 5% income and he would probably capitalize the average earnings of $8,240,000 into a present value for the group of $164,800,000. The fact is that these mines are not worth even half of this amount, because their future life is not by any means perpetual. On the contrary, their future is much less promising than is popularly supposed. These mines have shown unusual persistence in depth, but the limit of profitable working is now in most cases in plain sight. It must not be forgotten that the tonnage maintained now is three time as great as the mines have averaged in their fifty years of life. It will be observed that the Tamarack mine is not in the list of profitable companies. This mine has become worthless because the Calumet conglomerate, by far the richest deposit in the whole district, has failed in depth. The Tamarack owns an irregular tract immediately below the Calumet & Hecla mine and including the whole downward extension of the great lode which has enabled that property to pay $115,000,000 in dividends. In the upper portion of its mine the Tamarack was able to earn handsome profits and it paid up to 1906 a total of $9,420,000 in dividends. Since then it has uniformly lost money because the rock no longer yields enough copper to meet expenses. The depth at which the lode became unprofitable was approximately 8000 ft. on the slope. If this richest of all deposits has played out in this manner it may be taken as a sure inference that inferior lodes will play out at lesser depths.

Valuations of the Copper Mines

Mohawk	$3,500,000
Ahmeek	7,200,000
Allouez	1,500,000
Wolverine	3,700,000
Osceola Consolidated	6,000,000
Calumet & Hecla	31,400,000
Quincy	3,250,000
Isle Royale	1,450,000
Superior	1,000,000
Baltic	5,000,000
Tri-Mountain	165,000
Champion	5,000,000
Lake	300,000
Atlantic	350,000
Total	$69,815,000

Kearsarge Lode.—Beginning at the northeast end of the district we have first the Kearsarge amygdaloid, on which are situated the Mohawk, Ahmeek, Osceola Consolidated, Allouez, Wolverine, and Centennial mines. This is the longest lode in this district. It dips northwestward at an angle of about 37°. Its thickness is some twelve feet. Its length is five miles. While this vein is mineralized quite uniformly for the above length there are two areas or oreshoots that are distinctly richer than the average. These occur on the Wolverine and Ahmeek properties. These two enrichments appear to be substantially of the same size and character, but apparently the Wolverine orebody is the richer.

The Wolverine has been able to maintain a yield of about 27 lb. of copper per ton, but there has been some decline. At first the rock yielded 30 lb., but it has now gone down to about 25 lb. per ton. The conditions for cheap mining are ideal and the Wolverine has been able to produce the cheapest copper of the district, its cost per pound being less than 8c. The Ahmeek mine is much younger and is just arriving at its most profitable stage. It has been securing about 22 lb. refined copper per ton and has brought its tonnage up to about 550,000 per year. I calculate that this mine will have to spend considerable money for further construction and development in order to bring its output up to 800,000 tons per year. Including the probable expenditures for construction, I estimate that the mine can produce copper at slightly over 9c. per pound for the next ten years.

The other mines on this lode are not so good, although the South Kearsarge branch of the Osceola Con. seems to have a portion of the Wolverine ore-shoot. We may calculate with certainty that part of the Kearsarge lode will prove profitable down to a depth of at least 6000 ft. It is not an unfair supposition that at least 60% of its area would be mined to that depth and will produce 16 lb. per ton. William Hague has estimated that at a depth of 2000 ft. on the slope the lode is yielding an average of 18 lb. per ton, but that the yield may be expected to diminish with greater depth. It is probable that the lode will be able to produce to a depth of 6000 ft. some ninety million tons of ore, of which some twenty million tons have already been mined. This would leave seventy million tons to be taken out.

The Mohawk mine has a surface area covering the Kearsarge lode of about 480 acres, this being the upper portion from the outcrop down to the Ahmeek line, which will be reached at an average depth of 2500 ft. along the slope. About 70% of the territory so far explored appears to be mineable and yields about 55,000 tons of ore or approximately 800,000 lb. of copper per acre. On this basis approximately 330 acres containing 264,000,000 lb. of available copper was the full measure of production possible in this territory before mining began. About 88,000,000 lb. has been already removed, leaving for the future a product of about 176,000,000 lb. This can be mined in approximately 15 years at a cost of 11c. per pound and a profit of 3c. per pound, giving a total profit of $5,280,000 and a present value of $3,500,000.

The Wolverine mine has a surface area covering the lode of about 215 acres. The total production to date has been approximately 107,000,000 lb. and the future production will be 80,000,000 lb. This can be mined in 9 years at 8c. per pound, leaving a profit of 6c. per pound and a total profit of $4,800,000, and a present value of $3,700,000.

The fairest method of measuring the probabilities of the Ahmeek mine is to compare it with the Wolverine and Mohawk combined. The reason for this is that the Ahmeek contains, as mentioned above, a rich portion of the vein comparable to that of the Wolverine, but not so rich. It contains only 22 lb. of copper per ton, against 27 lb. for the Wolverine. A large part of its territory is simply a downward extension of the lode from the Mohawk property. The total area of the Ahmeek property covering the Kearsarge lode above a depth of 6000 ft. on the slope is 660 acres, against a combined acreage of 695 acres for the Mohawk and Wolverine. I do not believe that the Ahmeek property is likely to produce more than 75% as much copper as the two properties combined. The portion underlying the Mohawk has the pronounced disadvantage of containing only the deep levels. I therefore base my valuation of the Ahmeek mine on the assumption that it will produce three-quarters as much copper as the Mohawk and Wolverine combined. This will give about 335,000,000 lb., of which 45,000,000 has been mined, leaving 290,000,000 lb. to be extracted. It is a fair assumption that of this, 150,000,000 lb. will be produced during the next ten years at an average cost of a trifle over 9c. per pound, making a total expected profit in that period of about $7,500,000 and a present value for that period of about $5,500,000. The remainder, 140,000,000 lb., will probably be low grade, costing 11c. per pound and making a profit of $4,200,000 for a period of 12 years following the first 10. The present value of such an expectation is about $1,700,000, so that the maximum valuation of the Allouez is $7,200,000.

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[*] Abstract from a report to the Board of State Tax Commissioners of Michigan.

The Osceola Consolidated owns the North and South Kearsarge mines. The South Kearsarge is rich like the Wolverine, but it is largely worked out. The North Kearsarge is poor like the Mohawk. Without going into details, the total expectation is about 21,000,000 tons containing about 300,000,000 lb. copper. This can be mined in 15 years at a profit of 3c. per pound, totaling $9,000,000. This would give it a present valuation of approximately $6,000,000.

The only remaining mine on the Kearsarge lode that can be classed as profitable, the Allouez, may be counted on for about 10,000,000 tons and 140,000,000 lb. of copper. The operating record to date of this mine is not very flattering, costs for the past five years being 15c.; but in 1910 the cost was reduced to 11.6c. This mine has only two shafts, which gives it a maximum producing capacity of 400,000 tons per year. At this rate it will take 25 years to exhaust the property, and it is not safe to count on the cost of copper at less than 12c. per pound. This gives, then, a total of $2,800,000 profit to be expected in the 25 years. This gives the mine a present value of only $1,500,000.

Osceola Amygdaloid Lode.—Only one mine is working on this lode at present, the Calumet & Hecla. On this property it has been developed for a length of 9900 ft., but a considerable portion at the North End is not apparently profitable. Since December 1900, this lode has produced 3,301,766 tons. The abandoned extension on the Old Osceola mine toward the south is supposed to have produced 4,000,000 tons. The yield of copper on Calumet & Hecla ground alone has been about 55,000,000 lb. This vein is not as uniform as the Kearsarge. Mr. Hague summarizes the situation as follows. "From the fact that the Osceola lode in the Tamarack workings shows a yield of about 13 lb. per ton at a depth of 6100 ft. on the dip of the lode, and from the fact that the Osceola branch of the Osceola cone has been closed, the lowest workings being 4700 on the dip of the vein—an arbitrary limit of 5000 ft. has been placed upon profitable mining on the Osceola lode—providing the price of copper remains the same, and provided that no material reduction in working costs takes place while operating at such depth." On this basis, and assuming that 60% of the lode will prove mineable, it is estimated that it will yield some 23,000,000 tons, which will produce 330,000,000 lb. of copper. This will be produced in 20 years at a cost of 11c. per pound, giving the mine a present value of $5,900,000.

The Calumet Lode.—This is the single conglomerate vein worked in the district. It is by far the richest in the whole region and has paid nearly 70% of all the dividends of the Michigan copper mines. It has been worked by the Calumet & Hecla and Tamarack companies. The Tamarack, as mentioned above, has become unprofitable on account of great depth and the Calumet & Hecla has its possible future sharply defined. This fact is ominous for the prosperity of the district as a whole, for the failure of this great deposit is not being compensated for by new discoveries. The Tamarack mine has no payable ore at all in sight, and I appraise its value at zero.

The Calumet & Hecla has on its conglomerate lode about 27,000,000 tons of ore reasonably assured at an average estimated content of 26 lb. per ton, making a total of 702,000,000 lb. The tonnage is divided roughly between 5,000,000 tons of shaft pillars, estimated to contain 50 lb. per ton and 22,000,000 tons of other rock in the lower portions of the mine estimated to contain only a shade over 20 lb. per ton. These figures contrast sharply with the former richness of this deposit, for ten years ago the average yield of the Calumet & Hecla rock was 60 lb. per ton. Great progress has been made in reducing costs. The mine was excellently equipped with magnificent machinery during the bonanza days, and this machinery has proved ample for the ultimate requirements of the property. The development required to extract the ore has been largely completed. As a consequence, I believe the mine can be worked at a great profit until it is exhausted. I estimate for the remaining copper a cost of only 9c. per pound, which will leave a profit of 5c. This will give the property a profit of $35,000,000 in 20 years on this lode, giving it a present value of $21,000,000. The company also claims, and I have no reason to doubt, that it can produce 150,000,000 lb. of copper from some 30,000,000 tons of conglomerate sand now piled in Torch lake. This can be produced at about 9c. per pound during the next 20 years, the present value being not less than $4,500,000. The total value to be credited to the conglomerate lode, therefore, at the present time is about $25,500,000. For the whole property the valuation is $31,400,000.

Pewabic Lode.—This is an amygdaloid at present worked only by the Quincy mine. It is not a single vein, but a series of amygdaloid flows carrying copper for a thickness of about 200 ft. The main lode, which contains most of the workings, is near the centre of this series, but perhaps nearer the foot-wall side. The production of the Quincy mine up to the end of 1910 was 458,000,000 lb. of copper. This is exclusive of the production of the old Franklin mine, whose property is now embraced by the Quincy. I have not been able to verify the production of the Franklin, but it was apparently some 150,000,000 lb. The total output of the lode to date may be estimated at about 600,000,000 lb. The vital point in the present situation is that the property has been exhausted to a great depth, approximately 5200 ft. along the slope. It has long been recognized to be in a dangerous condition on account of possible caving. A few years ago the Atlantic mine suddenly closed and was permanently abandoned by the operating company. The yield of copper per ton for the last 5,000,000 tons mined has been less than one-half the yield of the first 5,000,000. The mine is well equipped and undoubtedly secures the best results obtainable under the conditions, but it is facing the three adverse factors of great depth, a declining yield, and the danger of caving. The total production possible from the lode to a depth of 7000 ft., which may be taken as the ultimate profitable depth, will not exceed 200,000,000 lb. A fair present value is based on 150,000,000 lb. to be produced in 7 years at a cost of 11.3c. per pound (which is the average of the past five years) and a profit of 2.7c. per pound. The total profit expected in 7 years is $4,050,000, giving it a present value of $3,250,000.

The Hancock Con. M. Co. is projecting some explorations on the Pewabic lode, but has not yet reached it. This property is nothing but a prospect and I shall not consider it worth anything. The Franklin mine is also exploring for the Pewabic lode, but so far as present appearances go the Quincy owns all the ground which is likely to be profitable.

Isle Royale Lode.—The above described deposits are all northeast of Portage lake. The only two lodes being worked southwest of Portage lake with any pretensions to success are the Isle Royale and Baltic. The Isle Royale was discovered in the early days and has been worked with success for 50 years. Its record for the past five years shows a cost of 16.7c. per pound for 21,902,000 lb. of copper. On this record it might be put down as unprofitable, but there is another side to it. The output has been brought up from 192,000 tons in 1906 to 521,000 tons in 1910. The yield of copper per ton has remained substantially the same and shows an average for five years of 14.6 per ton. The cost in 1910 was only 11.8c. per pound, which seems warranted by the yield of the rock. This indicates that the mine has some value. It seems reasonable to expect that it will produce 112,000,000 lb. above the 4000-ft. level in 16 years at a cost of 12c. per pound. This indicates a total profit of $2,240,000 and a present value of $1,450,000.

Baltic Lode.—This is the last important vein discovered in the country. It was opened up about 1897, although some former unsuccessful work has been done upon it.

Four mines are situated upon this lode, the Superior, Baltic, Tri-Mountain, and Champion.

Mr. Hague comments upon the Superior as follows: "This property is in the prospective stage, though a very promising one. One shaft has been put down about 15 levels. A total of 286,566 tons of ore yielding 5,602,408 lb. of copper has been hoisted from drifts, as practically no stoping has been done. This is about 19½ lb copper per ton. Depth and lateral extent must be obtained before any definite statement can be made as to life or yield. About 1400 ft. laterally on the vein has been opened to date. If the Baltic may be used as a standard for this property the following figures may be used for the tonnage developed: 1,900,000 tons at 19½ lb. equals 37,000,000 lb. of copper." One unfavorable feature about this property is that the outcrop of profitable ore is short. On the theory that the depth of an ore-shoot has some relation to its length, there is some reason to fear that the mine may not prove extensive. It is therefore hazardous to count upon indefinite extension downward. It seems fair that the probable value of the property should be based on an expected output of 75,000,000 lb., this being twice the amount now opened. Since the property is not equipped, it is probable that 2c. per lb., or a total of $1,500,000, will be needed. Therefore the total expected cost may be put at 12c. per pound, leaving an average profit of 2c. per pound, or $1,500,000 to be obtained in 15 years. This would give the property a present value of about $1,000,000.

The Copper Range Consolidated Co. owns the Baltic, Tri-Mountain, and Champion mines. Each of these works upon a separate ore-shoot and together they cover a length of more than three miles along the vein. Taking the three orebodies in the aggregate, the length is such that one would be disposed to concede the probability of the ore extending to a great depth. However, the ore-shoots are separated by big stretches of entirely barren ground. The ore-shoot of the Tri-Mountain, which is the central one, weakened abruptly at a depth of about 700 ft., and the mine has become practically unprofitable. The management, however, is not disposed to take these unfavorable developments seriously, but fully expects to find better ore at greater depth in all three mines. Under these circumstances I do not feel disposed to express an opinion as to the future of these properties, except that the continuity is not so well demonstrated as in the case of mines north of Portage lake. There are undoubtedly large gaps of barren territory in the vein separating the richer bodies both laterally and vertically. It is to be remembered that these mines are well managed and have been very profitable, so that a considerable falling off in yield can be withstood before the profits will be extinguished.

At the Baltic mine Mr. Hague estimates ore reserves at 3,400,000 tons reasonably assured at 22 lb. per ton, making 75,000,000 lb. copper. If we assume that this is reasonably certain to be extended to 5,000,000 tons and 110,000,000 lb. of copper, we get an assured life of about 7 years. The cost of production is less than 9c. per pound, profits 5c. This gives an expected profit in seven years of $5,500,000. It is perhaps reasonable to expect that further discoveries will enable the company to make additional profits, which will be sufficient to pay interest on a full valuation of this property after the seven years have expired. It seems, therefore, fair to give the mine a full valuation of $5,000,000.

The Tri-Mountain mine has been able to maintain a cost per pound of copper at about 12.8c. for the past five years, but with a diminishing output both of tonnage and copper. The future of the mine is entirely prospective except for about 16,000,000 lb. of copper which may be obtained in the next four years at a profit of $192,000. The present value is $165,000.

Mr. Hague's estimate of ore reasonably assured at the Champion mine is 5,000,000 tons, which will produce 110,000,000 lb. of copper. The same assumption can be made for the Baltic as regards cost and the valuation can be placed at the same figures, $5,000,000.

Lake Mine.—Another property situated some twenty miles southwest of the Copper Range group is generally supposed to be valuable. This is the Lake property. It is not by any means assured that this mine will ever pay a dividend. So far 14,485 tons of rock has been shipped from this mine and stamped, with a yield of 318,050 lb. of copper, this being an average of 21.95 lb. per ton. If a large tonnage of ore of this grade could be secured and mined at average cost, the property would unquestionably be valuable. But it is stated by the management that the ore shipped to the mills was selected and cannot be taken as a fair average of the mine. At present all effort is being directed toward equipping and opening the mine on a sufficient scale to place mining on an economical basis. Ore will then be sent to one of the Copper Range mills. The cost of freight will be from 15 to 20c. per ton. It is not probable that under these circumstances operating costs will be less than $2.10 per ton. This will make 15 lb. per ton the smallest yield, that can possibly meet expenses. It is hoped that this mine will prove to be something like the Baltic, in which case about 2,000,000 tons may be conceded to be opened, which might yield 40,000,000 lb. of copper. Conceding that this product may be obtained at a profit of 1c. per pound during the next ten years, we get a present value of about $300,000 for this property.

Eastern Metal Production

The total value of the mine output of gold, silver, copper, lead, and zinc in the Eastern or Appalachian States for the year 1910, according to H. D. McCaskey of the U. S. Geological Survey, was $10,127,304, against $11,818,531 in 1909. This represents the production of 100 mines, of which 61 were gold placer mines, many of them small. The total gold output from all mines was 8,974.63 fine ounces, valued at $185,522, an increase over 1909 of $29,582, and the silver production, recovered entirely in the refining of gold and copper produced, was 91,595 fine ounces, valued at $49,461, an increase over 1909 of $14,667. Of the gold output in 1910 the placers yielded 1524.54 fine ounces or 17%, the quartz ores 6977.57 fine ounces or 78%, and the copper ores 472.52 fine ounces or 5%. This 5% was derived from 774,040 short tons of copper ore mined, with an average gold and silver value of $0.076 per ton, against 787,146 tons in 1909, with a gold and silver value of $0.06 per ton. There were 60,410 short tons of dry and siliceous ores mined in 1910, with an average gold and silver value of $2.39, against 25,531 tons in 1909, with a value of $4.33.

The copper production, from copper and iron ores, was 17,923,412 lb. valued at $2,276,273, a decrease of 2,430,813 lb. in quantity and of $369,766 in value as compared with the 1909 figures. Most of the copper produced in these States comes from the Ducktown district of Tennessee, which contributed 94% of the output in both 1909 and 1910. The copper ores yielded an average of 23.2 lb. of copper to the ton of ore in 1910, against 25.9 lb. in 1909.

The production of lead, all from lead-zinc ore, was 198,850 lb., valued at $8750, in 1910. No mine production of lead was reported for 1909.

The zinc output in 1910 was 140,875,886 lb., figured as spelter, valued at $7,607,298, a decrease from the production in 1909 of 25,452,973 lb. and of $1,374,460. The output of zinc ore was 411,381 short tons in 1910, with an average recoverable content of 342.4 lb. of zinc per ton. Of the zinc output of the Eastern States in 1910, over 97% came from New Jersey, the remainder being produced in the lead-zinc belt of Virginia and Tennessee.

THE engraving division of the U. S. Geological Survey printed during the fiscal year ended June 30, 1911, 7,283,894 geologic, topographic, and other maps, many of them in several colors, each requiring a separate impression. Some of the geologic maps require as many as twenty printings. The total number of printings during the year's work was probably not less than 45,000,000 or 50,000,000.

Estimating and Valuing the Future of Mines

By Morton Webber

Among those professionally interested in mining and more particularly those who have specialized in valuation, there exists considerable divergence of opinion as to method in arriving at an equitable valuation of the future possibilities of a developed mine. Blocked out ore can be measured and its net value computed as tangible assets, but the appraisal of the possibilities of vertical and lateral ore extensions can only be computed by inference and, therefore, an appraisal must be a matter of experience and judgment. The factors that should be balanced are many and vital, and inasmuch as some are at variance with others, fair valuation is one of the most difficult duties of the engineer.

Too frequently is it the case that this particular phase in an examination is shirked under the cloak of conservatism. Conservatism, in its true sense, is essential in every report, as the valuating engineer should primarily endeavor to prevent the loss of a client's money. This should be basic, but conservatism should not permit the engineer to evade an issue and discount obvious possibilities, merely to keep himself right. Most capitalists know of innumerable cases where through the timidity of their engineer they have lost excellent chances of investing in properties that have subsequently proved profitable. However, the cursory reader must not interpret these observations as an indication of undue optimism. A report is either correct or incorrect in presenting facts and possibilities as they are, and it is no more the earmark of a competent mine valuer to minimize possibilities than to magnify them.

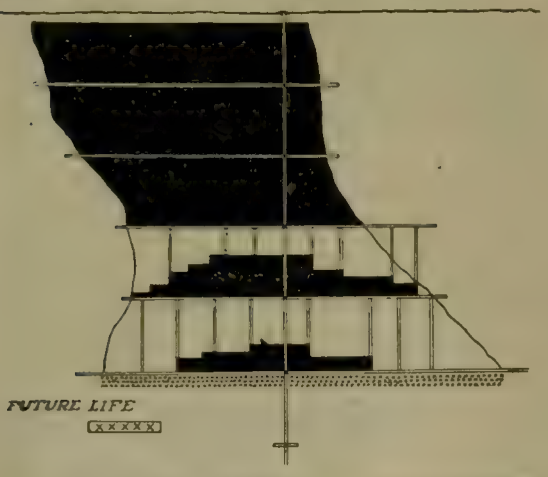

Fig. 1. MINE (A) WITH 65,000 TONS, NET VALUE $130,000.

A mine value is based on three main factors: (1) positive net ore; (2) probable net ore; (3) probable extensions of orebodies. The inferential main factors that determine the value of the future extensions are five in number: (1) the character of the deposit in respect to past geological experience in similar deposits; (2) the size of the deposit in respect to length and width; (3) the question of secondary alteration; (4) the depth to which the mine has been gutted; (5) the experience in the immediate neighborhood of the persistence and continuity of orebodies at depth. Few mines can be bought on the basis of ore reserves alone. Good mines that are for sale are becoming scarcer every year, and on this account the mine valuer is, by the laws of supply and demand, forced more and more to assign a definite purchase value to future possibilities.

A proportionate basis was inaugurated some years ago according to which the net value of the ore reserves of a mine are taken to represent a percentage of the total valuation, the balance being assigned to future possibilities. The relative proportions, one to another, are determined for each mine, depending upon the manner in which the orebodies are found to go down, possibility of lateral extensions, and the possible intersection with other orebodies. In other words, if a figurative example be taken of a mine having $700,000 net in sight, together with a mill capable of yielding $100,000 net per annum, a fair price would be $1,000,000, provided the bottom of the mine was sound. In other words, superficially, the future possibilities are appraised at 30% of the total purchase price, or $300,000. These figures serve only for illustration, as they are decidedly inaccurate inasmuch as the future possibilities in this case are really appraised at $461,200, because the present value of $700,000 locked up in ore reserves drawing no interest is only $538,800 because of the distribution requiring seven years, at the rate of $100,000 per annum. In the risks of mining, when dealing with ore reserves, an investor is entitled to figure what his locked-up money would be worth at a similar risk, and 7% is the least that should be expected.

This method is still popular with many who operate and deal in mines, and is still practised by many well known engineers. However, if it be analyzed it will be found to have little to recommend it, either in the interest of buyer or seller. The magnitude of ore reserves in any particular mine is a matter of administrative policy. A small mill in combination with an energetic policy of development will result in the mine maintaining a large ore reserve. A large mill on the same mine accompanied by an ordinary development policy will result in an ore reserve, proportionately reduced. It is, therefore, obvious that the same mine may be developed to the same depth under two administrative policies as indicated and exhibit the same earmarks of permanence, yet, under this proportionate method of valuation, the appraisal of the future possibilities results in entirely different valuations of the same mine bottom. Such a process has therefore nothing in keeping with common sense.

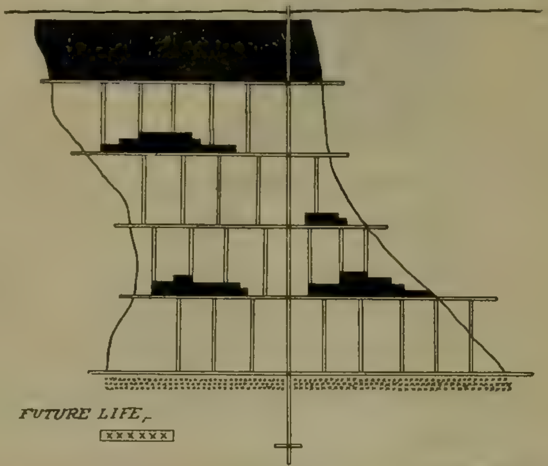

Fig. 2. MINE (B) WITH 125,000 TONS, NET VALUE $250,000.

Fig. 1 and Fig. 2 further illustrate the weakness of the proportionate method and will, moreover, probably convince the reader that there is little interdependence between existing ore reserves and future possibilities. The diagrams are supposed to represent the same mine worked and developed down to the same horizon under two different administrative policies, and there is the same length and thickness of oreshoot exhibited in both cases in the bottom of the mine. Fig. 1 shows the mine as the result of a proportionately large mill having exhausted the orebodies down to the third level. The ore remaining is estimated at 65,000 tons or about one year's ore supply for an imaginary 200-ton mill.

Figuring on $2 per ton profit in both illustrations, the profit in sight is $130,000, less interest. Fig. 2. represents the same mine where supposed to have only a mill of about half the capacity, and the profit in sight is 125,000 tons or $250,000, less interest. Allowing for the lateral extensions of the ore-shoot with depth it is probable that if the proportionate method was used by the valuer that he would be willing, in both cases, to allow 30% of the total price to be represented by future possibilities, and that 70% would be backed up by net profit in sight. This, then, gives total valuations of $185,714 and $357,142. Deducting the profit in sight in each case, $130,000 and $250,000, leaves the relative valuations of the identical mine bottom as A, $55,714, and B, $107,142. The crossed portion indicates the future possibilities. These are the same in both cases, yet, although the same method is applied on the same mine bottom, the disparity is enormous.

The foregoing calculation is sufficient for illustration, but the discrepancy is materially greater when the refinement of actual conditions is introduced. In cases A and B the ore reserves must be regarded as locked-up money drawing no interest, and, as previously explained, the purchaser is entitled to compare this with what his money could be earning at 7%. Otherwise it would be poor business to buy ore reserves. In the first case the 200-ton mill would absorb the ore reserves in about one year, and in the second case with a mill of half the capacity the ore reserves would supply the mill at least four years. In the first case the value of 65,000 tons is $130,000 net. The value of this sum less one year's discount interest at 7% is $121,420. The second case is a little more involved, inasmuch as the ore reserve is consumed at the rate of 31,250 tons per annum for four years. The $250,000 is therefore received at the rate of $62,500 per annum. Calculating interest on the four payments until they are received at 7%, the present value of the $250,000 ore reserve is found to diminish to $211,614. To reiterate, the discount value on the first payment of $62,500 is $58,375 and the second $54,552, and so on. To arrive accurately at the respective valuations of the future possibilities, the two cases summarize as follows: Case A, total price as before, $185,714, deduct $121,420, the discount value of the ore reserves as shown, and the valuation of the future possibilities is then $64,294; case B, total price as before, $357,142, deduct true discount value of ore reserve computed at $211,614 as shown, leaving value of future possibilities at $145,528, as against $64,294 for case A.

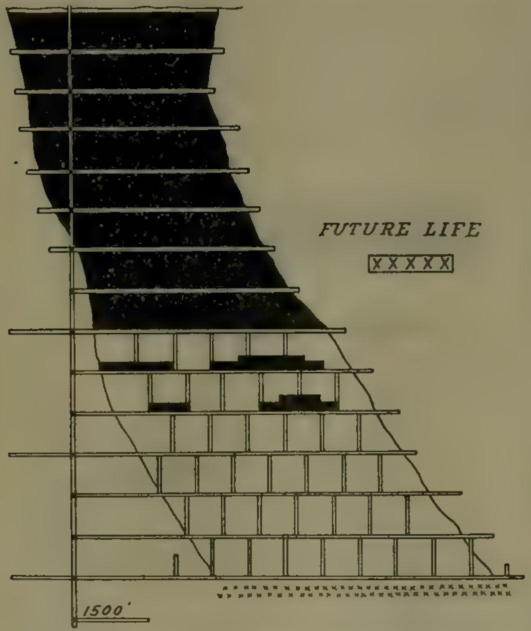

FIG. 3. MINE (C) WITH NET VALUE $950,000.

The proportionate method is decidedly attractive superficially. It might be said that it is seductive. A process that apparently possesses as a fundamental the idea of securing 70% of a purchaser's money by net profit in ore reserves might well be expected to be popular with capital interests who deal in mines. Nevertheless, it is woefully misleading. A large and important ore reserve, instead of being an item of security might become the means of a purchaser making a very bad investment in respect to future expectations. The previous examples which have been reduced to the fine point of actual conditions attest this. If the two cases instead of being the same mine only worked under two different administrations, be imagined to be two distinct mines having the same relative disparity of ore reserves, but in other respects exactly similar, the fallibility of the system is again cogent. Allowing for the basic discount interest, the future of A has been computed at $64,294 and that of B at $145,528. As the bottoms of the mines at the same period are identical, there is no reason to expect better results from B than A. Mine B might show decrease either in grade or value in two or more levels. Mine A might go down for an additional eight. Again there is still another point; the profits derived from the subsequent exploration of A will start to come into the interest market in a year, but with B there is a debit balance accrued to the round sum of $41,767, that is, 7% for 5 years on the price paid for the future possibilities.

As mines with a profitable future are seldom for sale for the net value of their ore reserves alone, a question of future possibilities is as a sequence forced into a calculation against this additional price asked. The geological deductions that have been previously made must be considered in respect to the likelihood of the mine providing a sufficient extension of orebodies to justify this additional price, and at the same time show a compensatory profit on the investment as a whole. This additional price can be calculated in tons of ore which must be expected of similar grade to that produced in the past. It is in this inferential deduction of probabilities that the ability of the engineer is taxed to the utmost. Nothing can be taken for granted beyond the present faces, and the engineer must rely on past experience, training, confidence, and common sense.

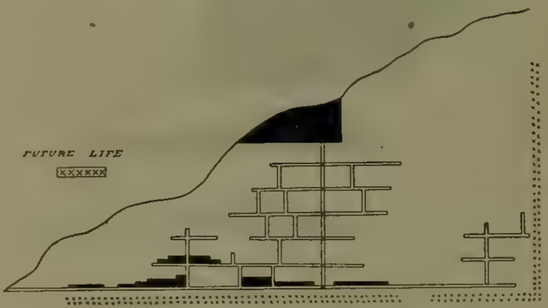

FIG. 4. MINE (D) WITH NET VALUE $700,000.

There are several deductions, though apparently simple in presentment, that are most important. Expectations at depth are an obvious gamble, an engineer examining a property that has only been opened up to a depth of 200 ft. would be taking a positive risk, in the majority of cases, in calculating on a duplicate extension in depth. Should, however, the same property prove a constant producer down to, say, 800 ft. and at that depth the bottom of the mine was still apparently sound, the engineer would be taking a fair chance in counting on an additional 200 ft. In diagram C, Fig. 3, which is the longitudinal projection of a mine developed down to 1400 ft., it will be seen that with the continuity of the orebody a valuating engineer would not be unduly sanguine in hoping for an additional 300 ft. At the same time the engineer must invariably bear all the points in his mind simultaneously and not allow himself to be led away by any individual theory or deduction, for it will be seen that mine C, although a phenomenally strong orebody has been developed already to a considerable depth, and that its exhaustion must be proportionately near at hand.

The lateral extent of orebodies in the majority of cases is some indication of the probability of vertical extension, for the reason that, as a rule, ore-shoots have a greater tendency toward vertical than horizontal inclination. In other words, although they are seldom vertical, they are more inclined to a perpendicular angle than to lying more or less flat. Therefore, if an orebody is 400 ft. long on a certain horizon, it is likely to prove more than that amount in depth and height. This is not to be interpreted as suggesting a known relative proportion between length and depth of ore-shoots. It is merely that the length of a section laterally penetrated by a level is likely to be greater than the minor axis and less than the major axis of the shoot. This deduction probably accounts for the fact that ore-shoots highly inclined from the vertical in respect to the pitch of the shoot in the vein matter, do not, in the majority of cases, descend to depth as favorably as more vertically inclined shoots. It is clear that the more the shoot approaches the horizontal the greater will the horizontal intersection by the level approach the maximum length, or major axis. To those not versed in valuation, the inclination of the shoot must not be confused with the inclination or dip of the vein. What has been written refers to the inclination of the ore-shoots in the vein itself, irrespective of the dip of the vein.

Many important discoveries have been made by closely following the experiences of mines either adjoining or in the immediate vicinity of a property. The recent important discoveries that have been made in Nevada in the course of the last year and a half reflect the greatest credit on the reasoning power and intelligence of those responsible for the discoveries. Depending upon depth or lateral extensions is highly speculative, but the experience in an immediately adjoining property either as to lateral or productive depth of workings has increased the value of a property on sound and fair grounds.

When representing the purchaser the engineer must use his own judgment on the individual case presented. Mines are always drawing nearer their exhaustion, and the duty of the engineer is necessarily a compromise between securing a client's money as far as possible on known values and getting the best attainable speculative possibilities in respect to unknown values. Little headway would be made in mining if valuing engineers and financiers were to allow security to absorb and blot out profit. A young mine with a small ore reserve and excellent possibilities may be a much better purchase than a mine developed to its maximum extent, even though the prices in both cases ahe the same. Mine C, Fig. 3, and D, Fig. 4, represent two entirely different types. Unquestionably C is a mine of decided merit not only as a past producer, but also in respect to known ore reserves. Not only that, but the bottom is as good as it ever was, and the continuity of the ore is phenomenal. The ore reserve is also estimated at $950,000 net. Mine D, however, notwithstanding an ore reserve of only $700,000 is a better purchase, even though the price in both cases is identical. The reason for such a statement is that there is little speculative attraction in C. Its capabilities are known, its lowest level has now arrived at a depth which, in the light of past experience, clearly shows that it is bound to soon approach its exhaustion. It is like a hale and hearty man of sixty-five, strong as ever, but with the laws of average dead against his seeing ninety.

Not only this, but in mine C the daily output is known and its capacity as a maximum producer per day established. There is no chance of increasing the output to reduce the standing charges on the one hand, and bringing its profit into the interest earning market in a shorter time, on the other. Mine D has everything before it. Compare the proportionately longer base line with C. The latter has only a bottom, but D has also a bottom and a side. Also it has the great advantage of permitting gravity work, precluding pumping and hoisting, and has also possible ore extensions on its side, as indicated by the crossed lines in the diagram. As both have the same average thickness of vein it is plain that an energetic development policy would result in an ore reserve that would permit a mill being erected at D of a size that would reduce the daily costs much below those at C, thus making its ore reserve more profitable, grade for grade, and bringing into the region of profit ore zones that C with a smaller output and handicapped with hoisting and pumping charges could not touch.

The inception of the foregoing has not been to instruct; what has been written is done in the interest of perhaps the most complicated and at the same time, vital branches of the industry where many reputations have been made by men who were not optimistic but had the courage of their convictions. Wholesome criticism and exchange of views is in the interest of all concerned. This article has been respectfully submitted to a serious and honorable profession, where the associations of dishonesty which have arisen owing to its latent speculative aspect and which have seldom had origination with those professionally trained, are being steadily eradicated.

Subsidies in Western Australia

To stimulate the deeper development of small mines held by syndicates, the Mines Department of Western Australia has recently made arrangements to pay subsidies on lots of ore from these mines, crushed at any of the State batteries. The payments are made on the following lines: Fifty cents per ton on ore raised from depths of 100 to 110 ft.; 54c. from 110 to 125; 60c. from 125 to 150; 66c. from 150 to 175; 72c. from 175 to 200; 76c. from 200 to 225; and 84c. per ton below 225 ft. The depth will be taken as the vertical depth below the natural surface at the mouth of the shaft or adit, in or from which the said work is performed; and in case of work done from a level, the depth of the level will be taken as the depth thereof at the shaft from which it is driven. Development is to consist of sinking shafts and winzes, driving, raising, and cross-cutting. Shafts must be not less than 5 by 3 ft., raises or winzes, 4½ by 2 ft., or cross-cuts and drifts, 4½ by 2 ft., while any work greater than 6½ by 3½ ft. will be considered as of that size. The amount of waste removed shall be allowed for by granting subsidy on one of ore broken and crushed from any other part of the mine, for each 13 cu. ft. of waste so mined. The regulations stipulate certain forms to be filled in and approved of by a State battery manager, or mine inspector. If that officer is not satisfied with the work carried on, the subsidies may be refused altogether. In a way the payments may be likened to a reduction in crushing charges for some; but for others it will mean a great help in opening small prospects, which often have to be abandoned on account of water troubles at a shallow depth, or the gouging out of the richest shoots as quickly as possible and then abandoning them. In another way it will tend to keep the batteries employed more continuously. At present many mills run for a few weeks and then shut down for a while, which is not an economical way of working a plant of any kind. In a recent address by the Acting Premier at Menzies, he stated that the public batteries had cost to date $3,585,000, and receipts totaled $3,480,000, and that no interest or sinking fund had been paid on the loan money.

TUNNEL LININGS of hard shale brick laid in portland cement mortar have a considerably longer life than stone or concrete linings when exposed to locomotive gases and dampness, according to the observations of M. J. Corrigan, general inspector of tunnels of the Baltimore & Ohio railroad. Soft sandstone in some tunnels has been found to deteriorate in places to depths of 2 in. or more in a year and low-grade concrete also to be rapidly attacked. Coal-mine drainage coming in contact with the lining is observed to be a further source of disintegration.—*Engineering Record.*

Coolgardie and Ora Banda

By M. W. von Bernewitz

Some time in 1910, the Chamber of Mines of Western Australia approached the Government with the suggestion that more geological surveys be undertaken in mapping out various districts, connecting them with known centres, and issuing early reports for the public. Two of these, namely, that of the Coolgardie and the Ora Banda field, by T. Blatchford and C. O. G. Larcombe, respectively, have been issued, while one on Southern Cross, Kalgoorlie, and Boulder is well on the way toward publication. In the Coolgardie field some four miles of country was examined. There are three distinct types of gold-bearing lodes: (1) lodes formed in the fissures of the greenstone and schists; (2) auriferous acid dikes; (3) quartz veins. In the first named class the lodes have been small, and gold has been won from short shoots, which are of little value to the mining industry on the whole, although satisfactory to the small operator. All these mines are now closed. Three of them produced $226,000 from 27,417 tons. In the second class, about three miles from Coolgardie, no less than seven of these dikes occur parallel. Work has been done to 300 ft. depth, but apart from Tindal's and Griffith's mines, the work has been abandoned. Practically all the mines on quartz lodes are closed also; but considerable gold has been won from time to time. Bayley's did from 6000 to 8000 ft. of boring from the surface and 1000-ft. level, but in no case was ore cut. In making recommendations for further prospecting, the geologist suggests that drilling be started in the acid dike at Tindal's from depths of 200 to 300 ft., as that vein has proved to be the most consistent in size and gold content, and horizontal holes would cut at least 6 lodes. If good results were obtained investors would be attracted. The yields from the mines in Coolgardie have produced to date 293,357 tons for $4,115,000. At Bayley's —where gold was originally found—76,402 tons worth $2,125,000 was won. I recently spent a day looking around Coolgardie generally. It is depressing from a mining point of view to see all the batteries silent—even the State mill only works spasmodically—a few dry blowers at work screening the alluvium, of which tens of thousands of tons have been turned over; the once fine plant of Bayley's is idle and rusting away; at the same time, an immense amount of work has been done, as evidenced by the dumps of waste, alluvial diggings, and mill residue. Will the field be busy again? Recent work, and the geologists do not hold out much hope.

The Ora Banda field is 18 miles northwest from Broad Arrow, the latter being 23 miles from Kalgoorlie by rail. The Gimlet centre lies between two ridges, one consisting of coarse-grained amphibolite, and extending for some miles. The amphibolite is derived from a gabbro, and at one place is a fine-grained chloritic rock. In this the same processes of alteration as have been at work in Kalgoorlie may be traced. Granite outcrops about one mile northeast, but there are no mines along the contact, as is common in other parts of the State. There are two belts of schists, one a quarter of a mile wide, between porphyrite and amphibolite; the other between the latter and granite. The latter belt is a mile wide, and along its contact with the amphibolite, which extends some miles, there appears to be a favorable zone for the occurrence of gold in such a way that it may prove profitable to small operators. The chief occurrences of gold are in porphyrite and schist. Large low-grade deposits occur in the former, and judging by the nature of the ore, and observing the deposits below the zone of oxidation, there seems to be no doubt that in this area there is a typical lode formation of a similar origin to Kalgoorlie. The ore is simply the rock changed by the introduction of finely-disseminated pyrite, silica, and other minerals. In the schists, the occurrences should be of value, though not of great extent. There has, in some cases, been a strong movement along the strike of the schists, giving rise to faults, the planes of which have been filled with gold-bearing quartz. Mr. Larcombe concludes his summary by remarking that a zone of porphyrite bounds the west side of the Golden Mile, and the line of amphibolite is almost identical with the amphibolite which forms the north end of the Kalgoorlie field. In fact, it seems more than a coincidence that the succession of rocks at Ora Banda is the same as at Kalgoorlie. When plotted on a map the Kalgoorlie series apparently connects with the Ora Banda series, a distance of some 35 miles northwest. Mr. Larcombe's extensive geologic report on the Golden Mile is now being published by the Australasian Institute of Mining Engineers.

Analysis of Zinc-Dust

Among the many methods of analyzing zinc-dust, the Drewson method, recommended by Paul Speier, is one of the most convenient and most reliable. It is based upon the fact that finely divided zinc reduces a solution of chromic acid (bichromate of potassium and sulphuric acid) without generating hydrogen. The process is carried out as follows: Dilute 40 gm. of molten bichromate of potassium to make 1 litre, and adjust the litre with a strongly acidulated ferrous sulphate solution by means of the ferricyanide of potassium volumetric test. Put 1 gm. of zinc-dust into a glass beaker and pour over it 100 c.c. of the bichromate solution. Add, while gently shaking the beaker, 25 c.c. of diluted sulphuric acid in portions of 5 c.c. each, at intervals of from 8 to 10 minutes. Let solution stand for an hour, and then add another 25 c.c. of diluted sulphuric acid. Then put the whole mixture into a volumetric apparatus and dilute to make about 500 c.c. Then gradually add, while strongly stirring, ferrous sulphate solution (200 gm. $FeSO_4 + 7H_2O + 25$ c.c. H_2O_4 concentrated to 1000 c.c.) until one drop with ferricyanide of potassium solution produces a weak but distinct blue coloring. In order to determine the quantity of the metallic zinc contents, the cubic centimetres corresponding to the iron solution which has been used have to be deducted from the bichromate of potassium solution, and the bichromate of potassium contained in the remainder has to be multiplied by 0.66113.

Mining Taxes in Colombia

The mining law now in force in Colombia provides that the denouncer of a gold or silver mine shall pay to the treasury department of the Federal Government before making the denouncement, the sum of 50 centavos, and shall be charged $4 gold for the title to each mine. Every gold or silver mine having veins of these ores shall pay $1 gold, annually for each claim or *pertenencia*, and such mines containing more than one *pertenencia* are subject to annual taxation at the same rate for each additional *pertenencia* or fraction thereof. Mines containing less area than a *pertenencia* must pay taxes at the same rate charged for one *pertenencia*. Denouncements made and mining titles issued in accordance with the provisions of the mining code do not require internal-revenue stamps to insure their validity. Owners of mines to which titles have been issued and which are not in litigation may, by paying at one time double that which they would have to pay in twenty years in accordance with the code of October 21, 1867, insure permanent ownership thereto and thereby become exempt from further taxation in the future or from registration or denouncement by anyone. Whoever denounces a mine without taking the necessary steps to complete the formalities required by law, within one year from the time of making the denouncement, forfeits his rights to the mine which thereby becomes abandoned and subject to denouncement by other parties. The location of mines in the beds of navigable rivers or streams is prohibited. The provisions of the fiscal code govern concerning coal mines and asphalt deposits, oil wells and natural gas, and no concession for the exploitation of these will be valid without the approval of Congress.

Storing Drill-Cores

By A. H. Meuche

*Another matter which has become a sort of hobby of mine is the care and preservation of drill-cores. Perhaps this is due to the fact that I have examined in the neighborhood of a hundred thousand feet of drill-cores during the last few years. I have seen cores kept in a limited number of boxes; when these boxes became full, the cores were dumped out and the boxes refilled. I have seen core-boxes kept in a cold, wet cellar, one box piled on top of another, forming a high stack. Often the lids are nailed down tighter than the bottom is nailed to the box, so that in trying to pry off the lid the box falls to pieces. I have climbed upon racks, pulled out boxes (not having covers) that were slipped in sideways, balanced them on my finger tips and tried to get down. Once or twice the boxes turned upside down.

With these experiences you can readily perceive why the method used by the Victoria Mining Co. and later adopted, with some minor changes, by the Mass Consolidated Mining Co., appeals to me. In both cases a sort of cabinet has been built, using the core-boxes without lids as drawers. The boxes slide lengthwise into a rack or cabinet. The boxes or trays are stacked so close together that the bottom immediately above acts as its cover. At the Victoria, a strip the full length of the box is nailed on either side, forming the slides for the drawer. A drawer-pull and a label giving the number of the hole and the depths of the hole from which the core was taken are fastened to one end of the box. At the Mass mine the necessity of nailing strips to the sides of the box has been overcome by allowing the bottom of each box to extend about half an inch on either side. The boxes are made about 5 ft. long, which is a convenient length to handle, and hold enough core for ordinary purposes. The cabinet itself is made similar to any ordinary cabinet, holding drawers, except that it is not necessary to put a piece of wood under each drawer as a stiffener. If the sides are made of two-inch material, a stiffener need only be introduced about every ten boxes. Sides or partitions are made for each stack of core-boxes and as high as desired. These had better be made pretty heavy, as they must support the entire weight of all the boxes in each stack, and in order to make the construction as slow-burning as possible, I would suggest a tight partion. Strips are nailed on both sides of these partitions to catch the strips on the boxes, thus supporting them. These strips should be placed just far enough apart to allow easy and free sliding of the boxes.

The accompanying sketch (Fig. 1) will explain the construction fully. The advantages of this system are the convenience in referring to the cores at any time and small amount of space required. Each box occupies a space of 10⅞ by 2^3/$_{16}$ inches. Allowing one stiffener for every 10 boxes, 30 can be stored in a stack 5 ft. 9 in. high. As each box holds 30 ft. of 1⅛ in. core, which represents approximately 40 ft. of drilling, one stack would represent 1200 ft. of drilling. Ten such stacks, representing 12,000 ft. of drilling, would only occupy a space 6 ft. high, 10½ ft. long, and 5 ft. deep. I do not believe that the same number of boxes with covers screwed on could be gotten into the same space, and I question if the lumber and screws used for a cover would cost as little as would this cabinet. The only objection to the scheme is the trouble involved in transporting the boxes from the drill. The Mass Mining Co. solved this by making boxes with hinged covers and locks which would just hold one core-box. The core-box was then placed in the box, which was then locked and sent to the mine office. For shipping, the core-boxes could be crated readily enough.

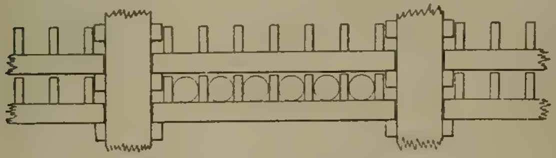

FIG. 1. SKETCH SHOWING BOXES IN RACK.

I wonder, with such a convenient method as this of storing cores, if as much core would be thrown away as is now done. After so much money has been spent in obtaining the records, it seems too bad to see the true records destroyed. I often encounter the argument, "Of what good are they?" They usually are no longer of any use to the company, but some one else may examine them and see something of great scientific or practical value. There is some excuse for a person holding merely an option on a piece of land to throw away the cores, as he may not have any place to store them, but in those cases I truly believe that the Geological Survey should make an attempt to preserve the records.

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*Abstract from a paper on 'Some Practical Suggestions for Diamond-Drill Explorations,' read before the Lake Superior Mining Institute.

Copper Producers' Statement

The Copper Producers' Association August statement shows a decrease during the month in accumulation in this country of 4,297,357 lb. The details are as follows:

	Pounds.
Stock of marketable copper of all kinds on hand at all points in the United States August 1, 1911	137,738,858
Production of marketable copper in the United States from all domestic and foreign sources during August	125,493,667
Deliveries of marketable copper for consumption and export during August	129,791,024
Stock of marketable copper of all kinds on hand and at all points in the United States September 1	133,441,501

August production and deliveries for three years may be compared as follows:

	Production.	Deliveries.	Surplus.
August 1911	125,493,667	129,791,024	*4,297,357
August 1910	127,803,618	129,563,051	*1,759,433
August 1909	120,597,234	107,996,911	†12,600,324

*Decrease. †Increase.

August exports and domestic deliveries for three years has been as below, in pounds:

	Exports.	Domestic deliveries.
1911	69,855,660	59,935,364
1910	61,831,780	67,731,271
1909	48,382,704	59,614,207

The changes in surplus since January 1, 1911, have been as follows, in pounds:

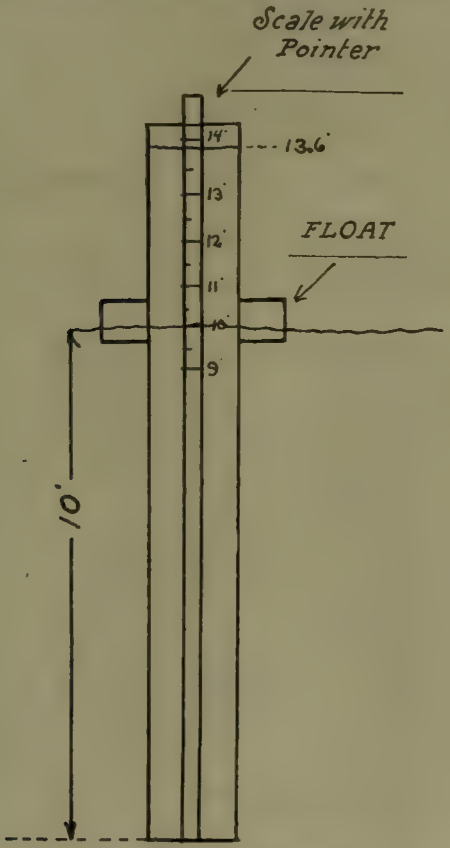
	Increase.	Decrease.
January	20,409,295	....
February	14,198,280	....
March	5,370,164	....
April	3,547,974	....
May	440,024	....
June	....	8,561,768
July	....	19,695,306
August	....	4,297,357

L. Vogelstein & Co. report the following figures of German consumption of foreign copper for the months January to July 1911, inclusive: Imports of copper, 106,077 tons; exports, 4928; consumption, 101,149. The corresponding consumption during the same period in 1910 was 95,092 tons. Of the above quantity 91,771 tons was imported from the United States.

Measuring Specific Gravity in Agitators

By Charles F. Spaulding

Take a piece of 3 or 4-in. pipe some 14 ft. long. Sink it in the agitating-vat so that the lower end of the pipe will be exactly 10 ft. below the surface of the pulp. Measure the height of the solution inside the pipe (in feet). This divided by ten will give the specific gravity of the pulp. For example, suppose that the lower end of the pipe is exactly 10 ft. below the surface of the pulp and that the solution in the pipe stands 3.6 ft. above the surface of the pulp, or 13.6 ft. above the bottom of the pipe. This measurement divided by 10 gives 1.36 as the specific gravity of the pulp. If it be desired to refine the measurements, the scale can be calibrated according to the specific gravity of the cyanide solution instead of feet and tenths. This is based on the fact that the inside column must balance the outside column. The weight of the inside column is the area by height by weight of a cubic foot of solution. This must balance the weight of the outside column, which is area by height by weight of a cubic foot of solution times the specific gravity of the pulp. Eliminating the equal factors in the above and having the pipe 10 ft. deep, the matter is reduced to the height of the solution in the pipe, measured in feet, divided by 10, this giving the specific gravity of the pulp. The pipe could be arranged on a float so that the bottom of the pipe would be 10 ft. below the level of the pulp in the vat. A small float with a pointer could be placed inside the pipe. The whole arrangement could be placed inside the vat and left floating around. The pointer would indicate the specific gravity at any time. This would be especially advantageous in continuous agitation, one specific gravity tester in each tank. If the ore foams badly a shield 12 to 18-in. diameter placed around the pipe will allow the operator to see the surface of the pulp in the tank.



SPECIFIC GRAVITY TESTER.

Copper Production of New England

By A. L. Sweetser

Few people realize that the first copper mine in the United States was developed at Granby, Hartford county, in the State of Connecticut, in the year 1705. In the following year the Bristol mine in the same State became the second producer of copper in the United States. Both of these mines were developed in a fault zone between gray gneiss, hornblende schist, and Triassic sandstone. The Loudville mine, in western Massachusetts, was also in active operation before the Revolution of 1776 and produced lead, silver, copper, and zinc, the minerals being found in veins of quartz traversing trap rock and gray sandstone. The rusty colors of the pre-Cambrian rocks of New England, especially in the upper strata, early induced prospecting, and considerable digging was done at various places long before the Revolution. No authentic records exist of the production of these mines previous to 1880, at which time the United States Government published the mineral statistics on the production of the various States. This continued until 1885, after which date only the total production of New England has been given. From these bulletins and the individual reports of each State the following tables of the copper production from 1880 to the present date have been compiled:

Pounds of Refined Copper Produced from 1882 to 1885

State.	1882.	1883.	1884.	1885.
Maine	125,000	98,000	100,018	45,000
New Hampshire..	165,000	114,000	149,000	55,000
Vermont	1,265,000	400,000	655,405	111,602

Pounds of Copper Produced in New England from 1882 to 1911

1882	1,555,000	1897	72,017
1883	612,000	1898	95,226
1884	904,423	1899	110,554
1885	211,602	1900	80,495
1886	315,719	1901	60,039
1887	200,000	1902	45,047
1888	271,631	1903	55,612
1889	172,000	1904	36,086
1890	378,840	1905	34,960
1891	296,463	1906	21,438
1892	467,448	1907	6,311
1893	432,793	1908	188,756
1894	374,514	1909	197,044
1895	105,036	1910	190,600
1896	104,993		

In 1877 there was a copper boom in Maine. At this time the Blue Hill and Sullivan mines attained great prominence. These were large producers until 1884, when they were closed because of the low price of copper. In these mines the copper occurred in small veins traversing slate and gneissic rocks. The Davis pyrite mine in Franklin county, Massachusetts, has worked steadily since 1880, and at Sheldonville, in Norfolk county, Massachusetts, a copper mine was opened in 1901 on a quartz vein in granite, carrying gold, silver, and copper. For many years several properties in Grafton county, New Hampshire, have been steady producers, in a small way, the ore being found associated with blende and pyrite in fissure veins. In Vermont copper ore occurs in quartz veins in talcose slate and also in pockets of mica schist. The chief mines are in the counties of Lamoille and Orange. Previous to the development of the Lake Superior district of Michigan, Vermont was an important source of copper. The Elizabeth mine, opened in 1793, is the oldest in the State. In 1821 the Ely mines were the largest producers. They have been worked to a depth of 3600 ft. At the present time the most important copper producer is the Union mine.

Direct fusion of ore containing 25% sulphide and 7 to 11% mispickel gives 90% of the gold on the first fusion. The remainder may be obtained by re-fusing with more flux.

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Positions Wanted

The Editor:

Sir—I should like to announce to those interested that the work of acting as a clearing house between the employer and the employee, which I assumed on the departure of Mark Lamb for South America, has been taken up by the American Metallurgical Society.

RAYMOND C. BENNER.

University of Arizona, Tucson, August 31.

Air Hammer-Drills

The Editor:

Sir—In your issue of August 19, page 237, under the heading of 'Concentrates,' is an item referring to air hammer-drills, in which the statement is made that they are adapted only to drilling uppers. While I infer that this statement has reference only to stoping drills or what is known as air-feed hammer-drills, still it is misleading. As you are aware, Water Leyner drills are air hammer-drills, and there is no limitation to the direction in which holes may be drilled with them. The type of drill in question might have been more clearly defined.

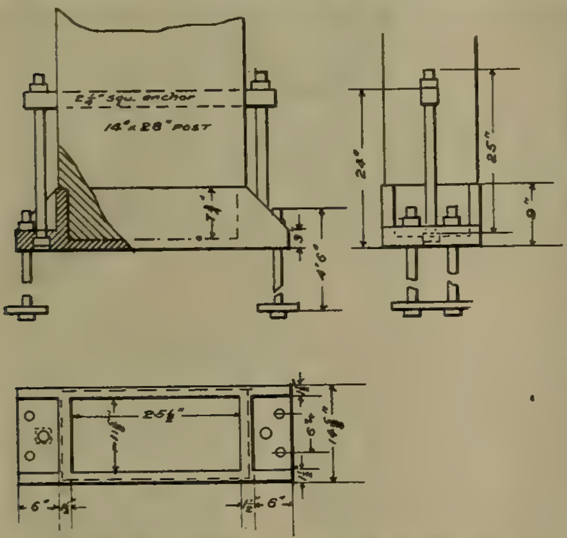
C. A. HIRSCHBERG.

Littleton, Col., August 24.

Securing Battery Posts

The Editor:

Sir—In the issue of August 26, F. W. Sewell describes the battery-post shoes in use at the Guanajuato Con. M. & M. Co., and to their simplicity I wish to take exception; I admit their solidity and strength, but wish to criticize their unnecessarily heavy proportions and expense. The core and mill-work must have entailed a large sum for the casting and finish; the extra framing, necessitated by the round and taper ends as well as that for the seating of the two brackets and the five bolt holes, is expensive; the freight and cost of handling into place must have been high.



BATTERY-POST SHOES AT BLACK MOUNTAIN MINE.

Let me call attention to the battery-post shoes erected in 1905 in the 120-stamp mill of the Black Mountain M. Co., at Cerro Prieto, Sonora, Mexico. The battery posts were 14 by 28 in.; the weight of the shoes 510 lb., held down by two 1¼ in. by 4½ ft. bolts at each end, with plate washers imbedded in the concrete mortar block base. 1½ by 25 in. bolts are passed through the shoe with a square head in the recess in the underside of the shoe, and through the 2¼ in. square anchor bar in the battery post itself. I admit that, in case one of these bolts broke, it would be troublesome to replace. But, with the exception noted, the Cerro Prieto design has every advantage over the other; less weight without loss of requisite strength, simpler design, and less framing necessitated. After five years run, no failure of the shoe or post anchors was noted. If the wood for the posts be well seasoned, there would seem to be no excuse for a driving fit into the shoe, as described by Mr. Sewell.

K. BAUMGARTEN.

Tucson, Arizona, August 29.

Overvaluation of Prospects

The Editor:

Sir—In your issue of August 12, 'L. L.,' in criticizing a former article of mine, lays especial stress on the consideration of time, place, occurrence, and metallurgical environment in the valuation of prospects. When I stated in the article in question that the ore must be of a grade to pay a reasonable profit over all expenses, I of course assumed that the above considerations were fully taken into cognizance, as without so doing no reliable valuation can be made. That the unprofitable ore of today might become profitable tomorrow is not denied, but the future possibilities of transportation or metallurgical progress can hardly be considered as a factor in an investment where reasonably quick returns are expected. It is also immaterial whether the ore is exposed 100 ft. high or 100 ft. deep. It is the amount of ore exposed, and not the type of deposit, that is one of the governing factors. Bedded deposits, as at Joplin, and porphyry coppers may possibly be an exception, but even here, to learn the true nature and occurrence of the orebodies it required considerable exploratory work by shafts and drifts, before any dependence could be placed upon drill-holes. That the majority of the big mines of the world had surface showings of pay-ore must be self-evident, as without this no deep work would have been undertaken in an unproved district. However, this being so would not justify the investor in paying the price of a mine for a cropping of ore, since no less an authority than Daniel Guggenheim states that only 1 out of 200 prospects showing ore at the surface ever becomes a mine.

R. L. MANN.

Cazadero, August 28.

Cross-Fractures and Ore-Shoots

The Editor:

Sir—In these days of practically having to first find your own mine and then to develop it, the subject of 'Surface Indications of Ore-Shoots' is a vital one. I had hoped that the theme would bring out a larger 'blossom.' Mr. Storms has made a good case in voicing the miners' desire, born of well founded empiricism, to 'get into the heart of the hill.' Of course Mr. Storms or anyone else would nevertheless keep an eye out for ore in the gulches. The tarrying 'At the Sign of the Hill' has been pleasant, but with the hope that the quest may be continued and that I may not fare like the late Mr. Pickwick, I would like to submit the question of 'cross-fractures as indications of ore-shoots.'

I do not recall that this subject, by itself, has been discussed in the literature of ore deposits. At any rate, I do not think it has been sufficiently emphasized. I refer to the minor fracturing or seaming or plating that often locally develops in a direction more or less across that of the main line of deposition, be this in fissure-vein, shear-zone, or contact-metamorphic type of ore deposit. (Using the latter term in common parlance, and not in the restricted sense of the 'true contact-deposits' of the U. S. Geological Survey.) I am not directing these remarks as much to that sympathetic shearing which often accompanies cross-faults and intersecting veins, as to those independent zones or patches of cross fracturing that often occur along the general course of deposition. This fracturing may penetrate either or both walls or may develop only in the vein filling; it may accompany wall-grooving but not always. The frequent occurrence of such cross fracturing in connection with ore-shoots has so impressed me that I now intuitively look for it as I would for the presence of zinc where native silver occurs. The fractured areas are probably due to various causes: later movements, folding of the rocks, etc., both cases being the expression of local relief of strain.

As to their control over ore deposition I would suggest action similar to that of 'pressure phenomena.' The Cerro de Plata prospect in northwestern Sonora, is a type of silver deposit closely related to jointing, which is here regional. Perhaps in cases where the cross fractures are strong and extend down through the country rock they may serve the same purpose as 'verticals.' J. E. Spurr, in his first work on the Tonopah deposits (Prof. Paper No. 42, U. S. Geol. Surv.) calls attention to cross fractures, and, as I remember it, speaks of them as acting like walls to the mineral solutions, the quartzose filling suddenly jumping to greater width at the place of meeting and gradually narrowing down to normal width again. W. Lindgren, in his 'Metasomatic Processes in Fissure Veins,' ('Genesis of Ore Deposits,' Amer. Inst. Min. Eng., 1901, page 556), speaking of the influence of small cracks and fissures on replacement, says: "Generally, however, the replacement process proceeds irregularly, owing to the effect of little cracks and fissures. Short clay seams may often interpose an absolute barrier, so that sharp contacts of replaced and fresh rocks results." This is beautifully illustrated at the Promontorio copper mine, in central Sonora. S. F. Emmons ('Downtown District of Leadville,' U. S. Geol. Surv. Bull. 320, page 71), says: "It is evident that the fractures across the limestone have played an important part in fixing the location of orebodies and in furnishing channels along which the ore-bearing solutions may pass from one horizon to another, but the general impression produced upon the mind of the writer has been rather that they serve to divert or temporarily arrest horizontally moving solutions (especially where, as can sometimes be proved, they are the final results of a strain that produced folding) rather than to afford continuous channels for solutions moving directly upward."

Recalling some of my personal observations and depending, in some cases, on memory, I might mention the Blair mines, at Silver Peak, Nevada. While having charge of the field work on an examination that extended over several months, during which time we did some drifting 'feeling out' the ore, I tried to find a reason for the sudden stopping of ore to the west in the Wasson Tunnel workings. This ore-shoot zone, in all probability, is the same as shown in the Drinkwater workings above. However, there was solid ground for several hundred feet between, and I have no later data confirming this. Cross fracturing is prominent both above ground and below, but ore does not always accompany the cross fracturing, at least above ground. In the Wasson workings I could see by the magnifying glass, absolutely no difference between the pay and the barren quartz, except that the pay ore was cross fractured. The quartz was apparently the same, as were also the scattered crystals of pyrite and galena, only that these latter assayed very high within the pay zone and quite low outside of it. The amounts of these sulphides were practically the same in either case. The cross fracturing here has a dip to the west, which, if the Wasson pay zone is the downward extension of the Drinkwater, would make the shoot zone pitch across the dip of the cross fractures.

In the case of the Belmont vein, at Tonopah, I have in my notes that the cross fractures on the seventh level dip to the northeast, and are more prominent in the foot wall. I do not know the pitch of the ore-shoots here. In the Mizpah vein, sixth and seventh levels, the cross fractures seem to greatly influence the deposition of the ore, the quartz being the widest on the lower side of the fractures. I failed to note the direction of dip of these cross fractures, nor do I know what may be the pitch of the shoots. These notes were taken during a hasty trip through, hence are incomplete.

The Rosedale gold mine, in New Mexico, affords a good example of ore-shoots pitching across the dip of the cross-fractures. Here there are two shoots, apparently approaching in depth, with cross fractures in each shoot dipping oppositely. The Coronado fault vein, at Morenci, Arizona, is strongly cross-fractured on the surface. I know nothing about things underground there from personal observation. I have been told, but not authoritatively, that at the King of Arizona mine, Yuma county, the hunt for a new lens of ore is guided by the cross fracturing of the formation.

My observation has been that where cross fractures exist, the shoot pitches, more often than not, across their dip, at least near the surface, and perhaps in about the same ratio as in normal and reverse faults. In advancing this idea I am running counter to what would seem the natural pitch that the shoot should have, and even narrowing the question of dip down to wall groovings alone, the impression that I have of it is that the shoot dips across rather than with the groovings. The suggestion, however, comes up that this might be modified by the relative age of the grooving and the present pay ore, the original grooving that marked the first line of movement having probably been obliterated by later movements. J. F. Kemp ('The Problem of the Metalliferous Veins,' *Econ. Geol.*, Vol. 1, No. 3, 1906, page 219), says on this subject: "The usual experience reveals the ore running diagonally down in the vein filling, and more often than not following the polished grooves in the walls which are called slickensides, and which indicate the direction taken by one wall when it moved on the other during the formation of the fracture." Personally I would make the distinction between slickensides and wall groovings more emphatic, the former, as exhibited on wall gouge *may* be found to have any direction, on digging into a thick gouge.

This question of the relation of cross fractures and ore-shoots would be made clearer, and probably practical help would result, if those who are in a position to do so would map the points involved. In cases where local patches of cross fracturing occur along the strike and dip of veins, it might throw light on the subject were these patches plotted, showing their local dips, in relation to the ore-shoots.

Returning again to cross fractures as indications of ore-shoots, it may be that such fractures in some cases impoverish the vein, but even so, another portion has probably been enriched, and as a general proposition I would rather have the cross fractures present.

W. N. CUMMINGS.

Tucson, Arizona, September 2.

HAMMER DRILLS are used at the Ray Consolidated copper mine in Arizona in the drifts and have on test permitted more rapid advance than with piston drills, according to *Mines and Quarry*. The method is as follows. After a shot, the driller puts in his upper holes from the top of the pile of broken rock while the shoveler is at work loading. The lifters are therefore put in last, when the waste has been all removed. The rock consists mainly of schist, with some limestone, and would be classified as 'fairly soft.' From April 5 to May 1, 25 days, a crew of one drillman and one shoveler, using a Sullivan DB 15 tool, advanced a 4 by 6-ft. tunnel 254.5 ft. The cost of labor and supplies on the machine amounted to $1.54, or $0.006 per foot of tunnel. The DB 15 tool weighs 25 lb., uses 7/8-in. hollow steel, and consumes about 20 cu. ft. of free air per minute at 90 lb. pressure. Another method employed at this mine for driving is to drill the upper holes with an air-feed stoper, and the down holes with the hand-feed tool. The great advantage in using hammer drills in work of this class, as in stoping, consists in the fact that no time is lost in removing the broken rock before beginning drilling, as in the case of piston drills, or in mounting the drill afterward on the bar or column. Holes can be placed at just the point and angle required to break the rock properly, with the least amount of drilling and the smallest quantity of explosive.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

LIME hardens on filter cloths when the presses stand unused, and this leads to slow leaching and high tailing. The remedy is acid treatment of the cloth.

ASBESTOS in its highest development is not only fibrous, but its fibres have a high degree of flexibility and a good degree of tensile strength and elasticity. Furthermore, it is incombustible, being thus strongly contrasted with organic fibre and rendered most valuable for fireproofing.

STANDARD SPECIFICATIONS have been prepared by the American Society for Testing Materials for structural steel; special plate and rivet steel; building, bridge, and ship material; concrete reinforcement bars; forgings, axles, and wheels; structural nickel steel; and many other products. These have been adopted by the Association of American Steel Manufacturers and govern the steel trade of the United States.

FIRE FIGHTING in the mine is complicated by the low head-room. It is impossible to carry water far from the nozzle because no adequate elevation can be secured even with considerable pressure. In a seven-foot adit, for example, under 40 lb. pressure the jet can only reach 34 ft. from the man. Any sort of a fire of consequence is too hot to allow a man to go within this distance of it. Again, the irrespirable air prevents effective fighting unless the fighter dons oxygen helmets, or is supplied with fresh air from behind him.

FIRE-CLAYS require more than analysis to determine their availability for manufacture into fire-brick. The tests made include also the refractory test, and determination of porosity before and after burning at cone 12. According to the use to which the brick is to be put, other and supplementary tests are necessary. These include resistance to abrasion (for the top of blast-furnace linings); ability to carry loads at furnace temperatures; heat conductivity; specific heat; resistance to sudden temperature changes; and numerous others.

WATER is found in some amount in all formations below the earth's surface, from the loosest and most porous sands and gravels to the hardest slate and granite. The amount varies from the merest trace chemically combined in the molecules of the rocks to immense reservoirs which supply wells flowing hundreds of thousands of gallons a day. Some waters are so pure that a refined chemical analysis shows only minute traces of organic and mineral matter; others are so heavily charged with minerals or other impurities as to be unsuitable for use.

THE compressive strength of timber is much greater than its transverse strength, and a seasoned long leaf yellow pine log 10 in. in diameter and 9 ft. long used as a post will sustain safely a load of 63,270 lb:, whereas the same log used as a beam will carry only 8250; and yet the usual method in timbering mines is to make the legs and collars the same size. It is convenient to do so, and details of wooden framing are such as to make that method of construction desirable; yet the extra amount of material that goes into the legs is usually wasted. In swelling ground the full strength of the legs may ultimately be developed and squeezes caused by adjustment of stresses under geologic forces may impose upon them loads which they may even be unable to sustain.

MEN working around gas apparatus should be free from any disease of the heart or lungs. It is especially dangerous to expose one overcome by gas to cold, by reason of the difficult heart action. The muscular weakness which comes from gas poisoning, particularly in the legs, may appear without attracting notice, so that the person affected may be unable to escape. The gas engine should never be placed in a confined space, or in a basement. If doors are required to the engine room, they should be cut away at top or bottom, or both. The exhaust pipe or vent should never be inside a building, but always outside, and more than six feet above the ground level.

BLASTING in wet or cold weather involves many difficulties, such as water in bore holes, necessity for hurry, and so on. It not infrequently happens that electric fuse wires are stripped or broken in tamping, connections are improperly made, poorly insulated and leaky, or the circuit is broken or interrupted in some other way which results in the misfire of the explosives in some or all of the bore-holes, causing serious loss and delay. In order to eliminate this trouble as far as possible, a 'galvanometer' has been designed for testing the blasting circuit before firing. It is possible with this instrument to detect a break or leaks of any considerable extent in the blasting circuit, and also to detect serious defects in the electric fuses and determine the point at which the troubles exist.

TIMBER preservation treatment has been applied to both square and round timbers of Douglas fir when used in permanent mine work. The treatment generally consists in impregnating the wood with creosote, but carbolineum and zinc chloride have been used. Round timbers are easily treated, because the soft sapwood readily absorbs the fluids. The wood should be peeled clean of bark before treatment. In the square form, the impregnating of Douglas fir with preservative fluids has never been entirely successful, because the density of the heart-wood hinders the penetration of the preservative. Of late years, however, considerable progress has been made in developing a successful treatment of Douglas fir heartwood by the boiling process, followed by pressure.

FEEDING the large stamps now used in South Africa has introduced some peculiar problems. It is not always convenient to build, and especially to re-build, ore-bins of sufficient capacity immediately back of the stamps, and continuous feeding of ore, as by conveyor-belts, is impossible because the action of the stamps is irregular. Hans Behr has applied for patents covering two systems designed to meet these difficulties. In the first a conveyor belt delivers to each mortar a continuous stream of ore somewhat less in quantity than that demanded by the stamps. The deficiency is made good by ore delivered in the ordinary way through automatic ore-feeders. According to the other scheme the belt delivers to the mortar the full amount of ore, but its speed is regulated by electric resistance brought into play automatically when the mortar is full. This second plan would necessarily require a separate delivery belt for each mortar.

EXPLOSIVES of many different compositions are now on the permissible list of the U. S. Bureau of Mines, but all have been formulated with a view to producing explosives which on detonation give a relatively low flame-temperature of short duration. It has been found that in order to ignite inflammable gas and coal-dust mixtures, a certain temperature, acting through a certain length of time, is required. It has also been determined that the temperature on detonation of all explosives exceeds the ignition temperature of inflammable gas and dust mixtures, but, fortunately, the flame of the permissible explosives is of such short duration when properly detonated, that the requisite time necessary for igniting the inflammable mixtures does not obtain. It is evident that any factor that increases the duration of the flame-temperature of a permissible explosive, such as the use of a weak detonator or the use of any explosive not in accordance with the provisions prescribed, will increase the danger in their use.

Special Correspondence

NEW YORK

Market Depression Continues.—English Capital to Invest.—Copper Curtailment and Production.—Arizona Commercial and Superior & Boston.

Under normal conditions, the celebration of Labor Day marks for Wall Street the close of the vacation season and the time for resuming the serious occupations of the year. Vacations have been as generous and as universal as usual, but the market slump of the month just past has engendered a spirit of all-pervading pessimism. The Boston copper market is upset by the attempted consolidation of the Calumet & Hecla and further by the appraisal of the Michigan mines by J. R. Finlay at 60% of the present depressed market price. American interest in precious-metal mining, at least so far as the Eastern share-markets are concerned, has been given mostly to Mexican or Canadian properties since the Nevada mining boom. In both of our neighboring countries conditions have taken an untoward aspect. Political quiet in Mexico is far from assured, and in Canada the situation is little better. Porcupine suffered by being absurdly overdone.

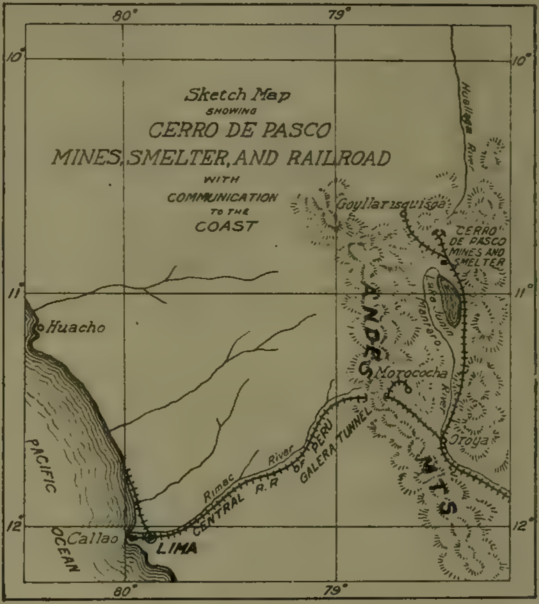
One important move that may mean something tangible for the development of the Canadian mining fields, is the recent organization of the Anglo-French Financial Company of Canada, with a nominal capitalization of two and a half millions. The president of the company is Frederick Baker, head of the Venture Corporation, which developed the Esperanza, Ltd., at El Oro, Mexico, and bought the Camp Bird from the late T. F. Walsh. Mr. Baker is also a director in the Hirsh Syndicate and the Lena Goldfields. The vice-president is Norton Griffith, head of a large contracting firm which has carried out some of the most difficult railroad construction in the world. The remaining officers and directors are prominent in banking and Stock Exchange circles in London. The president and vice-president are expected to sail for Canada during the current month, and to look over the field with a view to taking up railroad and mining projects.

The reports of the largest copper producers for the month of August show little attempt at curtailment. The Phelps-Dodge output for the month of August is given as 11,349,904 lb., which is larger than for any previous month in 1911. The Calumet & Hecla output for August is 11,374,064 lb., which compares with 10,551,847 in July. The only month in which this figure was exceeded was in April, when the total was 11,515,859 lb. The Anaconda turned out 22,500,000 lb. for August, a greater output than has been made in any one month this year. The Butte-Ballaklava has resumed shipments after being shut down for nearly a year on account of litigation with the Anaconda. It is said that there is to be another attempt at a curtailment agreement, but curtailment, like charity, begins at home and is apparently as rare.

The plans for the consolidation of the Arizona Commercial and the Superior & Boston have been announced. The former is a promotion of N. L. Amster, who was caught in the recent slump and was obliged to relinquish control of his various properties. The latter is one of the important new properties at Globe. The merger is to be effected by an issue of 350,000 shares of stock, par value $10, by the Superior & Boston; 200,000 shares of this stock, $5 paid in, is to be exchanged for $1,000,000 outstanding bonds of the Arizona Commercial. The consolidated company will later make a bond issue of $600,000 and Arizona Commercial stockholders will be given the right to take these bonds at par. The subscribing shareholders will receive one share of Superior & Boston for each two shares of Arizona Commercial. The deal is to go to a Boston banking house, and is to become effective upon its acceptance by three-fourths of the Arizona Commercial bondholders.

The market in Tennessee Copper has improved, reflecting better conditions. The directorate has been strengthened by the election of Horace M. Kilbourne, one of the vice-presidents of the National City Bank, Victor Sutro of Sutro Brothers, and Herman A. Kellar to seats on the board. Tennessee Copper now claims to have the largest sulphuric-acid plant in the world and is producing 500 tons daily, which output is to be much increased in the near future.

The copper producers are inclined to look upon the August statement of the Producers' Association as something of a triumph. Notwithstanding the heavy output for the month, a decrease of 4,297,357 lb. in accumulated stocks is recorded. It is still the export demand that is saving the situation. While, in a way, the tremendous foreign consumption bolsters the metal market, it is unfortunate that domestic manufacturers are not in a position to take advantage of cheap metal. When constructive enterprise again gains headway in this country the metal market will advance, and by the same token, our domestic consumers will be caught coming and going. For the present the consumer abroad is making the most of a good thing, and Americans are rather helplessly aiding and abetting him therein.



The Cerro de Pasco is said to be in a position to start dividend disbursements, and to begin to return to its owners the large amount which has been expended in its development. J. B. Haggin is the principal figure in a group of wealthy men who have contributed the 18 or 20 millions which have been spent upon the property. The others are J. P. Morgan, H. C. Frick, the Hearst Estate, the Estate of the late D. O. Mills, and one or two others. The ores go to the Baltimore refinery of the Guggenheims, and, for the year ended June 30 last, yielded 48,600,926 lb. of copper. W. A. Clark is again in receipt of his regular monthly 75c. per share on the stock of the United Verde Copper Co. Owing to subsidence of the ground under a part of the smelter and the necessity of extensive repairs, payment of one dividend was omitted. United Verde is a close corporation, so close, in fact, that when a speculator bought 500 shares of stock at auction some months ago, in the belief that he could make a quick turn, he was surprised to learn that he had made a permanent investment. For some reason Mr. Clark apparently had no bid to make for that particular block of stock, and the owner has had considerably more capital than he desires tied up in United Verde.

A special meeting of the American Institute of Mining Engineers will be held August 29 to formulate amendments to the constitution to be voted on at the regular business meeting of the Institute next February.

MEXICO

Oil Production Increasing. New Railway Lines.—Conchos Reservoir. Taviche Shipments

Mexico is rapidly assuming importance as an oil producer, and oil men realize that its production during the next few years probably will have great bearing on the oil markets of the world. The present wells in what is generally referred to as the Tampico district—principally in the State of Veracruz, south and west of that Gulf port—are capable of producing fully 200,000 bbl. per day, and present development promises a big increase in the possible production during the next year. By the end of this year the Huasteca Petroleum Co., a Doheny concern, will have storage for 10,000,000 bbl of oil, through the completion of 100 additional 55,000-bbl steel tanks. These tanks are being erected about four miles distant from the company's tank farm on the Panuco river at Tampico, where there are 65 steel tanks of the same size, and a concrete reservoir holding 850,000 bbl. Materials for a second pipe-line from the company's Juan Casiano field to Tampico have arrived at the port. The Texas Oil Co., which is getting ready to export to the United States, is preparing to build pipe-lines from the tank farm it will establish to producing fields. The Electra Syndicate, of London, has brought in a well at less than 2000 ft. in the Topila field, where the East Coast Oil Co., a Southern Pacific concern, recently brought in a gusher. The Pearsons are rushing pipe-line and storage work in an attempt to take care of the production in the Potrero field.

CONCHOS RIVER, IN CHIHUAHUA, MEXICO.

English capitalists are reported to be considering the building of a railroad from Zacatecas, or some nearby point on the Mexican Central line of the National Railways, to the Bolaños district in the northern part of the State of Jalisco. Such a line would result in a mining revival in that old district, at one time among the most important in Mexico. The Mexican Mines Co., organized by the Bradbury interests of Los Angeles, California, after their purchase, last year, of the famous old Bolaños silver mines, has been doing some road work preparatory to taking in pumping machinery for the unwatering of the extensive *antigua* workings. The unsettled conditions have delayed the company's plans. The Franco-British Syndicate, organized by French and English capitalists two years ago to build the Guadalajara-Chamela railroad in Jalisco, is waiting on the election of governor and members of the State legislature. Ernesto Madero, the present minister of finance, is authority for the statement that the new State government will guarantee the bonds of this railroad. It will open the Ayutla, Autlan, and other mining districts of Jalisco, and will be a valuable feeder for the National Railways. The Casados and El Favor Mining companies of the Hostotipaquillo district of Jalisco, have combined to build a wagon-road from the Casados and El Favor camps to La Quemada, on the Southern Pacific. The railroad terminus now is at Magdalena, 9 km. from La Quemada, but track is to be extended after the close of the rainy season. It is planned to place in service on the road electric trucks using the new Edison storage battery. E. A. Montgomery, of Los Angeles, has arranged for a year's extension of the option covering the Zapote mines in the Ameca district of Jalisco, and has ordered the sinking of a 2-compartment shaft to a depth of 500 ft. The shaft will prove the district at considerable depth, as the surface workings of the Zapote are much lower than those of surrounding mines. The option price is ₱100,000.

More than 1000 men are at work on the Conchos dam and reservoir of the Mexican Northern Power Co., a Canadian concern, in the State of Chihuahua, and it is announced that the big work will be finished by June, 1913. The power that will be generated will be transmitted to the Parral, Naica, Santa Barbara, Santa Eulalia, and other mining districts of Chihuahua, and it is expected to make a big difference in operating costs in those districts. During the revolution, the company's work was delayed by labor shortage. Water will be stored along the course of the Conchos river for a distance of 30 miles, the reservoir varying in width from 4 to 5 miles. It is estimated it will take ₱15,000,000 to carry out the company's plans.

Monthly shipments from the San Juan mine of the

San Juan Mining Co. in the Taviche district of Oaxaca average in value over ₱100,000. It is planned to sink the San Juan shaft, now down 700 ft., to a depth of at least 1500 and possibly 2000 ft., and a new hoisting plant is being put in. Plans for a 200-ton mill to treat the lower-grade ores have been made. The San Juan is the property that was returned to the San Juan Mining Co., an American concern, after much litigation, by a decision of the Supreme Court of Mexico, last year.

BUTTE, MONTANA

Heinze in the Coeur d'Alene.—Anaconda Production.—Butte-Ballaklava Resumes.—High Ore Ready.

F. Augustus Heinze has been on an extensive visit to the Coeur d'Alene district. During his stay there J. Parke Channing was in the district, and the two held conferences. While attending the annual meeting of the Stewart company, Mr. Heinze made arrangements for the doubling of the capacity of the Stewart mine. "We are now shipping 500 tons a day," said Mr. Heinze, "and just as soon as the arrangements are completed for the lease of the Federal company mill, we will increase the capacity to 1000 tons per day. Our new main working tunnel, which is now in 400 ft., will tap the Stewart orebodies about 2000 ft. from its portal at an added depth of 200 ft below our present lowest workings. To connect this tunnel with the railroad, we have obtained from the Bunker Hill & Sullivan company a lease of the necessary grounds over which to construct a branch line." There is a report that Mr. Heinze became interested in some other properties while in Idaho, but he denies the report. It is stated that he and his party secured an interest in the Morning mine. They visited the property and made a thorough inspection of one of the long tunnels. The Colorado mine of the Davis-Daly company is shipping and giving satisfactory returns. The ore blocked and in sight insures continuous shipments for an indefinite period.

The official figures of the Anaconda company production show that 22,500,000 lb. of copper was produced during August, as compared with 21,052,000 during July. During the last month the Washoe smelter produced 16,000,000 lb. and the Great Falls smelter 6,500,000, and in these figures is included the output of the North Butte and Tuolumne mines, which amounts to about 2,800,000 lb., the North Butte production being about 2,100,000 lb. The production of the East Butte smelter is given at about 1,100,000 lb. and in this is included the Butte-Alex Scott and some other small properties.

The Butte-Ballaklava company has commenced mining again after many months of idleness. The ground now being mined is claimed not to be covered by the injunction and is on the 1200 and 1400-ft. levels. On the east drift of the 1200-ft. level the superintendent says he has opened a vein on the foot-wall side showing between 18 and 24 in. of bornite and glance. Work is also progressing well on the 1400-ft. level. A shipment of two carloads was made a few days ago to the East Butte smelter, and it is intended for the present to ship about four cars a week. Mr. Newton has recommended to the directors that the shaft be lowered another 200 ft., which would make the depth 1600 ft., and he expects to receive word soon to go ahead with the sinking.

The shaft of the Ophir mine of the Butte Central Copper Co. will be down to a depth of 1000 ft. by the close of this week, and as soon as another 50 ft. is provided for a sump the work of cutting a station will be commenced. The Ophir is now shipping about a car of ore a day to the Washoe smelter, and the returns are averaging over $1800 per car. The work of cutting the station on the 2800-ft. level of the North Butte mine is progressing, and it is expected that it will be completed in about two weeks. Cross-cutting on the vein will then be started. The High Ore mine will be ready to resume operations under the compressed-air system of hoisting about the first of the month.

JOHANNESBURG, TRANSVAAL

Coal Shortage.—Electricity Popular.—Power Troubles.—Independent Stations Needed.

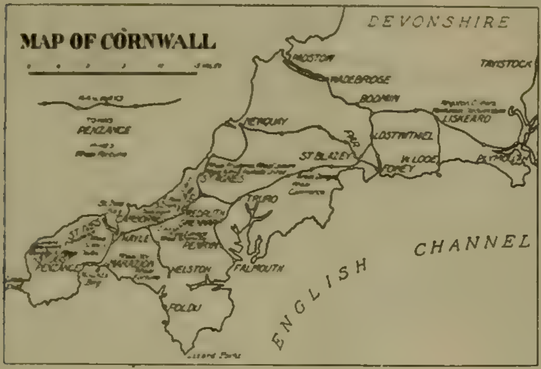
Complaints have been numerous of late that not only have the South African Railways been unable to supply the collieries with sufficient empty cars to keep them working, but, owing to the same cause, several of the gold mines have been on the point of closing for want of coal. During the last three years the railway has been frequently unable to meet its obligations in this respect, owing to lack of suitable cars, and it undertook to have a supply in readiness last April. Owing to the expectation that the Victoria Falls Power Co. would commence operations, this promise was not carried out. It was thought that the extensive use of electricity would materially reduce the coal traffic. Such has proved not to be the case, because the power-stations are all on the Rand, and coal from the collieries about a hundred miles distant has to be carried for their use. Then again, the power-stations use small coal previously unsalable and the collieries have experienced no trouble in disposing of the lump coal, so that, as a matter of fact, the power-stations coming into use have added to the coal traffic rather than diminished it. It is fortunate for the railways that all the collieries are in one association, thus enabling coal supplies to be diverted to the gold mines most in need of fuel. Otherwise, undoubtedly several would have been compelled to stop operations. In Natal likewise there has been a chronic scarcity of empty cars for a long time, at times throwing the collieries idle and the export trade out of joint. It is bad enough for the Rand gold mining industry to be crippled from such an unavoidable cause as scarcity of at least 50,000 negroes to complete their full complement of unskilled labor, without being threatened with a stoppage for want of coal. The fact is that the management of the South African Railways leaves much to be desired, but being Government-owned, a deaf ear is turned to all complaints and warnings. Industries are crippled by exorbitant railway rates, and, owing to the want of ordinary business foresight, the railways are poorly equipped and under-officered to such an extent that unless an early change for the better is made it will be impossible to avert a crisis. The change from steam to electricity at many of the Rand mines is not as complete as could be wished, owing to the inability of the power company to meet the demands. As a motive power, electricity is proving itself far more popular than steam, both for milling and hoisting at the mines. At several of the new producing mines where the only power planned for is electricity to be purchased and supplied by the Victoria Falls Power Co., the management is finding itself in a quandary, milling operations being restricted, and working costs unduly high in consequence. In fact, several mines originally intended to be worked exclusively by electricity have been compelled to provide themselves with steam-plants. The trouble is entirely due to preventable mechanical defects which the Power company officials are taking steps to remedy, but nevertheless the loss to some of the mines is severe. Apart from economy, this experience indicates that the Randfontein Estates and the East Rand Proprietary Mines have taken the correct step in erecting their own power stations.

It is hoped that the satisfactory results obtained at the Brakpan mine on starting its mill may give more confidence to the companies holding ground in the Far East Rand. The Brakpan company certainly displayed courage in sinking two shafts to such a depth in the face of their drill records, and it is to be hoped that equally good results will be shown on the adjoining State mines, where Barnato Bros. is sinking four large shafts to considerable depths without even testing the ground. There has never been any doubt as to the value of the outcropping Modderfontein properties, but the experience at Geduld to the north has not been reassuring, despite the excellent results shown by the first borings. The Geduld company has now obtained the necessary power to increase its nominal capital to £1,000,000. Recent exposures of veins on that property have been more encouraging, but on such a property as the Gedald it seems almost absolutely necessary that large scale operations be conducted if fair dividends on the huge nominal capital of the company are to be earned. It is in this part of the Rand known as the Far East that the most favorable conditions are expected as regards depth, but when water and stability of the foot wall are taken into consideration they leave much to be desired.

LONDON

Cornish Tin Mines.—Dolcoath.—Grenville.—Carn Brea & Tincroft. Wasteful Power-Stations.

The elasticity of the Dolcoath, the premier tin mine of Cornwall, is once more evidenced by the report for the half-year ended June 30 now issued. The underground work in connection with the new Williams shaft, and the substitution of Holman air-cushion or 'pneumatic' stamps for the battery of old Cornish stamps, have made it necessary to reduce the amount of ore mined and milled. To make up for the deficiency, it has been possible to raise ore of higher grade, and this fact, together with the advance in the price of tin, has had the result of bringing the total receipts to a substantially higher figure. The same policy was pursued during the second half of 1910, but not to the same extent. The tonnage raised and milled was 40,315, compared with 44,659 during the second half of 1910, and 47,279 during the first half of 1910. The concentrate sold was 852 tons, compared with 877 tons and 852 tons, a recovery of 47.38 lb. per ton compared with 44 lb. and 40.4 lb. The average price obtained per ton was £117 6s. 6d., compared with £97 15s. 2d. and £88 13s. 8d., and the receipts were £100,048, compared with $85,819 and £75,639. The profit, after payment of royalty, was £36,370, compared with £24,515 and £13,018. The working costs were not substantially different. The shareholders have received £34,000 as dividend, being at the rate of 10% for the half-year. The new battery of 8 air-cushion stamps is at work, and a further 4 are to be erected. The cage roads are completed at the Williams shaft, and the electrical hoisting engines and the electric pumps are being erected. It is expected that the plant will be ready for operation by the end of September. An interesting announcement is that the zinc-copper and copper-tin deposits in the Killas Shaft and Stray Park sections are being actively explored once more. Some years ago a flotation plant was erected for the treatment of these ores, but it was not worked regularly, owing to the lack of labor required for the development of the deposits. The directors are offering the remaining 10,000 shares *pro rata* among shareholders at par, £1; they have already received an offer for the whole or any part of the issue.



The Wheal Vor tin mine is situated in the Breage district of Cornwall, a few miles south of Hayle. It was reopened in 1906 by the Dolcoath group, but misfortune has dogged the steps of the enterprise. The electric pumps first supplied were of faulty construction, and the engines of those substituted, after having unwatered the mine to 864 ft. below adit, broke down. Enough exploratory work, however, was done in the interval to prove that there are several veins worth following. Owing to the difficulty of raising further funds, the mine has been idle for a year. The directors are now more hopeful of the prospects for another unwatering and reopening. They point to the fact that electric power can be obtained cheaply from the new central electric station at Hayle, which is supplying Dolcoath and South Crofty, and will shortly send current to Geevor at Pendeen. By taking advantage of this opportunity, cheap power could be obtained with little outlay of capital.

The present Grenville company was formed under the limited liability laws in July 1906. The mine is situated to the south of Camborne, and it had previously been worked for many years on the cost-book system. The ore yields a good quality concentrate fairly free from wolframite and iron and bringing a higher price at the tin ticketings than the produce of many of the neighboring mines. In writing of the company recently I mentioned that the new manager, Henry Battens, had introduced the wholesome practice of buying supplies in the open market instead of being dependent on directors or shareholders interested in the timber, machinery, and other trades. At the same time I recorded that he had made a profit of £4308 for the half-year ended December 31 last, so reducing the debit balance from £10,465 to £6157. The report for the first six months of 1911 shows that in spite of the continued water trouble the debit balance has been changed into a credit balance of £799. The amount of ore raised was 17,059 tons and the yield of concentrate was 266 tons, as compared with 21,047 tons and 298 tons during the second half of 1910. The extraction was 35 lb. per ton as compared with 32¾ lb. The income from sales was £30,293 as compared with £29,485, and the profit after paying royalty was £6956 as compared with £4308. The output was smaller than would have otherwise been the case because for at least half the time the water prevented access to the best stopes. Last autumn was unusually wet in Cornwall and the pumps at many mines were unequal to the extra duty imposed. Much time and money were spent by Mr. Battens in repairing the pumps, and afterward, when the water was lowered, in inspecting and strengthening the various workings. Mr. Battens writes hopefully of the future and describes several new finds of ore.

The report of the Carn Brea & Tincroft for the half-year shows that the yield per ton has fallen seriously, being only 22.29 lb. of tin concentrate per ton of ore stamped. Since the present company was formed in 1900, only once, namely, during the second half of 1903, has the figure sunk below 23 lb., and the average has been from 26 to 30 lb. The ore raised was 38,253 tons and the produce of tin concentrate 380 tons, as compared with 38,892 tons and 472 tons during the previous half-year. The best results were obtained during the first half of 1909, when 36,825 tons yielded 567 tons of concentrate. The income from the sale of tin concentrate was £39,038, figures practically identical with those of the two other periods quoted above, the price of tin being the compensating factor. During the past year the average price obtained for the concentrate was £102, as compared with £82 during the second half of 1910 and £69 during the first half of 1909. The sale of wolfram, copper, and arsenic ores and concentrates brought the total receipts to £41,057. The working cost was £41,492, figures slightly higher than the average of the last four years. To this has to be added £1501 for royalties, so that the result of the half-year's work is a loss of £1936. No allowance is made for depreciation. I have frequently referred to the current history of the company during the last year or so and have recorded the appointment of Edward S. King, late of West Australia, to the managership. In his report he foreshadows new methods of payment for underground contract work, improvements in the handling of ore, and the overhauling of the old dressing plant. He adds: "At present there are 8 hauling shafts and 5 pump shafts, and altogether 24 engines working under steam, and one engine on suction gas," a serious item in the standing charges.

General Mining News

ALASKA

The Tanana

On August 13, P. R. McGuire, in behalf of himself and others, recorded in the commissioner's court at Fairbanks 27 association claims, covering 4320 acres of supposed placer ground in the Beaver river district.

Ore showing $2.50 to the square foot was discovered in drilling on Wagner & Co.'s claim on Eva creek, about 1500 ft. above the present workings. The ore was found in the last five holes, and is believed to be an extension of the Wagner vein.

(Special Correspondence.)—The Tanana Quartz & Hydraulic M. Co. has let a contract to Nash & Littlewood for sinking a 100-ft. shaft on the vein discovered on the Texas claim of the Tony Goessman property, which is situated on the divide between Bedrock and Chatham creeks.

Fairbanks, August 14.

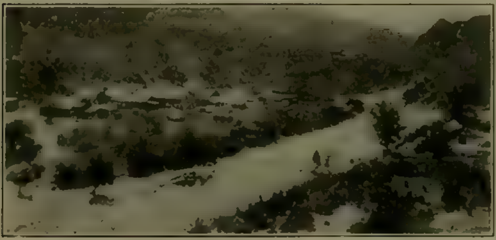
ARIZONA

Gila County

The output of the smelter of the Old Dominion Copper M. & S. Co. at Globe in August was 1,982,000 lb., bringing the total output for the first eight months of the year to 17,937,000 lb., against 18,330,000 lb. for the same period last year, and 24,750,000 lb. for the first eight months of 1909.

The directors of the Old Dominion Copper Co. of New Jersey, the operating company, have declared a quarterly dividend of $1 per share, payable October 5 to stockholders of record September 20. By this the Old Dominion Co. of Maine, the holding company, will receive $155,245, through its ownership of 155,245 of the 162,000 outstanding shares. The Maine company has declared a dividend of 50c., payable October 6 to stockholders of record September 20.

By a plan announced in Boston for consolidating the Arizona Commercial Copper Co. and the Superior & Boston Copper Co., the latter company will increase its authorized stock to 650,000 shares, par value $10, of which 200,000 shares will be offered in exchange for the $1,000,000 bonds of the Arizona Commercial company. The Boston & Superior company reserves the right to withdraw the plan unless it is accepted by 75% of the Arizona Commercial Copper Co. bondholders.


MINERAL CREEK, RAY DISTRICT.

Maricopa County

Cobalt has been discovered in the Saddleback district west of Phoenix, according to C. H. Howland, manager for the Palo Verde Copper Co. Samples assay 20.62% copper and 4½% cobalt per ton.

Pima County

The Imperial Copper Co., a subsidiary of the Development Company of America, has filed with the bankruptcy court of Arizona a schedule of its assets and liabilities. The assets amount to $2,435,121 and the liabilities to $3,333,146. Over-extensions and lack of coöperation between security-holders are given as the main causes for the failure.

Pinal County

The construction work for mine No. 2 of the Ray Con. Copper Co., including the steel head-frame, the electric hoist, and other equipment, has been completed. The surface equipment practically duplicates that of mine No. 1. The ore to be handled is richer than that from No. 1. On the 100-ft. level a new tipple has been put in, and the main drift has been connected with the Humboldt and M. & H. shaft. Extensive development work is being done on the 200-ft. level.

CALIFORNIA

Amador County

(Special Correspondence.)—At the Poundstone mine, a mile east of Sutter Creek, the drift from the bottom of the 300-ft. shaft is out about 500 ft., exposing a good body of ore. The vein has shown marked improvement recently. An electric pump will be ordered soon. The Poundstone adjoins the Bailol, formerly operated by a German syndicate. The South Eureka company is erecting several buildings at the Oneida, including change-house, machinery structures, etc. Electric wires have been strung and new lines of water pipe laid. The repairs to the Argonaut shaft have been completed, together with the work from the 1400 to the 2100-ft. level points. The two lower levels are being unwatered and active developments will shortly be resumed. After lying idle for about 20 years, the Sierra gravel mine, east of Sutter Creek has been reopened by Albert Martell, H. M. Hale, and J. M. Hendricksen. It is reported that the Defender mine will be acquired by new owners and placed in operation in October. The property has been idle since drowning of the bond-holder, Carl C. Forseen, in the Mokelumne river last winter. It is announced that the W. E. Downe coal mine, near Campo Seco, soon will be reopened. An engine and boiler have been received and the shaft will be unwatered at once. The deposit of coal is said to be of good grade, but has hitherto received little attention. It is planned to supply local mines with coal in place of the fuel oil now largely employed. Sedge Hartwick is manager.

Jackson, September 8.

Tuolumne County

The Uncle Sam mine, at Arastraville, has been unwatered for the purpose of a thorough examination for an Eastern company.

A large number of men has been added to the working force at the Dreisam and complete operations resumed. The winze to the north of the shaft on the 400-ft. level, in which the vein shows a width of 4 ft., is being sunk an additional 35 ft., which will make it 100 ft. deep. Drifts will then be started both ways. At present ore is being extracted from between the 400 and 300-ft. levels. In the near future developments will be pushed on the large vein recently discovered by cross-cutting on the 100-ft. level. J. E. Conde, the owner, is operating the property and is superintendent.

The vein which was first uncovered on the 1500-ft. level of the Black Oak is being driven both ways on the 1400-ft. level, where stoping is also in progress. At this depth there is 4 ft. of ore that will average $90 per ton. The lower-grade ore goes direct to the mill, while the best is being sent through a chute and stored in the level below. It is reported that the management later will build a modern mill and cyanide plant.

Tuolumne, September 10.

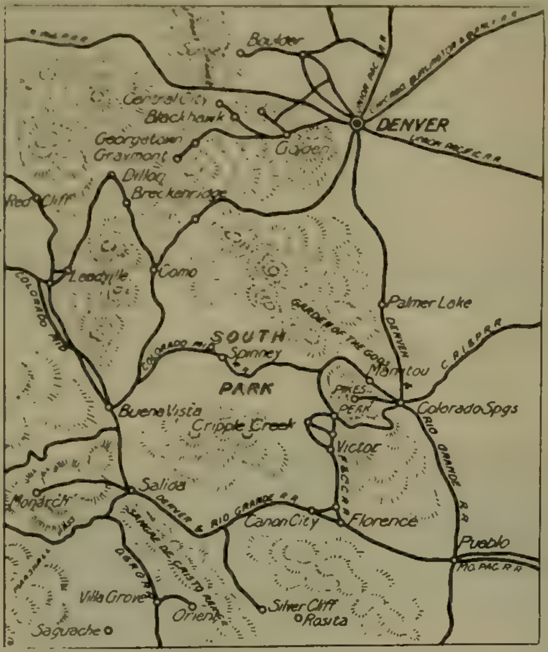
COLORADO

Clear Creek County

(Special Correspondence.)—A streak of silver-lead ore from 6 to 8 in. wide that carries 600 oz. of silver per ton has been uncovered on the Seven-Thirty vein by Joseph Wood, who is operating under lease. Eric Erickson has taken a lease on the West Griffith mine and is stoping on a body of lead-zinc ore that is from 2 to 3 ft. wide. The product is to be shipped to Idaho Springs for concentration at the Jackson mill. John Esgrig has taken a lease in the east drift of the Aetna vein at the Capital mine. Drifting is under way and a streak of 3-oz. gold ore is being followed that is from 8 to 10 in. wide. Work will be resumed in a few days on the Mint property, situated on Covode mountain. It has been decided to sink the shaft 400 ft., making the total depth 600 ft. The Temple Drill Co., holding a lease, will be allowed to develop all ground below the 200-ft. level, while the New System Mines Co. will operate in the upper workings. The 10-stamp mill will be brought into commission during the next two weeks.

Georgetown, September 8.

(Special Correspondence.) The Kitty Clyde mine last week shipped 18 tons of smelting ore that sold for $35 per ton in gold and silver. G. W. Ford is lessee. It is reported that a 12-in. streak of ore has been uncovered in the Dorit adit on Chicago creek that assays $400 per ton in gold and silver. It is stated that work will soon be resumed on the Specie Payment mine and that operations will be carried forward through the Two Brothers adit. The property has practically been in idleness for the last two years owing to litigation. A. M. Welles is manager.



PART OF COLORADO.

Idaho Springs, September 7.

Denver County

(Special Correspondence.) — According to allegations made in a lawsuit recently filed in Denver, the slag pile of the old Argo smelter in North Denver, which went out of business last fall, is worth about $500,000, on a basis of $5 per ton, while parts of it may be rich enough to bring the whole to a value of $1,000,000, at least it is so asserted. The trustees for the Boston & Colorado Smelting Co. contracted with H. C. Pringle and associates to let the latter sell the slag and pay the trustees 30c. per ton. Pringle arranged with H. C. Reno for the latter to sell the slag and pay the former and associates $1.10 per ton. The smelter is alleged to have agreed to pay Reno $1 per ton after deducting $2 treatment charges, freight, and the $1.10 for Pringle and associates. H. B. Little, plaintiff, alleges he was a partner of Reno.

Denver, September 9.

Gilpin County

(Special Correspondence.)—At the 1400-ft. level in the Topeka mine ore assaying $14,187 in gold per ton is reported to have been discovered. It is believed that at this depth the Topeka will come into the vein of uranium ore on which the Wood, Kirk, and German mines are operating. The ore is said to be the richest found in this section for several years.

Central City, September 8.

One hundred miners and prospectors recently organized the Tolland Mine Operators' Association of upper Gilpin county to revive the mining industry in that district. The meeting was held in Tolland. J. R. Braidwood is president. The meeting was promoted by a Denver newspaper.

'Wild West' pictures set in a real mining camp were recently staged at Tolland by the Selig film company. The 'canned drama' was of the popular romantic type.

Jefferson County

The ore-testing plant at the School of Mines at Golden cannot be completed, owing to the failure of the State to pay the educational appropriation.

Teller County

The Trilby mine, on Bull hill, shipped 29 cars of ore in August. A rich vein of sylvanite ore is reported to have been found at the 300-ft. level of the Commonwealth mine in Arequa gulch.

IDAHO

Idaho County

John and Edward F. Massam, of Spokane, have sold the controlling interest in a gold quartz property at Elk City to the Blanchet-Gamatot syndicate, of Paris, for $100,000. M. Snellus, chief mine manager for the syndicate, has taken charge of the developing of the property. Edward Massam still retains an interest.

Owyhee County

(Special Correspondence.)—The Rich Gulch M. Co., of the Silver City district, has ordered a 250-ton amalgamation and cyanide plant from the F. C. Richmond company. Grading for the plant has been almost completed. The company is driving an adit deeper on the vein, which is of gold-silver ore. A. F. Stevens is general manager for the company.

Silver City, September 9.

Shoshone County

The Gold Ridge M. & D. Co. has bought the Buckhorn mine in the Ten-Mile district. The company has ordered a 15-ton Chilean mill for delivery October 1. A. A. Hammer is secretary of the company. H. J. Rice is president and manager and is in personal charge of the work. The company is a Spokane corporation.

Official announcement that the output of the Stewart mine, in the Coeur d'Alene district, will be increased from 500 to 1000 tons per day was made by F. Augustus Heinze, president and controlling stockholder of the Stewart M. Co., on arriving in Spokane from an inspection of the property, on which he was accompanied by Maurice W. Bacon, Western manager, and E. H. Wilson, chief engineer. "We now are shipping about 500 tons per day," he said, "and as soon as the second mill, to be leased from the Federal M. & S. Co., is in operation, our output will be doubled. We have a call on the Tiger-Poorman mill at Burke, and we probably will utilize that plant. We find it costs less to lease this mill than to remodel an old plant."

MICHIGAN

Houghton County

The directors of the Copper Range Con. Co. have declared a dividend of 75c. per share, making the payments so far for 1911, $3.50 per share. Since 1905 a total of $31.50 per share has been paid in dividends. The payments last year in the aggregate were $4.

Drill-hole No. 15 of the Mayflower M. Co. has passed through two copper-bearing veins, one being remarkably rich. The hole is down 1040 ft. No. 7 drill-hole of the Contact-Elm River company is down 250 ft. The vein was found at a depth of 185 ft. Work on the 460-ft. level of the Houghton Copper Co. has been stopped, and development has been resumed below the 475-ft. level.

MISSOURI

Jasper County

The Jack Possum M. Co. has been incorporated at

The Odell-Daley Material Co., capitalized at $5000, paid up, has been organized at Joplin to handle mine tailing, using it for railroad ballast, material for concrete manufacture, etc. Incorporators are O. M. Odell of Joplin, and J. A. Daly, F. M. Daly, and S. A. Wright, all of Nevada. At the Missouri Standard mine a rich body of ore averaging between 64 and 65% zinc has been found. A mill will be started. This ore, near the Four Corners, is as rich as any in the district, according to report.

MONTANA

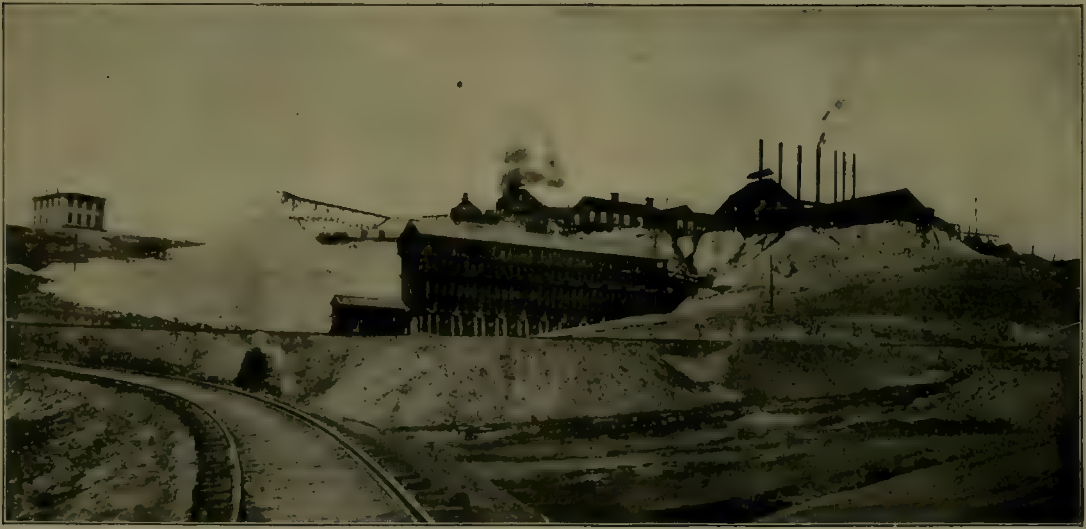
LINCOLN COUNTY

(Special Correspondence.)—Through the piercing for the first time of what has proved to be a false bedrock in the placer workings on Libby creek, a layer of rich gold-bearing gravel has been uncovered. A dollar and a half in gold has been taken from each pan of gravel from the bottom of the hole, and there is other ground which has the appearance of being similar. With the steam drilling-machine brought in here recently by J. Y. Ownbey and G. F. Hinton to prospect upon ground owned by William Criderman and John H. Town, a hole was put down to a clay formation which heretofore has been considered the bedrock on all the Libby creek placers. Then, by way of experiment, the drill was sent on down, and it was found that the clay was only 3 ft. thick, underneath which was a 3-ft. layer of gravel rich in gold. The hole is 48 ft. deep. There is an area of about 2000 acres of placer ground on Libby creek. Among the owners of placer ground near the Criderman-Town claims are the Libby Placer M. Co., headed by P. J. Brophy of Butte; the Comet Placer M. Co., also controlled by Butte men; George Chews of Spokane, and the Howard brothers of Libby. Throughout all of it, sufficient gold is found above the clay 'bedrock' to pay for working it on a large scale, but much greater possibilities are now opened up. The ground adjoining the discovery is taken up, and there is no chance for new locations.

Libby, September 12.

SILVERBOW COUNTY

It is reported that in the near future the Tuolumne Copper Co. will ship its ore direct to the Washoe smelter in Anaconda, as the Butte, Anaconda & Pacific railroad soon will be connected with the mine. The change will eliminate hauling the ore by teams and will save about 60c. per ton. The new plant of the Tuolumne company is to be completed within two months. The company has found an orebody 18 ft. wide on the north vein at the 1600-ft. level. The ore assays from 10 to 12% copper with some silver.



MINES AT BUTTE, MONTANA.

Ore shipped from the Ophir mine of the Butte Central Copper Co. so far has averaged $1800 per carload, according to report. Electrically driven air-compressors are now used at the mine, an electric pump is planned, and within a few months an electric hoist may be used. The new mill is to be ready in December.

NEVADA

ELKO COUNTY

It is reported that the Western Asset Co., German branch of the Rothchilds, is planning to erect an electric smelter at Contact, and build a railroad line from the camp to Valley Pass, on the Southern Pacific. Valley Pass is near Cobre. The company is to receive a 25% interest in all claims in the Contact district in return for the smelter and road. It is to put in a dam on the Little Salmon river for a hydro-electric plant to run the mines and smelter.

ESMERALDA COUNTY

A Philadelphia syndicate, including J. A. Steinmetz, J. A. Vincent, and J. S. Janney, is negotiating to acquire the control of the Vernal M. Co. in the Diamondfield district, with the intention of starting development immediately.

(Special Correspondence.)—H. A. Darms, of Napa, California, who with relatives owns extensive coal deposits at Coaldale, intends forming a company to develop the property. Some development work has been under way for six months, and his mine is said to be the first one in the State to operate its engine on coal from the mine. Fair quality coal was found at the 200-ft. level, and good coal at the 250-ft. level. The vein is 7 ft. wide, and there are four other veins east of the one being developed. R. W. Cattermole, chief engineer of the Tonopah & Goldfield railroad, is said to be interested. Adjoining claims are being developed by a syndicate, of which J. V. Ravenauck, Russion consul at Pittsburg, Pa., is a member. While the freight on Wyoming coal shipped to Tonopah is $9 per ton, it is reported the freight from Coaldale is about $1.50. The operating costs are about the same.

Tonopah, September 14.

HUMBOLDT COUNTY

Newspaper reports state that a vein discovered in a raise in the old Borland mine of the Rye Patch Con. property has ore which yields 500 oz. silver per ton and $125 from the screenings. The property is being operated by the Conlin brothers, formerly of Sierra City, Cal., and in Joplin, Clark Marshall being one of the chief stockholders. The property, in 'Possum Holler', Chitwood, is said to produce nearly 30 tons of blende per week.

the old days was one of the bonanza properties of the county.

According to C. W. Culver, of the Culver D'Armond lease at Awakening, the Critchfield discovery at that camp shows an 18 in. vein which pans over 50c. per pound.

LANDER COUNTY

(Special Correspondence.)—Maricopa Mines Co. has intersected a new orebody at a point 910 ft. from the portal of the True Blue adit. It is reported to be 7 ft. wide and to assay 20 oz. in silver and gold per ton. Silver predominates. East and west drifts are under way, and a raise has been completed from the adit to the surface. It is expected to have the mill in operation before winter sets in. The tramway from the mines to the mill-site has been completed. The Maricopa holdings lie in New York canyon, a short distance from the town of Austin. A shipment of 500 sacks of high-grade ore was recently made by the Austin Manhattan company from the Jack Pot mine to smelters, forming the second consignment of the month. A large quantity of milling ore has been extracted. It is understood that the dry-concentrating plant is effecting a recovery of over 70%. Francis L. Judd and California associates have taken the Yankee Blade mine under lease and bond. The 830-ft. shaft has passed through the Ford & Johnson and Confidence veins, with a cross-cut from the 300-ft. level intersecting the Yankee Blade vein. A 25-hp. hoist is on the ground and will be placed at the vertical Yankee Blade shaft, which will be unwatered.

Austin, August 24.

LYON COUNTY

The Nevada Douglas Copper Co. has entered into a coöperative agreement with the Western Gypsum Co. whereby the former will ship from its deposits at Yerington to the latter's mill at Reno. Walter C. Orem is president of the Nevada Douglas company and John L. Howard of San Francisco is president of the Western company. Shipments will be started in a few weeks.

J. M. Collier in the Sunrise district has discovered a vein of ore said to assay $200 gold per ton from the foot-wall and $600 per ton from the hanging wall. The vein is only 6 in. wide at the surface. J. G. Kaufman, of Yerington, bought the Empire-Nevada Copper M. & S. Co. property at a sheriff sale.

NYE COUNTY

On the northeast cross-cut on the 800-ft. level of the Rescue-Eula mine, a few days ago there was found a rich vein of quartz, which in streaks assays from $40 to $60 per ton, according to press reports. The cross-cut after penetrating 6 ft. had not reached the hanging wall.

The Tonopah Extension produced during August $56,000 worth of bullion, or 4384 tons of ore, an average of over 141 tons per day, according to unofficial reports.

(Special Correspondence.)—Directors of the Tonopah-Belmont company, at a meeting in Philadelphia last week, ordered the payment of the fourth dividend for this year, of 25c. per share. On the 1,500,000 shares outstanding the amount distributed will be $375,000, and will bring the total dividends this year to $1,350,000, and the total in dividends paid by the company to $2,093,000. Owing to a reserve fund held in the treasury the construction of the new Belmont mill in Tonopah will not affect the payment of dividends.

Tonopah, September 5.

WHITE PINE COUNTY

There are persistent rumors that the Ely Calumet Copper Co. of Ely, which has been idle since 1907, will resume operating in the near future. It is said that Al Myers and G. L. Rickard will have charge of the reopening of the property.

(Special Correspondence.)—The Giroux shaft has been again sealed, since when it was opened fire was discovered smoldering on the tenth level. It is doubtful whether the cause of the fire will ever be known, since the only man who probably knew was among those killed.

Ely, September 9.

NEW MEXICO

DONA ANA COUNTY

The Memphis Copper Co., operating the old Memphis mine in the Organ camp, is said to have found an 8 ft. vein of $60 ore at the 175 ft. level. N. J. Dailey is manager for the company.

SOCORRO COUNTY

(Special Correspondence.)—Shipping ore assaying $200 per ton is being sacked at the Little Charlie group of the Mogollon Gold & Copper Co. It is reported that a 90 day working lease has been let on a portion of the old Cooney mine.

Rapid progress is being made in constructing the new power plant of the Ernestine M. Co. The oil storage tanks have been received at the mines. Delivery of engines and other equipment will be made in September. During the past two weeks 1050 tons of ore was treated, with a concentrate product of 4 tons. Bullion for the second 10-day period of August amounted to 5100 oz. The slight curtailment in capacity of the plant is due to shortage of water.

Additional leaching capacity is being installed in the mill of the Deadwood mines. The gold and silver bullion product since last reported amounts to 5000 oz. Last week's ore treatment was 400 tons, with 20 sacks concentrate.

Good headway is being made in excavation and foundations for the new power plant of the Socorro mines, which will be erected near the reduction works. The mill is reported as now treating about 165 tons of ore per day.

A three-year bond and lease has been granted on the Iron group property, and it is said that extensive development will be started.

Mogollon, September 1.

OKLAHOMA

OTTAWA COUNTY

In the Miami, Oklahoma, camp an entirely new ore formation has been found in a drill-hole at a depth of from 170 to 204 ft., the ore being of much higher grade than the average at Miami. In the extreme north end of the camp development is being pushed toward the 290-ft. level, where a body of zincblende has been defined in a dozen or so drill-holes put down.

UTAH

SUMMIT COUNTY

Through an alleged mistake in signals, seven men in the lowest of the three decks of the cage at the Daly West mine at Park City were plunged into the sump, where the water was 17 ft. deep. Two men were drowned. J. E. Bamberger, president of the company, states the men disobeyed orders and should have been on the top deck. The hoist was in charge of an extra man, who, it is asserted, had operated the engine in a satisfactory way several times before the accident.

CANADA

BRITISH COLUMBIA

The British Columbia Copper Co. in July produced 854,122 lb. of copper, 11,777 oz. of silver, and 2430 oz. of gold. The July production of copper last year was 574,172 lb. The June 1911 production was 816,676 lb. of copper, 11,742 oz. of silver, and 2428 oz. of gold.

The Granby Con. M. S. & P. Co. in July produced 1,228,646 lb. of copper, against 1,671,000 lb. for July 1910. Its silver production was 21,038 oz., also considerably less than its production in July 1910, which was 29,205 oz. Its gold production was 2990 oz., against 3484 oz. in July 1910.

Lyman Carter, of Spokane, who is president and manager of the Blue bird mines in the South Rossland district, is planning extensive development of the property. A spur track is to be run to the mine and three shifts of men will be placed at work. Shipments of silver-lead ore are expected to be made to the smelter, beginning September. The Curlew and the Mayflower are producing high-grade ore from what is believed to be extensions of the same vein.

The Board of Conciliation and Arbitration as yet has not succeeded in ending the strike of miners in British Columbia. While the Granby company is still closed down, the British Columbia Copper Co. announces that it will not cease operations for the time being at least, and that it has ordered 5000 additional tons of Connellsville coke from Pennsylvania.

ONTARIO

The directors' report of the Apex Porcupine Mines, Ltd., issued this week, shows that 1,300,009 shares have been issued, of which 1,000,000 were in payment for the company. There remains in the treasury 699,331 shares. From the sale of stock $56,259 was received, which with $42 interest on bank deposits, brings receipts to July 31 to $56,701. For general expenses and development, $13,461 was spent, leaving a balance of $43,240. The report of P. Kirkegaard, engineer for the company, is included with the statement to stockholders.

The Temiskaming & Hudson Bay M. Co. paid a dividend of 300% August 31, state press reports, making the fourth paid this year and the third in the last three months. The dividend was the 32nd paid by the company since its formation in 1905, and on the 7761 shares issued the payments have amounted to 18,400% on the stock. The company has no definite periods for paying dividends.

The Swastika Central company, owning 18 claims in the Swastika district, will experiment with a shot-drill on the Green claim, at Pike lake, adjoining the Swastika mine.

A. G. Kirby is planning a mill for South Porcupine, but construction will not be determined for several months. It is to be a custom mill. Ten drills have been started on the McIntyre claim, which is equipped with a 12-drill compressor.

A site has been selected for the proposed $250,000 mill at the McIntyre, state reports from Porcupine. It is said the machinery will be in place before winter. The structure will be of reinforced concrete. Albert Freeman, president of the company, states that the mill will be prepared to crush ore milling $5 per ton, although he believes that for several years the value of the ore will average over $10.

Newspaper despatches assert that the International Nickel Co., headed by Ambrose Monell, operating the Dome mine, and interested in the Dome Extension, and reported to be the owner of the Jowsey-Wood claims in Carscallen, has bought the Porcupine Imperial company's property. Harry I. Taylor of New York is president of the latter company.

The Wettlaufer Lorrain Silver Mines, Ltd., with properties in Cobalt, has declared its regular quarterly dividend, No. 3, of 2½%, with the customary 2½% bonus, payable October 20 on stock of record October 10.

YUKON

The Yukon Gold Co. paid a quarterly dividend of 2%, or 10c. per share, on September 12.

MEXICO

BAJA CALIFORNIA

The Compagnie du Boleo in July produced 1,973,680 lb. of copper, against 2,315,040 lb. in June. The production for the first seven months of 1911 is 16,678,353 lb. of copper, against a production of 17,025,609 lb. for the same period in 1910.

CHIHUAHUA

Improvements at the Sierra Plata mine will increase the output from 90 tons per day to 300 tons in the near future.

It is reported that the smelter at Santa Rosalia will resume operations within two months. Bernard MacDonald will be in charge, and it is believed William Thompson, superintendent of the Veta Colorada M. & S. Co., will be superintendent.

As the result of one week's work at the Veta Colorada mill recently 26 bars of bullion, valued at $28,000, was shipped to the Stallforth bank at Parral. The capacity of the mill soon will be increased to 600 tons per day. C. F. Spaulding is manager.

(Special Correspondence.)—The report for July of the Rio Plata M. Co. shows a net return on shipments of $81,889. The stamp-mill crushed 1769 tons of dry ore which yielded 73,169 oz. of silver and 23.4 tons of concentrate. The cyanide plant treated 1999 tons of tailing containing 56,573 oz. of silver. The total value of silver recovered was $73,343, and operating expenses were about $12,500, leaving an operating profit of $24,842. There was expended on mine development $442.

Chihuahua, September 3.

(Special Correspondence.)—Owing to a temporary cessation of milling, operations at La Republica for July were as follows:

Tons milled	567
Production	₱32,861.01
Operating charges	₱35,846.15
Capital expenditure	₱ 2,622.60

The rainy season having brought an abnormal increase of water-flow in the mine, extraction of ore has had to cease pending completion of measures to protect the workings, and further production will be deferred accordingly.

Chihuahua, September 1.

SONORA

The Greene-Cananea Copper Co. has decided to operate the Puerticitos mine again, but it is probable that shipments will not be heavy. It is thought that while the decision indicates abandoning a retrenchment policy, the company still will keep its output between 3,500,000 and 4,000,000 lb. per month. Commencing with June, there has been no extraordinary construction expense to charge against cost of operating. At a cost of $4,000,000 the company has remodeled its plant thoroughly. The Sierra de Cobre mine, bought last year from Phelps, Dodge & Co., is said to have the low-cost record of the Greene mines. Ore is treated by direct smelting.

It is reported that James Box, Jr., son of Capt. Michael James Box, the first American traveler and explorer of Mexico, and an old-time ranger of Texas, is planning to purchase mines, mentioned in his father's memoirs, situated 12 miles east of Bavori. The property is said to have high-grade silver ore and to have been worked by the Spaniards.

GERMANY

The United States exported 91,771 tons of the 101,149 tons of copper required to satisfy the demand for the metal in the January-July period. Germany imported in all 160,077 tons, and exported 4928 tons of copper, according to figures compiled by Aaron Hirsch & Son.

PERU

Cerro de Pasco M. Co., according to apparently reliable reports, will commence to pay dividends in the near future. In the year ended June 30 there was shipped to the United States 48,600,926 lb. of copper to be refined and sold. In the year previous only 32,248,859 lb. was shipped, although that figure is over 5,000,000 lb. above that for the 1908-1909 twelvemonth. The bulk of the copper, if not all, is to be handled at the Baltimore refinery of the A. S. & R. Co., which has a contract for refining and selling the product of the Cerro de Pasco company.

PHILIPPINE ISLANDS

BENGUET

The Headwaters mill at Baguio is handling from 60 to 70 tons per day. Recent rains provide an abundance of water. It is stated that for ten months of the year there is no shortage in this source of power. At other times gas-engines are used. An extra engine has been ordered from the United States to insure running throughout the year. F. L. Cole, of Cole & Hanlon, is consulting engineer of the plant.

The stamps crush the ore in a cyanide solution through an 8-mesh screen, the pulp passing to a double cone classifier and a Callow thickener. The oversize passes to a Hardinge tube-mill. All ore passing a 100-mesh screen goes to a conical collector, from which charges are pumped to Pachuca tanks.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

W. H. Emmons is at Creede, Colorado.

John B. Farish is expected in San Francisco.

Courtenay De Kalb is to be in San Francisco.

T. Lane Carter is in Mexico examining mines.

R. S. Rainsford was in San Francisco Tuesday.

Gardner F. Williams is at the Fairmont in San Francisco.

C. Colcock Jones has gone to Nevada to examine properties.

F. Lynwood Garrison is examining coal lands in West Virginia.

G. L. Sheldon will return to Sonora about the first of October.

J. E. Adams, of Hawthorne, Nevada, was in San Francisco this week.

Stephen Rickard has been visiting San Francisco and other West Coast cities.

R. B. Brinsmade is superintendent at the Flojonales mines, Hidalgo, Mexico.

James M. Hall, whose headquarters are now in Chicago, has gone to Porcupine, temporarily.

John E. Rothwell, who is visiting Western metallurgical plants, was in San Francisco this week.

Stuart H. Ingram has been appointed manager for the Galenista G. M. Co., operating in Chihuahua, Mexico.

Leonard Sivyer will return to Los Angeles about September 20 from an extensive trip of exploration in San Diego county, and in Lower California, Mexico.

H. Kenyon Burch, mechanical engineer for the Miami Copper Co., will spend the next sixty days on the Pacific Coast, recuperating from an attack of peritonitis.

S. E. Bretherton will go to Denver about October 1, but hopes to return to San Francisco in time for the meeting of the American Institute of Mining Engineers.

T. C. Crawford, president of the United Gold M. & M. Co., sailed for London, September 13. He expects to return to San Francisco about the first of February.

Juan Felix Brandes, whose headquarters are now in the Newhall building, San Francisco, is leaving shortly for an extensive trip through Chile, Peru, and the Argentine.

Chester B. Allen, superintendent at the Tarantula mine of the United Gold M. & M. Co., has been appointed general manager for this company in California, with headquarters for the present at Chinese Camp, Tuolumne county.

Recent Publications

Commission on Conservation, Canada. Lands, Fisheries and Game, Minerals. Pp. 519, ill., index. Ottawa, 1911. Approximately half of this elaborate compendium is devoted to the minerals and the problems of the mineral industry of Canada. The mining laws and regulations are summarized, as are the statistics of production and of mine accidents. There is also a most interesting general chapter upon the conservation of the mineral resources. The spirit which pervades the report may be indicated by the following quotation:

"In considering the conservation of mineral resources it is of the utmost importance to observe the following facts: (1) There will be no mineral industry without profits; that is to say, no mining company will mine or extract these resources in such a manner as to entail continuous loss to itself in order to conserve such resources for the future. (2) The present generation has the power and the right to use *efficiently* so much of these resources as it needs. The past has proved that the needs increase with the extension of our industries, and more rapidly than the population. (3) The nation's needs will not be curtailed. The people will take what they require. Conservation of our mineral resources may be accomplished by investigation, education, and legislation. Investigation should be carried on to determine the nature and extent of each of our important resources; the rate at which each resource is being utilized; the nature and extent of the waste in mining, extraction, and use of each mineral product; how this waste can be prevented; to discover and develop substitutes which may take the place of products of importance, the supply of which is limited; to discover methods for utilizing by-products or other materials for which, under existing conditions there is no commercial demand, and if individuals and corporations are such that wasteful methods are used in order to make large financial profits, regardless of the rights of the future, such action should be restrained by legislation."

No attempt was made to estimate reserves of any of the metallic minerals, though the commission makes it clear that an increasing production is to be expected. Waste in the mining and milling of gold, silver, and lead is considered unimportant. In copper and nickel mining it is held to be large though mainly unavoidable. A recommendation that all slag, tailing, and other products containing metal but not marketable be stored, and that running such materials into streams be stopped. An approximate estimate of the coal reserves of the Dominion is made and many interesting and valuable data are brought together regarding the other non-metallic minerals of which Canada is so important a producer. The tone of the whole report is conservative but helpful.

The mining of phosphate rock for fertilizer showed increased activity in 1910, with the greatest production in the history of the industry, according to F. B. Van Horn of the U. S. Geological Survey. The output was 2,654,988 long tons, against 2,330,152 in 1909. Prices, however, were lower, the value of the 1910 output being $4.11 per ton, against $4.62 for 1909. While the tonnage in 1910 increased 13.9%, the value of the year's output increased less than 2%. Nearly half of the phosphate rock produced in 1910 was exported. There are at present five producing phosphate fields in the United States. In the order of quantity of production they are: (1) Florida, (2) Tennessee, (3) South Carolina, (4) Arkansas, (5) Idaho, Wyoming, and Utah. By far the largest of these fields is the Idaho-Wyoming-Utah field, where enormous deposits of high-grade phosphate rock, recently discovered, are available for mining. The field next in available unmined rock is probably Tennessee, where large areas are underlain by deposits of high-grade rock. Florida has a large reserve tonnage, but at the present rapid rate of mining it will not be many years before the rock will be exhausted. South Carolina has been mining phosphate rock since 1868, and the production has steadily declined since 1889, with the exception of two or three years, when a slight increase in production was noted. Arkansas has never been much of a factor, and, so far as known, the deposits are not of great extent.

The mine production of gold, silver, copper, and zinc in Tennessee in 1910, according to H. D. McCaskey, of the U. S. Geological Survey, was valued at $2,289,731, a decrease of $305,619 from the corresponding value for 1909. The gold production was 150.59 fine ounces, valued at $3113; the silver, 81,239 fine ounces, valued at $43,869; the copper, 16,837,727 lb., valued at $2,138,391; and the zinc, figured as spelter, 1,932,555 lb., valued at $104,358. When compared with the corresponding figures for 1909 these figures show decreases of $1005 in the production of gold and of 2,369,079 lb. and $358,494 in copper; but increases of 23,602 fine ounces and $13,898 in silver and of 740,394 lb. and $39,982 in zinc. A total of 578,434 short tons of ore was mined in 1910, of which 552,796 tons were copper ore and 25,638 tons were zinc ore. In 1909, 576,680 tons of copper ore and 34,334 tons of zinc ore were mined.

Market Reports

LOCAL METAL PRICES.

San Francisco, September 14.

Antimony	12—12¾c	Quicksilver (flask)	47½
Electrolytic Copper	14—15¼c	Tin	47—48⅜c
Pig Lead	4.75—5.70c	Spelter	7½—8¼c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50—9.75; large $7.50—8.50

METAL PRICES.

By wire from New York.
Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Sept. 7	12.28	4.50	5.87	52¼
" 8	12.28	4.50	5.87	52¼
" 9	12.28	4.50	5.87	52¼
" 10	Sunday.		No market.	
" 11	12.28	4.49	5.87	52¼
" 12	12.28	4.49	5.87	52¼
" 13	12 28	4.49	5.87	52¼

ANGLO-AMERICAN SHARES.

Cabled from London.

	Sept. 7. £ s. d.	Sept. 14. £ s d.
Camp Bird	1 8 9	1 8 9
El Oro	1 3 3	1 3 3
Esperanza	1 15 0	1 13 9
Dolores	1 5 0	1 5 0
Oroville Dredging	0 5 9	0 5 7½
Mexico Mines	6 15 0	6 17 6
Tomboy	0 17 6	0 17 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing prices, Sept. 14.		Closing prices. Sept. 14.
Amalgamated Copper	$ 55	La Rose	$ 4
A. S. & R. Co	67	Mason Valley	7⅝
Braden Copper	4⅝	Miami Copper	17¾
B. C. Copper Co	3¾	Mines Co. of America	5
Butte Coalition	14⅜	Nevada Con	16¾
Chino	18⅜	Nevada Utah	⅜
Davis Daly	⅞	Nipissing	7¾
Doble	1	Ohio Copper	1⅝
Dolores	4½	Ray Central	1⅛
First National	1	Ray Con	13¼
Foley O'Brien	1	South Utah	⅝
Giroux	4	Superior & Pittsburg	14½
Goldfield Con	5¾	Tenn. Copper	32¾
Greene-Cananea	6	Trinity	3½
Guanajuato Con	⅛	Tuolumne Copper	4
Hollinger	10⅝	United Copper	1¼
Inspiration	6⅝	Utah Copper	42
Kerr Lake	3¾	Yukon Gold	3⅝

COPPER SHARES—BOSTON.

	Closing prices, Sept. 14.		Closing prices Sept. 14.
Adventure	$ 4¼	Mohawk	$ 38¼
Allouez	23	North Butte	23½
Calumet & Arizona	48⅜	Old Dominion	26
Calumet & Hecla	410	Osceola	86
Centennial	8	Parrot	10
Copper Range	50¾	Shannon	8
Daly West	5	Superior & Boston	2¼
Franklin	6½	Tamarack	22
Granby	30	Trinity	3
Greene Cananea, ctf	5⅞	Utah Con	11½
Isle-Royale	12	Victoria	2
La Salle	3¼	Winona	5
Mass Copper	5¼	Wolverine	98

(By courtesy of J. C. Wilson, Mills Building.)

NEVADA STOCKS.

San Francisco, September 14.

Atlanta	$ .16	Mayflower	$ .04
Belcher	.55	Mexican	3.55
Belmont	6.50	Midway	.29
B. & B	.18	Montana Tonopah	.75
Booth	.08	Nevada Hills	2 55
Chollar	.12	Ophir	1.70
Combination Fraction	.09	Pittsburg Silver Peak	.90
Con. Virginia	.80	Round Mountain	.67
Florence	1.25	Sandstorm Kendall	.04
Goldfield Con	5.75	Savage	.24
Gould & Curry	.06	Tonopah Extension	90
Jim Butler	.24	Tonopah of Nevada	6.25
Jumbo Extension	.23	Union	1.37
MacNamara	.18	West End	.59

(By courtesy of San Francisco Stock Exchange.)

Commercial Paragraphs

The Crocker-Wheeler Co., of Ampere, New Jersey, announces the opening of a San Francisco office, room 400, First National Bank Building, in charge of John S. Baker, district manager.

Wm. H. Armstrong, for many years mill superintendent for the Dos Estrellas Mining Co. at El Oro, Mexico, has joined the sales force of the Mexico Mine & Smelter Supply Co., at Mexico City.

F. F. Lacks, Pacific Coast manager of the Orenstein-Arthur Koppel Co., is in Europe on an extended trip. During his absence D. W. Dodge and A. A. Prausnitz will assume the management for the company.

C. F. Braun & Co., Inc., has succeeded the corporation known as Braun, Williams & Russell. The new firm will continue to represent the Alberger Pump Co. Its address is the same—503 Market street, San Francisco, California.

Benjamin T. Delafield, who formerly represented the Lunkenheimer company for a number of years in the St. Louis and Kansas City territory, has become connected with the Best Mfg. Co., of Pittsburgh, Pa. He will make his headquarters in Kansas City.

The Geo. E. Dow Pumping Engine Co. has opened a display-room at 179 First street, San Francisco, where there are now on exhibition a great number of all styles and sizes of pumps for mining, irrigation, and water-supply. A full line of compressors is also represented.

The Gandy Belting Co., of Baltimore, sole manufacturer of the Gandy belt in the United States, has adopted a novel idea for distinguishing the Gandy belt from the other stitched cotton-duck belts. Commencing September 1, 1911, one edge of the Gandy belting will be painted green, while the rest of the belt will remain red as before, and it will continue to bear the brand "THE GANDY BELT" and their trade-mark, a coil of belt and a bale of cotton laid across it, printed upon the belt at intervals throughout the entire length of the roll.

The Griffin Co., San Francisco, agents for the Robins Conveying Belt Co., has recently secured a contract from the Melones Mining Co., Calaveras county, Cal., for a system of belt conveyors transporting and distributing ore direct from crushers to storage-bins. The equipment comprises three 16-in. Robins Belt-Conveyors, 12, 50, and 166-ft. centres, respectively, and one distributing tripper. The ore discharged from the crushers is carried directly to the bins by the main conveyor and is distributed the entire length of the bins by a long conveyor running at right angles to the main one, distribution being obtained by the Robins automatically propelled self-reversing tripper.

Catalogues Received

New York Engineering Co., New York. 'The Empire Hand Prospecting Drill.' 36 pages. Illustrated. 6 by 9½ inches.

The Excelsior Drill & Mfg. Co., Denver, Colorado. 'The Excelsior Airometer.' 8 pages. Illustrated. 6 by 9 inches.

Electric Weighing Co., New York. 'The Electric Weigher for Belt Conveyors.' 4 pages. Illustrated. 6 by 9 inches.

Joshua Hendy Iron Works, San Francisco. Bulletin No. 119, 'Stamp Mills.' Illustrated. 32 pages. 6¾ by 10¼ inches.

The Jeffrey Mfg. Co., Columbus, Ohio. Bulletin No. 41. 'Single Roll Coal Crusher.' 8 pages. Illustrated. 6 by 9 inches.

Atlas Engine Works, Indianapolis. Bulletin No. 201. 'Atlas Crude-Oil Engines' (Diesel Type). 36 pages. Illustrated. 8 by 10½ inches.

Allis-Chalmers Co., Milwaukee, Wis. Bulletin No. 1512 (Reprint), 'Compound Corliss Engines.' 12 pages. Illustrated. 8 by 10½ inches.

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EDITORIAL

THOUSAND-FOOT steamships are puzzling the harbor authorities of New York to provide docks for their accommodation. Before long we may be hearing of the struggles of the building commission to provide landing-places for airships on thousand-foot sky-scrapers.

NEW YORK leads in arranging for sectional meetings of the American Institute of Mining Engineers. The program for September 22 was the completion of the organization of the section and the reading of a notable paper by Mr. C. P. Perin on the iron and steel industry of India.

A SENATE bill provides that no higher postal rates shall be charged within the United States than are imposed upon matter mailed to foreign countries; in other words, that residents of the United States may have the benefit of the international parcels-post service. Perhaps the express companies are beginning to realize that increased facilities produce increased business, and that there is business enough for all, without any necessity for special privilege.

MANKIND is naturally hopeful, and the general depression which has long been widespread in business circles is so extraordinary as to call for volumes of comment from all sides. When such a habit of mind is persisted in there is danger of its becoming chronic, and it is unfortunate that the ghost of past over-speculation still lingers to hamper with its haunting memory the healthy growth of new business. Men learn by their mistakes, and the lesson acquired in 1907 should be an aid to business recovery.

THE American Mining Congress has postponed its forthcoming session until October 24 to 28 in order to secure the presence of the President, Mr. Taft, of Walter L. Fisher, and J. A. Holmes, and to permit the attendance of a large Alaskan delegation. The topics for consideration will be the prevention of mining accidents, workmen's compensation, the prevention of waste of natural resources, problems of coal mining, the Alaska question, and the relation of the mining industry to the public lands. These are fundamental and their interested discussion by a large body of representative men must naturally bear fruit in progress attained.

PLAGUE of the pneumonic variety, which last year ravaged eastern Siberia and northern China, was, as many of our readers know, derived from tarabagans, Asiatic marmots similar to our prairie-dogs, which are much hunted in Siberia for their skins. The sick animals communicated the disease to their slayers, who carried it to the villages, whence it spread, and was apparently about to sweep over north China when it was checked by prompt preventive measures. A commission, which has recently been studying the tarabagan in its native haunts, reports that there is no danger of a recrudescence of the plague this winter. It is said that the cackling of geese saved Rome; sick marmots seriously threatened the safety of the Chinese Empire.

NOTABLE economy in the use of timber will result from the action of the lumber associations in putting into practice the plan suggested by the Department of Agriculture of selling lumber in odd lengths. Now a stick too short to make a 16-foot length is cut to 14 feet, though builders often could use odd lengths to better advantage; studding, for example, is commonly 9 feet long. The new departure is a reasonable one.

VISIT of the Secretary of the Interior to Alaska has already been beneficial in producing a better feeling. Judging from private letters and local newspaper comment, Mr. Fisher made an excellent impression on Alaska, as the Territory did on him. Complaint emanates from Ketchikan because he was there the guest of the Alaska Packers Association. It was not to be expected that everyone would be satisfied, but fear that Mr. Fisher might be too favorable to 'exploiting corporations' is a new note.

ONTARIO goldfields continue to attract attention, and the new district, at West Shining Tree, has become the objective point of many prospectors. Many areas in Ontario are of much promise and may prove in the end to be of much value, but it should not be forgotten that the actual production of gold in Ontario is small as yet, and that the excitement created by a new discovery is not a reliable index of its true worth. The great value of some of the mines has already been demonstrated. Conservative statements are all that are desirable, and will in the end produce the soundest growth and development.

THE pacific power of capital is seen in the situation in Europe, where the great banking houses have spoken with authority regarding the Moroccan dispute. Primitive peoples may go to war whenever they hear the Red Gods calling, there being little to suffer injury except the anatomy of the combatants, but a modern civilization has too many interwoven threads of international interest to permit of disturbance without the gravest need. The boys may scuffle in the barn; the older people comport themselves differently in the drawing room. Arbitration treaties do not exhibit the growth of friendly feeling alone, rather they exhibit a realization that nations cannot afford to go to war under present circumstances.

PROSPECTING would be made easy if only a brief set of rules could be prepared giving the prospector infallible directions where to look for valuable deposits of ore. How to procure such a set, and how to be sure they are infallible, is another matter. Many prospectors work out for themselves something of the sort, with varying degrees of faith in its infallibility. Sometimes the conclusions reached are based upon inaccurate observation and faulty deduction, with the result that the final state is worse than the first. But when the problem is attacked by scientific methods generalizations of much value may be formulated. The frequent association of ore deposits with vulcanism is now well established and some years since Mr. T. A. Rickard pointed out that this in certain areas was of Tertiary age. On another page Mr. C. R. Keyes points out the importance of the form of vulcanism, and emphasizes the frequency of association of ore deposits with laccoliths. When we limit the inquiry to an area in which similar mineral associations occur, a petrographic province, other factors have a recognized index value; thus Mr. F. L. Ransome detected the association between alunite and gold at Goldfield, and many other interesting and useful instances of mineral association have been noted and used. The geologist, who knows that such generalizations have only been derived from the careful study of a great mass of conflicting evidence, is able to use them with safety and to advantage; the prospector who sees in them only a short cut to success, frequently employs them in a way that leads to but little of success or satisfaction. Such guides are only of general value; just as it is unsafe to make the assertion that the well brought up son of highly respected parents will necessarily prove a useful and successful man. When geologic guides to prospecting are over-emphasized the resulting reaction is likely to produce the depressed state of mind of the Cornish prospector who said "wheer she is, theer she be; wheer she bain't, theer be I."

PERUVIAN petroleum is lighter in grade, and hence more valuable for refining than that of California. Last year the Standard Oil Company imported 125,000 barrels of Peruvian oil, and it is interesting to note that the tank steamer bringing it north carried California crude in return. The principal developed oilfields of Peru are near Paita, in the northern part. The Lobitos Oilfields Ltd., according to *Peru To-day*, had 92 producing wells on December 31 last. The wells are about 1300 feet deep, and had initial outputs as high as 250 barrels. A second deeper sand is known and the ground is being tested to depths of 3000 feet. In southern Peru oil is also being developed in the province of Huancane, where the Titicaca Oil Company is active. The total output of the country in 1910 is estimated at 1,400,000 barrels, and there is every probability that production will increase here as elsewhere in South America.

San Francisco Meeting of the Institute

Plans for entertaining members of the American Institute of Mining Engineers on the occasion of their visit to California are rapidly assuming final form. At Los Angeles a strong local committee has been formed and the Eastern members will be entertained at dinner, probably on the evening of their arrival. Friday they will be given a trip to the beaches, and Saturday an automobile ride around the city and to Pasadena. Owing to the visit of the President to San Francisco October 14, and the exercises incident to beginning construction of the Panama Pacific Exposition, the plans previously announced by the San Francisco committee have had to be changed. The general excursion to the oilfields has been abandoned and in its place members desiring to visit Bakersfield will be given opportunity to do so, October 8 and 9, between sessions at Los Angeles and San Francisco. Meetings will be held in the latter city Tuesday afternoon, October 10, and Wednesday and Thursday forenoons. Evening sessions will be arranged if desired. Wednesday afternoon the party will be taken by special train to Palo Alto, where they will be met by resident members and shown through Stanford University. A similar excursion to Berkeley is also to be arranged, as well as trips to various metallurgical and manufacturing plants around the Bay, at times most convenient to small parties. Friday the engineers will be taken to Natoma to see the great dredges and rock-crushing plant. They will be given a luncheon at the club-house of the Natomas Consolidated of California, and will have every opportunity to see the operation of the dredges of the Natomas and Ashburton companies. Messrs. Newton Cleaveland, Corey C. Brayton, and Robert E. Cranston constitute the local committee. Saturday will be spent at San Francisco, where the Exposition officials have arranged an elaborate program and where in the evening there will be a carnival showing the city at its best. Sunday the excursion to the Bohemian Grove will be conducted as previously announced. Incidentally, these changes will reduce the cost per individual for California members who desire to take part in the excursions. Owing to the necessary absence of Mr. M. L. Requa, financial arrangements have been taken over by the general committee, and members desiring to contribute to the guarantee fund should send checks to the chairman, Mr. W. C. Ralston. An excellent meeting is assured, but it is hoped that as many as possible of the three hundred or more members resident in California will arrange to be present.

Smelter Fume

Smelter fume has been for some years past a critical problem in the metallurgy of the metals which chiefly occur as sulphides, of which copper, lead, and zinc are the most important. Smelters, like many other industrial plants, have always been considered undesirable neighbors because of the odors emanating from them, though when compared with tanneries, glue factories, stockyards, fertilizer works, and many other useful and necessary forms of industry, their offense seems almost negligible. The solid particles in the fume, gradually settling in the neighborhood of the stack, have also been sources of complaint. Dust of any sort is objectionable, and it has also been urged that the chemical effect of the dust settling from smelter fume is deleterious to the vegetation upon which it may settle, and to livestock that may browse upon this vegetation. It is unquestionable that injured vegetation and dead livestock have been found in the vicinity of smelters, but that the damage was the direct result of smelter fume can rarely be definitely proved.

The solid particles commonly present in smelter fume are of two kinds, fine particles of ore and flux which are carried off by the force of the draught, obviously no more objectionable than the ordinary dust of a country road, and fine solid particles which have been produced in the smelting operation itself. The most important of these are condensed sublimates of some of the volatile metals, notably oxide of arsenic, and H_2SO_4. The latter is produced in roasting and smelting both by the catalytic action which certain oxides, principally of iron and silica, exert on SO_2, and by the decomposition of various sulphates by heat. The SO_3 thus formed takes up moisture as soon as it has cooled sufficiently, forming a fog of sulphuric acid. Except when smelting a charge high in sulphur, the amount thus formed is undoubtedly small, and it is unquestionable that the damage produced has often been greatly exaggerated. Where any considerable amount of arsenic is present in the ore it will largely escape as fume and may poison livestock grazing near the smelter. There has been much controversy over the subject of smelter fume, and only a few points seem to be clearly established as yet. One is that the damage complained of has often been greatly exaggerated and in many cases can be proved to be due to causes other than smelter fume. The second is that damage has been done in some instances. The third is that it is commercially feasible to remove solid particles from fume before allowing it to escape. The Cottrell electrical process of precipitating solid matter had given good results at the Balaklala when that smelter was closed for a variety of reasons, and it has also been found possible to neutralize the sulphuric acid formed and then to remove all the solid by filtering through bags, in much the same method as that employed in the production of sublimed pigments of zinc and lead. Part of the cost of this work is defrayed by the increased recovery from the solids; the remainder may be regarded as an excise tax upon the privilege of carrying on smelting operations in agricultural districts. That a smelting industry should be compelled to carry this burden when the smelting operations antedate the agriculture would seem unreasonable, but legal privilege does not always coincide with justice and equity. The third cause of complaint is the most difficult to deal with. In roasting and smelting operations large quantities of SO_2 are discharged into the air; practically all of the sulphur driven off in roasting and all the sulphur of the smelting charge which is not drawn off in the form of matte escaping in this way. That SO_2 will injure vegetation is known to everyone who has had occasion to disinfect a sickroom containing growing plants; that the gas must be of a certain degree of concentration to produce injury is capable of equally simple demonstration. Theoretically the gases escaping from the smelter stack quickly mix with the outer air and are so diluted as to become harmless. Practically, it appears difficult to secure complete mixing of escaping gases with the great mass of the atmosphere, and they frequently travel to a considerable distance in nearly their original state, as the muddy water of a small tributary is often distinguishable in the clearer water of a large river for long distances below the point of inflow. Where the percentage of sulphur on the charge is low, this is no great matter, as the undiluted gases are not concentrated enough to produce injury, and smelting works have, for example, long operated undisturbed among the fertile farms of New Jersey. But where the sulphur content is high, as in pyrite smelting, the degree of concentration becomes dangerous, and the injurious effects of the gas may be increased by a moist climate, which tends to heighten the effect of SO_2, or by the topography, which may produce atmospheric currents that carry the escaping fume, undiluted, into contact with nearby vegetation.

Blowing air into the base of the stack by means of fans has been tried, but that the power cost is a disadvantage of this method is obvious. Converting the SO_2 into SO_3, which may be made into sulphuric acid, is done at the plant of the Tennessee Copper Company, and the objectionable gas is thus made a source of profit. But this can not form a universal solution of the problem; the initial outlay required is too great for small companies, and if all smelting plants engaged in the manufacture of acid the market would be inundated. It is also necessary that the fume shall have a high concentration in SO_2 to allow its economical conversion into acid. The problem is accentuated by the statutes of some States, which provide that the escaping fume must have a sulphur content so low as to be procurable only at a prohibitive cost. As described on a following page, Mr. Stewart W. Young has attacked the problem boldly by proposing the reduction of the SO_2 to sulphur by hydrocarbons, using calcium sulphide as the intermediary. The suggestion is a novel one, and the results of trial upon a working scale will be of much interest. Evidently one problem will be to bring the fume thoroughly into contact with the calcium sulphide without interfering seriously with the draft. In this connection it may be noted that in the early stages of the Gayley dry-blast process it was suggested that the blast be passed over calcium chloride, to which it would give up its moisture, the chloride to be regenerated by passing the gases of combustion over it. The mechanical difficulties of this method were found insuperable, though recent reports from Germany are to the effect that the method is being successfully practised there. In many other cases where a reversible reaction has been made the basis of a continuous process it has been found that after a number of reversals the reaction becomes slow and incomplete. The question of cost is the vital one, and the sulphur produced can scarcely be counted on as an asset. The cost data of experiments upon a working scale will be the criteria of success, and meanwhile we assume the prerogative of extending the thanks of the profession to Mr. Young for his efforts toward the solution of an urgent metallurgical problem.

Vanadium Deposits in the Caballo Mountains, New Mexico

By Carl A. Allen

Among practical mining men and many mining engineers there was long an inclination to consider vanadium and uranium as rare metals, whose consideration and study should be left to the research chemist and rare-metal enthusiast. This was also true of tungsten, but as the deposits of wolframite, in Boulder county, Colorado, and elsewhere, have now for some time been engaging the activities of metal miners, vanadium is also beginning to be regarded as a metal to be sought and its deposits studied like those of gold, silver, or copper.

The principal use of vanadium is in the manufacture of steel. It gives to steel toughness and the ability to withstand repeated shocks. The parts of automobiles that must stand the severest strains, especially jarring strains, are made from vanadium steel, as is drill steel for rock-drills.

So far as I am aware, only two States can boast of workable deposits of vanadium; Colorado and New Mexico. In Colorado the ore is principally carnotite and is found in stratified rocks in the region from Placerville west to the Utah line. In New Mexico the deposits of vanadinite or vanadate of lead, which this article describes, were really discovered in 1909, although the veins had been worked for lead for a number of years. The Caballos mountains, in which they are found, are about half way between Albuquerque and El Paso, in Sierra county. They run parallel to and are about six miles east of the Rio Grande river. Their length is about thirty miles, and near the northern end is the site of Elephant Butte dam, the largest project of the United States Reclamation Service. The highest elevation is about 10,000 ft., or from 5000 to 6000 ft. above the bed of the river. Near the mines, Palomas pass divides the range into North and South Caballos. The nearest station is Cutter twelve miles nearly due east on the Atchison, Topeka & Santa Fé railroad.

Geologically, the region is old, and, to the casual observer, unattractive. Leaving the railroad for the mountains, the first six or eight miles of the country is flat and barren, the road now and then passing over nearly obliterated sheets of black lava. Then low, rough foothills are reached that have been formed by the tilting of sedimentary beds of limestone, shale, and quartzite. These continue to the foot of the main range, and were, no doubt, tilted when the range was formed. The range itself is more like a long, rough hogback, and is composed of sedimentary beds of limestone lying on its eastern slope, and on the western side granite, gneisses, and schists. F. C. Schrader[1] calls the age of the limestone Carboniferous and makes note of a large bed of Cambrian quartzite below it, and also of a large fault scarp on the western side. The beds are, no doubt, of Paleozoic age, as fossils of that age are abundant. Beds of gray limestone are interspersed with thin strata of shale and calcareous slate. These beds I would class as Silurian, while the red strata geologically next above, and which form a line of hills just east of the veins, are, no doubt, the Carboniferous 'Red Beds' mentioned by Schrader.

For at least six miles, parallel fissures that cut these sedimentaries can be found, and a number of them have been prospected for lead. While the fissures are strong and well defined, the lead in the form of galena is of low grade and in scattered places in the veins, perhaps being confined to a contact between a bed of limestone and shale.

In the exploration of these fissures for lead, the Southwestern Lead & Coal Co. has been active. Many feet of work was done on the Napoleon and Rosa Lee veins, and considerable low-grade galena found on the latter. The company built a small concentrator for its treatment, and to add to its holdings purchased the Swan and Dewey veins. As these two are now the ones being actively worked for vanadium, their history may be interesting. The Dewey was located by R. Widner and his father. The White Swan was located by non-resident prospectors, and when they allowed their rights to lapse, Widner located the claims early the morning of April 1, 1906, only to find that R. T. Ward had been there at midnight and located ahead of him, giving it the name White Swan. Ward, however, agreed to allow Widner a half interest for doing the location work, and later traded to him his remaining interest for a Jersey cow. In the fall of 1907 Widner sold both claims to the Southwestern Lead & Coal Co. for $3000. They were considered valuable at that time only as lead prospects. The Dewey had practically no work on it, the Swan a short adit and a shallow shaft. In the adit was a streak of galena and a 6-in. streak of pure vanadinite. This was called lead carbonate, although the elder Widner was not satisfied about it and spent much time studying the long, brown, hexagonal crystals which separated so beautifully in his pan. The transfer to the lead company was made shortly before that company ceased operations, and very little more work was done. The two veins lie parallel, about 700 ft. apart, and are one and one-half miles north of the old lead mine, where the concentrator is situated. After the discovery of the value of the vanadium content of the veins, A. B. Bement, of Terre Haute, Indiana, one of the stockholders of the lead company, organized the Vanadium Mines Co. This company took over all the property of the lead company and has been actively at work developing these two claims and working out the treatment of the ore.

NEW SWAN HEAD-FRAME.

DEWEY HEAD-FRAME AND ORE-BINS.

The third and only other vein of importance so far opened up is the Red Top, one end of which is owned by R. Widner and the other end by J. H. Hardin. It was quite extensively prospected for lead, and has one shaft over a hundred feet deep. The vein lies south of the Swan and Dewey veins, about ¼ of a mile, being about half way between them and the lead zone.

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[1] 'Ore Deposits of New Mexico,' U. S. Geol. Surv. Prof. Paper 68, p. 284.

As before mentioned, these three veins belong to a large number of parallel fissures in massive limestones and slates. The three have galena in common with the others, but also have vanadinite, or vanadate of lead, which the others do not have. The ore occurs in shoots from 2 to 20 ft. wide, and of undetermined length. In the Dewey vein the vanadinite occurs in coarse crystals, sometimes almost black. The hanging wall is well defined and is usually followed by a streak of almost pure crystals in solid radiating masses or disintegrated as crystalline sand, the color being dark brown to black. Away from this streak the ore occurs as fine crystals in a fine black dust, probably pure manganese oxide in a very porous gangue. This gangue varies from barite and calcite to a slightly altered limestone. In the latter case the black oxide of manganese fills the seams and cracks and when panned yields beautiful yellow-brown crystals of vanadinite. In the main working shaft at 75 ft. a natural cave was found, 3 ft. wide, 30 ft. long, and 12 ft. high. There is very little galena in this vein.

CONCENTRATOR, WITH CABALLOS MOUNTAINS IN BACKGROUND.

The White Swan vein is the most developed and presents the most interesting study. It has a main shaft with drifts on the vein at 80 and 140 ft. From the first level a winze has been sunk toward the second, and a raise brought to the surface. Considerable stoping has been done. The vein is from 2 to 20 ft. wide, and the vein filling is a porous, friable calcite or altered limestone, with varying amounts of barite and fluorspar. The porosity ranges from vug-holes the size of a marble to caves 5 and 10 ft. long. The ore is of two classes; the most common is vanadinite in minute hair-like crystals, much finer than those in the Dewey, and usually as little rosettes lining the cavities in the vein filling. The crystals, although perfect in form, are exceedingly delicate and slender. They are of a yellowish brown color, and with a white background or base of calcite form specimens of exquisite beauty. Where these crystals occur, the solid portion of the gangue is impregnated with the same material, making the fine and coarse of the broken rock nearly uniform in grade. The other ore is both a molybdate and vanadate of lead, impregnating the altered and silicified lime. This ore is non-crystalline, and although containing many vugs and cavities, is hard and much more difficult to break than the other ore. The manganese dust that is found in the Dewey vein is found in many places in the Swan vein. Also at nearly every place in the Swan vein can be found a streak, 12 to 18 inches in width, having galena and small amounts of copper carbonates. This streak may be in the vein or lying on either wall. Often there will be a gradual change from the soft porous gangue containing the vanadinite to the firm silicified limestone bearing the coarse cubes of galena.

The genesis of the deposits presents an interesting field for study. The scarcity of the mineral in workable deposits and its occurrence here in only three of a large number of parallel fissures is sufficient to arouse the curiosity of the economic geologist. From the data that can be gathered at this stage of the development of the mines, it appears that there have been two distinct earth movements at widely separated periods of time. The first was, no doubt, when the Caballos mountains were formed and caused the large fault on the western face and the original fissuring on the eastern slope. The second disturbance was apparently productive of very little structural change, but from the cooling magma of the intruding rock hot solutions emanated and, following the line of least resistance, circulated in the old fissures, and by processes of replacement and fresh deposition, took away part of the galena ores and left vanadinite. That there has been replacement there is no doubt, little cavities showing perfectly by their shape that they once held crystals of galena, are now lined with crystals of vanadinite. Also the gentle gradation from vanadinite in its soft porous gangue to galena in a harder, less altered gangue is further evidence of replacement. That this replacement was effected by circulating meteoric or surface waters is improbable. First, because the magnitude of the deposits is great and the process of deposition has been carried far into the walls beyond where any signs of former galena deposits can be noted. Second, because surface waters frequently contain hydrochloric or sulphuric acid, both of which are solvents for lead vanadate. Third, the veins at the present time are entirely without water, and its presence at any time in any quantity, such as to cause a secondary enrichment, would have left appreciable amounts of the green oxide of vanadium, of which there is practically none.

East of the shaft on the 80-ft. level of the Swan mine, occurs a very sharply defined fault plane, cutting the vein at nearly right angles and dipping to the east 45°. To the west of the fault the ore-shoot is 15 ft. in width and shows extensive mineralization. On passing through it, a larger part of this is cut squarely off and the minerals appear as seams of very rich ore along a relatively narrow body of average grade ore and in little cracks often running far into the lime. These conditions indicate the existence of this fault plane when the waters that formed the vanadium shoots were circulating. Its slickensides of clay formed a barrier to the solutions, with the resulting larger mineralization on the one side.

The shoots dip to the east, and Mr. Bement directed the early development of the property with the idea of their following the dip of the strata and being confined to one or more certain beds of limestone. Working on this assumption, and carefully watching the ground as it was being opened, he kept the workings always in ore, with the result that there is a remarkably small amount of dead work in either mine. That there is some change in the mineralization as the vein passes into various beds of limestone, there is no doubt, but personally I do not believe that the shoot will be found to have the same dip as the strata. It seems to be more nearly vertical and approaching the dip of the fault plane. Mr. Bement located this fault plane on the surface of the Swan claim, and I noted several evidently of the same series between the Swan and Dewey claims. If these faults continue with depth, they will probably influence the outline, if not actually determine the dip of the shoots.

The Red Top vein shows the same features as the Dewey and Swan. At either end of the vein the combination of molybdate and vanadate is seen to be the dominating type of ore. This vein can be traced for a greater distance than the others, and the shear-planes parallel to the main fissure indicate considerable fracturing. No compact orebodies of magnitude, like those of the Swan and Dewey, have as yet been found. In the main shaft driving has been done on irregular bunches of yellow massive ore, while to the side of it is seen manganese oxide containing vanadinite. In this is a cave some 10 ft. wide, 10 ft. deep, and 30 ft. long.

What igneous rocks are associated with the different earth movements can only be determined by careful field study and petrographic examination. North of the mines, there are extensive flows of lava. East of the concentrator can be seen the remnants of a flow lying on the 'Red Beds,' and east in the vicinity of Ward's ranch there are numerous dikes cutting through the Cretaceous strata, some of which can be traced for long distances.

Statements as to the average grade of the ore might at this time be misleading, due to the relatively limited amount of development. The Vanadium Mines Co. has expected the mines to average 1% ore. Pure vanadinite contains 10.8% metallic vanadium, and it follows that the grade of the ore can be regulated a great deal in the mining or by sorting. Of the massive ore free from crystals, the combination of vanadate and molybdate runs from ¾ to 2%, which is better than where the molybdate is absent. When ready for steel, as ferro-vanadium, the metallic vanadium is worth at the present time $4 or $5 per pound. At this price ¼% ore has a gross value of $20 to $25 per ton, and with a modern mill and proper treatment of concentrate should yield a good profit. There is very little difference in assays from the three veins, and all have large quantities of ¼ to ½% material, and although an attempt may be made to keep the grade up to 1% at first, the lower-grade material will, no doubt, be eventually treated.

The treatment of the ore is first by concentration. The old lead concentrator is used for concentrating the ore in a small way and as a testing plant to determine the most efficient equipment for a modern mill nearer the mines. The mill is inadequate for permanent duty, principally because of the lack of fall in the original site. The ore must be ground to at least 20 mesh, to liberate the minerals, and this means the slender friable crystals are reduced to fine. This and the presence of the barite are the most difficult features in the concentration; a modern mill, however, should effect a good saving. The pure mineral contains 65% lead. Its specific gravity is the same as galena, but, unlike that mineral, there is no tendency for the fine ore to float.

Water is a very serious question in this part of New Mexico, and the present supply for this mill is obtained from drilled wells at the power-plant, four miles east. The water is pumped this distance through a 4-in. spiral-riveted pipe, and although the profile of the line is rough (the maximum head being 350 ft.), no great difficulty has been met.

To obtain the vanadium from the concentrate two processes are required: (1) obtaining the vanadium oxide, (2) converting the oxide into ferro-vanadium, in which form it is used by the steel companies. The first is the most difficult and expensive process. The Vanadium Mines Co. erected a plant at Cutter to leach the vanadium from their concentrate with sulphuric acid. The lead is left as a residue of lead sulphate and the liquor containing the vanadium is evaporated to dryness and the residue calcined to vanadium oxide. One difficulty is to secure a thorough leaching. The acid has a tendency to form a coating of lead sulphate on the outside of the grains of mineral, which protects the inside from further action. Experiments have been conducted along the line of smelting with an acid flux, the vanadium to be then leached from the slag with water. This has been done in Germany and may be found to be more efficient than the acid treatment.

This company is the pioneer with this class of ore, and, like all pioneers, must by experience and increasing knowledge of the peculiar conditions, work out the method that, from a commercial standpoint, will be the most profitable. Others that come after will profit by its experience.

ALABAMA'S gold production in 1910 was 1622.16 fine ounces, valued at $33,533, and that of silver 268 fine ounces valued at $145, according to H. D. McCaskey of the U. S. Geological Survey. These figures show an increase in value of gold output for Alabama of $4294 and an increase in silver output of $35 in value. The silver production is entirely from recovery of this metal in refining the gold. The production of gold and silver in Alabama in 1910 was reported from three deep mines and three gold placers. The total placer gold was valued at $357 in 1910, as against $69 in 1909. The deep mine production was from 9763 short tons of ore with an average recoverable value per ton in gold and silver of $3.41. In 1909 the ore production was 9886 short tons, but the recoverable value per ton was only $2.96.

THE SLOPE of the surface at any point is one factor determining the amount of water absorbed by the ground. The direction and amount of slope also determine the form of the water table; that is, of the upper limit of saturation. Except where the surface is flat, the water table is generally not parallel with the surface; it is almost invariably farthest from the surface on the summits of hills and mountains and nearest to it in valleys and along the coast, reaching the surface in swamps and along rivers, lakes, and beaches. The surface of the water table is always in motion, its higher portions flowing toward the lowest outlets along rivers or the sea. This direction of flow explains why fresh water is usually found when a well is dug in a sandy beach.—'Water-Supply Paper 223,' U. S. Geological Survey.

Unprofitable Copper Mines

By J. R. Finlay

[*]Several of the Lake Superior companies have mined copper at a loss, even during the high prices of the last five years. This fact was ascertained early in the investigation, and unless their records showed some signs of progressive improvement, no particular attention was paid to these concerns.

Franklin Conglomerate. The Franklin Junior mine has been working a conglomerate lode between Hancock and Calumet. During the past five years it produced 15,258,000 lb. of copper at an average of 16.7c. per pound. The output declined from 4,571,000 lb. in 1906 to 966,000 lb. in 1910. This record is such that the mine can be classed as absolutely unprofitable and I appraise it at zero.

Atlantic Mining Co. makes the following report: "The Atlantic mine caved in May 26, 1906, and the work done since has been entirely of an exploratory nature except that the stamp-mill has been doing some custom work, and this work shows no profit. It was done to keep the mill in condition to use if anything of value was found on ore lands. Explorations are now all stopped and the machinery is being dismantled."

This mine was formerly profitable, but suddenly caved in, as above described, because the openings had become too extensive. This property has recently been absorbed by the Copper Range Consolidated. The consideration was an issue of 10,000 shares of stock of the latter company, equal to 2½% of its capital. As the Copper Range Consolidated owns the Baltic and Tri-Mountain mines and half the Champion mine, together with the Copper Range railroad, it is plain that the valuation to be put on the Atlantic is 2½% of the total valuation of the Copper Range Consolidated. As this includes appraisement of the railroad company, I cannot state exactly what the amount should be, but based upon the valuation I have put upon the above-mentioned mines, it should apparently be about $350,000. This valuation covers 962 acres of mineral land and a mine which is stated to be as good at the bottom as it ever was, but needs to be reopened from the surface.

The Winona Copper Co. produced during 1906 278,182 lb. of copper at a cost of $1.05 per pound; 219,332 lb. of copper at a cost of 32c. per pound in 1907; and in 1908, 39,310 lb. at a cost of more than $5 per pound. It has been developed by two shafts: No. 3, 1272 ft. deep, and No. 4, 1460 ft. deep. The rock mined during the last year of production, 1907, produced 12.6 lb. of copper per ton. This record shows the mine to be absolutely unprofitable.

The King Philip Copper Co. has spent during the past five years $909,840; is developed by two shafts, one 1124 ft. deep and the other 1324 ft. deep. The latter showed ground like that opened in the Winona mine. This mine evidently has no value, the only hope being a remote one of finding better rock. The large amount of exploration done on the Winona and King Philip would ordinarily be considered a sufficient demonstration of the possibilities.

The Ash Bed Mining Co. attempted a little mining in 1906 and 1907, producing 1600 lb. of copper in 1907 at a total cost for the period under review of more than $8 per pound. In 1907 mining operations were discontinued and have not since been renewed.

The Tamarack Mining Co., which formerly paid large dividends, has become distinctly unprofitable during the period under review. It is still producing considerable copper, having produced 58,314,000 lb. during the last five years. Its average cost has been 15.2c. per pound. In 1906 the cost was 15.29c.; in 1907, 16.98c.; in 1908, 15.53c.; in 1909, 14.1c.; in 1910, 14.53c. Undoubtedly the management hopes to reduce the cost and make some profit, but I am not willing to appraise hopes when contradicted by the figures on such scale as this. I, therefore, value the mine at zero.

The La Salle Copper Co. produced 791,000 tons of copper during 1909 and 1910, at a total cost of 45½c. per pound. This property has a large acreage on the Kearsarge, Osceola, and Calumet conglomerate lodes. The southern end has still no promise. No. 1 and 2 shafts are down 2000 ft. and 1400 ft., respectively; about 17,000 ft. of driving has been done, and out of 181,075 tons hoisted, 64,598 tons were treated as ore, yielding 10.8 lb. of copper per ton. If this record demonstrates anything, it demonstrates that the property is hopelessly unprofitable, and I appraise it at zero.

The Gratiot Copper Co. produced in 1910 29,869 tons of rock which were stamped, yielding 283,615 lb., this being a recovery of 9.5 lb. per ton. Operations were suspended April 1, 1911, apparently with very good reason, and I appraise this property at zero.

The Centennial Copper Mining Co. occupies 640 acres of land at the south end of the Kearsarge lode. It adjoins the South Kearsarge and Wolverine mines on the west, and it would be strange if none of the ore worked by those companies crossed the line. However, the record of this company shows no promise. During the last five years 10,980,000 lb. of copper has been produced at a cost of 18.4c. per pound, the total loss in five years being about $290,000. While admitting that this mine may become profitable, this event depends entirely on the extent to which the Wolverine orebody may cross over upon its ground. It is not by any means impossible that it may never do this, as some of the ore-shoots take a course almost due north, in which case the Wolverine orebody might continue in a direction parallel to the Centennial boundary. I, therefore, appraise the value of this mine at zero.

The Victoria Copper Mining Co. has produced in the last five years 5,270,000 lb. of copper at a cost of 19c. per pound; the average yield is 10.9 lb. per ton. This record shows the mine to be hopelessly unprofitable.

The Mass Consolidated Mining Co. has produced during the past five years 10,988,000 lb. of copper at an average cost of 18.3c. per pound. This mine has been securing about the same results for the last twelve years and has called assessments for the amount of $2,100,000. Its record shows it to be hopelessly unprofitable, and I appraise it at zero.

The Michigan Copper Co. has produced during the five years under review 10,561,000 lb. of copper at an average cost of 20.7c. per pound. Mining operations were suspended in 1910, having continued for some twelve years. They cannot be considered as anything more than an experiment on a grand scale, which proved the property to be hopelessly unprofitable. This company undertook to reopen the old Minnesota mine, which was closed down some thirty or forty years ago after paying more than $1,700,000 in dividends. The mine, at that time, was given up as worked out. It was supposed that improvements in methods and facilities would make the veins profitable again. This belief has cost the stockholders of the Michigan more than $2,000,000.

I give the above details of these various properties to show at a glance the conclusive character of the evidence in regard to nearly all of them. To attempt to place a valuation upon properties which have no better record than most of those mentioned would be only a joke. In most cases these operations are simply costly experiments more or less completed, undertaken in the hope of developing a profitable mine. When the experiments are carried along beyond the period when the demonstration is thorough, the continuance is a psychological phenomenon.

NON-PRODUCING COPPER COMPANIES

In the data submitted is a long list of copper mining companies which have not produced during the five years I have reviewed. Some of them have produced in the past, but have closed down permanently; others have produced nothing at all. I have sought for some logical means for placing an acreage value on the undeveloped or demonstrated lands situated upon the copper-bearing rocks, but without success. It may be taken for granted that the long list of unprofitable enterprises mentioned above were undertaken upon the best showings of copper that could be found outside of the tracts owned by the profitable mines.

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[*] Abstract from a report to the Board of State Tax Commissioners of Michigan.

It seems ridiculous to place a valuation upon lands which have no showing at all when costly operations upon lands that have considerable showings of copper have not proved those showings to have any value, but, on the contrary, in most cases have proved them *not* to have any value. The fact is that the copper district has been pretty thoroughly explored. The only surely valuable deposits discovered in the last thirty years were those on the Baltic lode. The discovery of these mines, together with a theory that the mining business could be put on an improved basis through the installation of larger plants designed to handle a larger tonnage, caused a boom in the district which lasted pretty continuously from 1898 to 1907. The hopes entertained during this period inspired the expenditures of vast sums of money for explorations, the result of which has been meagre. It is probable that the people of the district have not fully recovered from the speculative mania which lasted so long. Many owners of mineral rights undoubtedly hope to dispose of them for fancy prices. This is largely because in the past promoters have been able to float mining companies and sell their shares to the public. They have actually preferred in many cases to pay owners large sums in cash for their lands rather than to issue stock for them. This kind of a market has no reference whatever to the intrinsic value of the properties. I take the ground that the State of Michigan does not wish to recognize extrinsic valuations created by promoters whose business is not to produce copper but to gauge the public appetite for speculation.

The St. Mary's Mineral Land Co. owns all the stock of the St. Mary's Canal Co. and half the stock of the Champion Copper Co. The St. Mary's Canal Co. owns about 86,000 acres of land in fee simple and 14,000 acres of land the surface of which has been sold but the mineral rights reserved. Such companies are rarely popular. It is very easy to create in the minds of the people the suspicion that such companies are holding large tracts of land for high prices and thereby impeding proper development, and, in a word, living on the unearned increment. In the case of the St. Mary's Mineral Land Co. this suspicion is hardly justified by the facts. A careful inspection of the record of this concern shows that during the past four years it has earned nothing applicable to dividends except a portion of its dividends from the Champion Copper Co., which of course is appraised separately. Its total receipts from sources other than the Champion Copper Co. dividends are as follows:

Land sales	$227,398.50
For wood and timber	27,253.64
Notes	66,000.00
Ground rent	9,330.39
Interest and sundries	59,785.49
Total	$389,768.02

But its expenditures in the attempt to open up new mines have been very large. Following are the assessments paid during these years on shares in copper companies:

King Philip company	$672,714.00
Winona company	6,736.00
Hancock Consolidated	160,000.00
Ojibway	4,000.00
Houghton Copper Co.	55,555.00
Challenge company	138,000.00
Office	57,792.66
Taxes	86,921.80
Franklin District	2,220.00
	$1,176,939.46

This statement proves that the company has lost $787,171.44, excluding the Champion dividends. This statement effectively disposes of the argument that this company is a dead weight on the community and is living on unearned increment.

Collecting Gold From Pannings

By John Saxton

[*]In estimating gold in gravels in India and West Africa, there are certain visible physical properties, such as difference in color and form due to a slight variation of hardness, which, although the eye is in good order and the judgment clear, may lead to wrong estimates until check samples are taken and the eye accustomed to the new condition of the metal. With the amount of black sand common to most alluvium mixed with fine gold, the process of forming a clean tail of gold is often a compound operation. The greater bulk or mass, the crystalline form, and the consequently greater friction of the heavy black sand, cause it to be comparatively sluggish in traveling on the surface of the contrivance used for panning and swirling the sample in the washing process, while the tendency of minute specks of gold, often polished and of a hardness which gives them a suitable form for moving comparatively quickly in relation to their density, is to work their way into the natural crevices of the black sands.

Until my sense of judgment becomes sufficiently trained to fix the relative size and weights of colors when sampling in a new field, I have for years collected samples for checks as follows:

(*a*) If a large amount of black sand is left in the concentrate and a rich tail of gold is formed, I take off the bulk with a small globule of clean mercury, manipulating so that it does not mix with the base metal in the concentrate. I then pour off the amalgam, and with a few spoonfuls of water carefully bring down about half the concentrate to a lower point in the pan. After working up, if no gold shows, I brush it off the pan, transferring to a white enameled shallow plaque about 10 inches in diameter, when the finest gold can be easily and quickly separated, the white plaque intensifying the black of the base concentrate. I then pick off again with the mercury, clean and weigh the gold.

(*b*) Pan down to a small bulk, transferring to a plaque to finish, when the gold can be quickly taken off with a small straw or glass quill. The quickest and simplest way of taking it off, when the gold is clean, is by means of a piece of ordinary wax candle worked soft with the fingers and formed into a small elongated pill or pencil. One wax candle will take and hold firmly 80 to 100 ordinary samples; the wax sets quickly and can be wrapped in thin greased tissue-paper, and will keep for an indefinite period, away from heat. Subsequently the wax can be dissolved quickly with heat and will leave the gold clean.

(*c*) Pan off to a small bulk, dry, and take out all magnetic particles with a magnet; be careful that fine gold is not lifted and carried up with the iron; roast, amalgamate, and then weigh.

A temporary roast in the field or on a wet day can be carried out quickly for minute samples as follows: Mix up nitre, charcoal, and sulphur to form a combustible mixture; make into a stiff paste, place the charge in the centre, ignite, and the roast is complete in a few seconds. A paste made of gunpowder or a small piece of dynamite, with care can also be used; in the latter cases a plate held a few inches above the charge prevents loss from sparks.

A good method is to collect the results from half a dozen pans, which greatly facilitates weighing with field instruments or portable scales. The plaque as described is in my opinion the best appliance for finishing small samples; it is light, simple to use, and requires a minimum of water, and with a common wax candle, samples of gold and other metals can be quickly and accurately taken and reduced when convenient.

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[*] From *West Aust. Min. Build. & Eng. Journal.*

Making Producer-Gas From Crude Oil

By H. A. Grine

The development of large quantities of crude petroleum in the California fields, the rapid growth of manufacturing industries, and the development of rich agricultural lands, growing out of the assurance of an abundant supply of cheap fuel, give promise of making California one of the world's greatest commercial centres. The growing demand for power at low cost for manufacturing industries, and the development of agricultural and mining properties, has attracted the attention of engineers, and has resulted in the manufacture of a number of devices for using this cheap and most convenient kind of fuel. While there are some regions where it is possible to secure power developed by hydro-electric plants at a low cost, there are many places where the introduction of low-cost power developed by oil fuel is in demand.

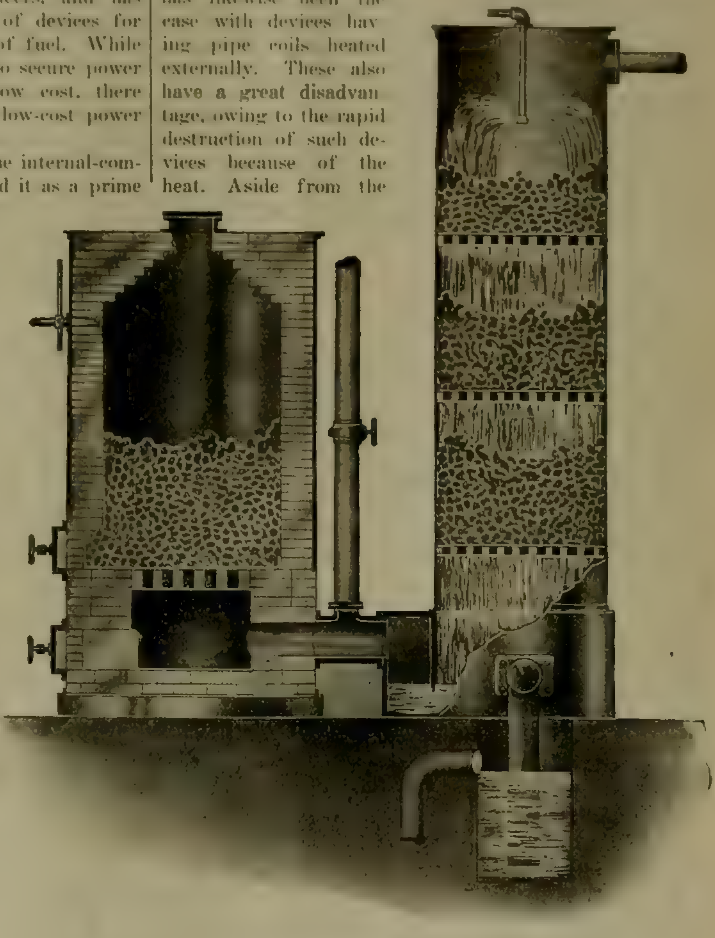
Engineers following the development of the internal-combustion engine have for some time recognized it as a prime factor in the production of cheap power, and engines for use of natural and artificial gas, kerosene, and gasoline have in recent years become well established throughout the eastern portion of the United States. However, the demand for gasoline and kerosene for purposes other than the development of power in power-plants has increased the price of these manufactured products to such an extent as to draw the attention of engineers and power users to more economical methods of generating power from the natural fuels.

Investigations conducted by the U. S. Geological Survey Fuel-Testing Plant during the past six years have definitely proved that the gas-producer in combination with the gas-engine will develop more power per pound of good fuel than a steam-plant will, and will also use, with excellent results, fuels that have been considered of practically no value. The wider distribution of the bituminous coals and their lower cost made them most desirable as fuels for gas-producers, but their volatile tarry matter presented a problem to gas engineers which had not been met with in the use of anthracite fuels. This problem has been overcome, and numerous plants are in daily satisfactory operation on all grades of bituminous coal.

The manufacture of producer-gas from the California asphaltum-base oils presented a greater problem even than did the bituminous coal, as they are composed largely of products similar to the volatile matter of the bituminous coal. The failures of early attempts at gasifying crude petroleum for use in gas-engines may in most cases be traced to a lack of knowledge of what was a suitable gas for gas-engine use, of the characteristics of the asphaltum-base oils, and of the conditions which are necessary to secure a complete gasification of the oil without a high percentage of by-product.

The numerous methods and devices for converting the oil into gas may be classified under three general heads, namely: (1) destructive distillation; (2) combustion and destructive distillation; (3) combustion alone.

Under the first heading are the devices using closed retorts or pipes set in furnaces which are kept heated by oil fires surrounding the retorts or pipes, and the large domestic-gas manufacturing units which are heated periodically to a high degree by blowing with air and oil, after which an atomized spray of oil and steam is introduced, making illuminating gas for a period. While a small amount of combustion takes place in such plants, owing to the dissociation of the oxygen of the steam, this process is practically a destructive distillation process forming considerable carbon as a by product. The failure of retort devices for developing gas for gas-engines has been due to the tendency of the heavy asphaltum of the oils to form coke in the retorts and gradually to fill them. This has likewise been the case with devices having pipe coils heated externally. These also have a great disadvantage, owing to the rapid destruction of such devices because of the heat. Aside from the mechanical difficulties of destructive distillation, devices for converting the crude oil into gas for use in internal-combustion engines, the gas made by them is not suitable to reliable and efficient operation, owing to the large percentage of hydrogen and hydrocarbon gases of which these gases are composed and the tarry matter carried to the engine.



GRINE-NELLES GAS-PRODUCER.

Under the second heading may be classed the devices in which a portion of the oil is burned continuously, creating a temperature within a chamber sufficient to cause destructive distillation of the volatile products of the oil. While such devices are a step forward in the art of making gas from crude oil for use in gas-engines, they retain many of the objections of the old retort methods. Considerable carbon is formed as a result of the destructive distillation of part of the oil. This is deposited in the gasifying chamber and outlet pipes, necessitating frequent burning-out or a periodic change of units, if continuous operation is demanded. The gas formed by such devices also contains the objectionable high hydrogen and hydrocarbon gases, and low percentage of carbon monoxide gas, so desirable for the operation of gas-engines, owing to its slow-burning quality.

Under the third heading may be classed devices in which the entire fuel is brought into intimate contact with oxygen in such manner and under such temperature conditions as to convert the greater part of the carbon of the oil into carbon monoxide. In such devices practically no residue is formed as a by-product, and a gas is formed, the combustible portion of which is composed of carbon monoxide with just sufficient hydrogen and methane to make the gas ignite readily.

In the last year the Grine-Nelles crude oil gas-producer has been designed to carry out this process with crude oil as a fuel. A commercial plant of 100 hp. capacity was erected at the William Fry pumping plant, Hollywood, California, by the Gas Power Machinery Co. of Los Angeles, about the beginning of this year. The results obtained have exceeded the guarantees made and have been in every way more than satisfactory. The plant is in daily operation, twenty-four hours per day, on a single gas unit and gas-engine, and requires little attention. The gas has a heat value of 135 to 150 B.t.u. per cubic foot, contained in the following gases:

	Per cent.
Carbon monoxide (CO)	15 to 16.0
Methane (CH_4)	4 to 5.5
Hydrogen (H_2)	6 to 8.0
Illuminants (C_xH_y)	1 to 1.2

No burning-out of carbon is required. A grate is provided in the generator, which is of the down-draft type, and on it a bed of coke is maintained. The gases formed by the incomplete combustion of the oil in the upper part of the generator, pass down through the bed of coke, where a complete gasification is accomplished. The greater part of such carbon as may be formed in the upper incomplete-combustion chamber is filtered from the gas in the coke bed serving to maintain the latter, and is retained until gasified by slow combustion as with any other solid fuel. The plant, using 14 to 18°B. crude and fuel oils, at 95c. per barrel delivered, is reported to be developing the same amount of power per gallon of crude oil as the distillate engines which it replaced were developing per gallon of distillate. The latter cost 7c. per gallon, or $2.94 per barrel, making a saving in fuel cost of 66⅔%. While this device is new, it is based on some of the best known and reliable practices in the gasification of bituminous coal.

Safe Placing of Wells

No well should be dug where polluting matter has access to it. Such matter usually comes from cesspools or privies, slops thrown on the surface, backings from hen-yards, pigpens, and barnyards, from manured fields, animals falling into the water, and filth thrown in through the open top or washed in through the plank covering or leaky casings. The matter entering through the top can be kept out by cement, iron, or other impervious curbings. The entrance of material at the bottom of shallow wells can be prevented only by placing them beyond the reach of contamination. Where any of the polluting agents are present, care should be taken to see that the well is at least 100 ft. away and on distinctly higher ground, so that both the surface drainage and the underground drainage—which generally moves in the same direction—will be away from it. On flat sands the wells should be at least 150 ft. away from any source of pollution. The importance of choosing a location safe from polluting influences is almost universally underestimated. Laying aside considerations of comfort and health, a safe well is nearly always, in the long run, the cheapest. Safety should invariably be made the first consideration instead of the last, and a small amount of care and foresight in choosing is well repaid by the prevention of a possible epidemic.—Water Supply Paper 223, U. S. Geol. Survey.

The Laccolith in Ore Deposition

By Charles R. Keyes

The almost universal tendency to consider ore-genesis to be associated with vulcanism is rendered singularly incongruous by the fact that important ore deposits are so rarely formed in connection with active volcanoes. It is perhaps for this reason more than any other that effort is made to establish kinship of some sort between certain kinds of ore deposits and certain kinds of eruptive masses. DeLaunay evidently has something of this idea in mind when he attempts to trace a close genetic relationship between local mountain making, rock character, and ore deposition. My own work in mine-examinations in western America has led me to associate many ore deposits with intrusive masses which, when carefully determined geologically, have proved to be laccolithic in character. Since Gilbert's first definition and description of laccolithic intrusions, of which the Henry mountains in southern Utah are examples, this type of bulging sill has been widely recognized. In western North America laccolithic mountains are far more common than is generally supposed. The true nature of laccoliths is not always easily established. Removal of some thousands of feet of overburden through profound erosion often disguises their real character. In other instances the probable laccolithic nature is not at once inferred because of the fact that the cover is nowhere broken and other causes may also operate.

The most familiar analogy to a cooling mass of magma that we know of is the 'freezing' of molten rock-materials in a slag-pot, or the solidifying of a ball of liquid metal from the furnace. The copious expulsion of gases evidenced by the rhythmic bubbling which goes on at the surface is justly comparable to just what takes place in the cooling of the huger magmatic body. The laccolith may be regarded as forming an intermediary stage of magmatic refrigeration between that displayed by the active volcano and that represented by the deep-seated, or batholithic, mass. The almost invariable absence of important ore deposits from the vicinity of active volcanoes is readily accounted for by the fact that in the expulsion of the soluble metallic salts in gaseous form from the cooling magma there is relatively small pressure, free access to sky, and little mingling with ground-waters. Ores due strictly to sublimation are seldom important enough to warrant mining. In the case of the deep-seated molten masses pressures are great, there is little fracturing of the rocks to furnish ready communication with the surface of the ground, and there is almost no association with meteoric waters. The main result seems to be diffused mineralization, or regional alteration, of the adjacent rocks.

Laccolithic intrusions provide many conditions favorable to extensive ore deposition. The rocks above are literally floated. This cover is rarely more than a mile thick. It is seldom fractured to sky, so as to allow ready escape of the metallic vapors as in volcanoes; nor is there complete suppression of circulation of expelled gases as in the case of deep-seated bodies. It is commonly creviced and parted around the margins of the dome. It is composed of tough rocks which effectually prevent extensive fracturing. The metallic gases and watery vapors expelled from the cooling magma pass at once into chambers and porous tracts where they are confined for a greater or less length of time, or they soon enter into the groundwater circulation since they are readily soluble. All in all, laccoliths offer ideal conditions for ore deposition.

It may be that laccoliths and volcanoes are merely slightly different phases of general vulcanism, the one occurring in tough shaly rocks and the other in brittle massive rocks. Perhaps it is only under laccolithic conditions that orebodies derived directly from cooling magmas are formed. At any rate, the definite determination of the laccolithic character of igneous masses may prove to be of great service in scientific prospecting in new and little explored mining districts the foundations of which are igneous rocks.

The Economics of Tube-Milling

By H. Standish Ball

*The modern tube-mill is a most efficient grinding machine, and is rapidly taking the place of Chilean mills, roller mills, grinding pans, and similar apparatus. Though used for many years as a cement grinder, the first reference found to its use as an ore-crushing machine was in 1892, when it was used by L. H. Diehl for grinding Kalgoorlie ores. For the next twelve years very little was heard about it, nor was it till about 1905 that it became a machine of great industrial importance on the Witwatersrand. During the last six years the development of its working details has been rapid, for it was but a step from the iron ball of the ball-mill to the flint pebble, another from the one manhole in the shell centre to two at opposite sides, and one more from the iron lining to the silex, set flat in cement, then back to iron or steel plates, and from these to the honeycombed and ribbed lining. Where formerly silex linings lasted three months and required three weeks for renewals, the life is now twelve months, and replacements are made in two eight-hour shifts. At first the mills were laboriously charged by removing a single manhole cover and throwing in loads of pebbles; next a bin was built over the mill to chute the pebbles rapidly into the mill and thus save time. Such a means as a fixed spiral in the discharge end, or a feeder large enough to pass the pebbles into the feed end of the mill, has materially lessened the old troubles, and tube-mills can be run 97% of the possible running time. With the simplified method of feeding now adopted, the modern operator is gradually dispensing altogether with the flint pebbles, their place being taken by the lumps of ore itself in Rand practice; thus the cost of the pebbles is saved and incidentally the capacity of the plant is increased 1 per cent.

Before giving an example of the process followed out, a few details of the present day tube-mill will be interesting, the mill taken being one of a series used by the Eckstein group on the Witwatersrand. The present standard size mill is 22 ft. long by 5 ft. 6 in. diam. Silex liners are used, 6 to 7 in. thick when new; thus the internal diameter of the mill when lined is about 4 ft. 6 in. The internal volume of a newly-lined tube-mill is 350 cu. ft., the volume of the shell without the lining being 523 cu. ft. The pebble load is a varying factor increasing throughout the life of the liner; with new liners the pebble load is 8 to 9 tons, with worn liners (liner 3 in.) the load is 12.8 tons, and may reach 14 tons just before the liners are removed. When the mill is stationary, the level of the pebbles is 3 in. above the axis of the rotation of the mill; with new liners the volume occupied by the pebbles is 200 cu. ft. Ore pebbles are now used to a large extent, and the ore is roughly sized to 4-in. cubes before being fed in.

The capacity of this mill is still a debated point, but the following result of one month's working on a typical Rand installation is interesting, the battery screens used being 12 mesh per linear inch. The equivalent of 400 tons of dry sand is passed through the mill in 24 hours, the pulp containing 38.5% moisture. In order to get the best results from the plant in question, the mill should produce 130 tons of product to pass through a screen of 90 holes per linear inch per 24 hours.[1] In addition to the tonnage of sand fed in, there is a weight of 7 tons of banket ore used per 24 hours in place of pebbles. One 125-hp. electric motor is required per tube-mill, though only about 75 to 90 hp. is actually absorbed when once the mill is running uniformly. The number of revolutions per minute is 31 to 32.

As an example of the rapid installation of tube-mills in the Transvaal during the past year, it is interesting to note that whereas, in 1909, 136 tube-mills and 9580 stamps were installed, in 1910 the former were increased by 39.7%, against an increase of 1.6% of the latter. Modern tube-mill plants in other parts of the world differ little in their principle of working, only having variations in minor details; for example, in American and Australian practice a product to pass through a screen of 200 holes per linear inch is frequently required.[2]

The function of the tube-mill as a fine crusher in connection with stamp-milling and cyanidation can be best shown by giving a typical crushing circuit, the one chosen being that adopted by some of the mines of the Gold Fields companies on the Rand. With this system only those particles of the tailing pulp which are sufficiently light to be carried over the hydraulic classifier pass away direct to the cyanide plant, the remainder being diverted to the tube-mill. From the stamps the pulp is taken by means of a pulp elevator to a cone classifier which separates the slime from the sand, the former going direct to the cyanide plant, while the latter is conveyed into the tube-mill by means of a spiral conveyor. From the mill it passes over amalgamated plates to a second cone classifier, where it is re-classified. The number of primary classifiers per tube-mill has been reduced to one, without interfering with efficient classification. The cones used are 6 ft. diam. by 9 ft. deep and contain two diaphragms 14 and 3½ in. diam., the upper one being 5 ft. 5 in. from the top of the cone, and the lower 1 ft. 3 in. from the bottom; the purpose of these diaphragms is to provide a means of obtaining a uniform feed of the pulp. The diameter of the outlet to the classifier is $2\frac{3}{16}$ in. and its capacity is about 400 tons of sand with 26% moisture per 24 hours.

At a comparatively early stage in the development of the tube-mill it became evident that high efficiency could only be obtained by feeding a sand containing a minimum of slime, and by reducing the percentage of water below the 50% first taken as a standard. This demand has resulted in the invention of a number of classifiers and thick-pulp feeds, of which the Caldecott diaphragm cone, mentioned above, is the most satisfactory. Up to the present, however, no efficient means has been found for providing an exactly uniform mixture of coarse and fine sand in the mill feed. The diversion of the fine ore from the bins directly to the tube-mill, without passing it through the battery, is one of the best suggestions yet put forward for increasing the efficiency of the stamp-tube-mill combination, and a start in this direction has already been made, with satisfactory results. It is remarkable to what a great extent fine battery crushing has given way to coarse, and it is possible that stamps may ultimately be superseded by other types of coarse crushers when the ore is to be finally crushed in tube-mills.

There are two kinds of crushing which take place inside a mill: (*a*) Crushing by shock, due to the impact of pebbles. (*b*) Crushing by abrasion, due to the rolling and rubbing of the pebbles, and contact with the lining of the mill. One form of crushing or the other will predominate, according to the type of mill used, the pebble load, and other conditions. Although the consideration of the tube-mill from a mechanical point of view is fairly simple, much experience is necessary in order to get the best results from it. For this reason attempts have been made to determine the most economical conditions under which tube-mills can be used, taking into consideration the desired fine grinding as the end to be obtained with the least consumption of power and smallest wear on pebbles and lining. These three points seem to depend on the following four factors:

1. The pebble load.
2. The tonnage dealt with, and the character of the sand.

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*Abstracted from the *Bulletin* of the Institution of Mining and Metallurgy.

[1] Screen equal, approximately, to 80 mesh I.M.M. screen.

[2] Screen equal, approximately, to 200 mesh I.M.M. screen.

3. The thickness of pulp.

4. The diameter of the mill and the number of revolutions.

A change in any one of the above will cause a change in two, and sometimes all three of the points given.

The investigation of these interesting points is obviously desirable, and the subject was an eminently suitable one to be undertaken by a laboratory such as that possessed by McGill University, owing to the freedom from interference with continuous tests which would be inevitable on ordinary commercial plants. The rock chosen to be experimented on was an elaeolite or nepheline syenite, of a hard uniform character, composed essentially of orthoclase, elaeolite, and hornblende, and was obtained from the Outremont quarries, Montreal. This rock was used, as it was considered to be typical of a hard, compact ore.

Four investigations were decided on, as follows:

Series I.—In which the feed was to be varied, the moisture, pebble load, and revolutions per minute remaining constant.

Series II.—In which the moisture was to be varied.

Series III.—In which the pebble load was to be varied.

Series IV.—In which the pebble speed was to be varied.

The other three factors remaining constant in each case. For the details of these tests, which were made in a 3 ft. 5 in. by 4 ft. 8 in. tube-mill constructed from an old chlorination barrel, reference should be made to the original paper, as given in No. 83 of the *Bulletin* of the Institution of Mining and Metallurgy, August 30. The following summary will be of interest:

Feed Tests.—From the results obtained it was found that a feed of 18 tons per 24 hours is the most efficient one for the laboratory mill, any larger feed apparently causing the crushing efficiency, as well as the relative mechanical efficiency, to decrease. This is a most interesting point, as a critical feed is indicated, above which it seems probable that the fine-grinding properties of the mill decrease in proportion approximately to the increase of feed. With a feed of 23 tons per 24 hours, only 3.79 tons of −120 grade per 24 hours were obtained, whereas the same fine-grade output would be obtained by crushing only 18 tons through a similar period; this fact shows that the critical feed has been passed between these two amounts.

The theory of a critical feed may have an important bearing on modern practice, as it would seem that more efficient working, with a greater output of slime, would be obtained if a smaller feed were used. In South Africa the tendency at present is to increase the feed in the 5½ by 22 ft. mills, and although they are now feeding at the rate of 400 tons per 24 hours, the belief is held that even heavier feed would result in increased grinding. The above results show the danger of carrying this too far. Using these figures as a basis and roughly calculating the feed for the laboratory mill, it appears that a feed of about 25 tons per 24 hours should result in more grinding than with a smaller feed, whereas the experimental results obtained in these tests indicate that this feed is less efficient than a smaller one and that the most efficient feed for this mill approximates 18 tons in 24 hours. Admitting the discrepancy of comparing two mills differing so radically as to size, it is at least of interest to note that, if any analogy can be drawn, the indications are that the South African mills are overfed and that a feed of about 300 tons instead of 400 tons per 24 hours might result in both increased grinding and efficiency.

Moisture Tests.—The most prominent feature of these

GENERAL SUMMARY OF TESTS.

Remarks.	Test.	Pebble load.	Pebble vol.	Rev. per min.	Peripheral speed min.	Moisture. %.	Feed. Tons per 24 hrs.	Hp.	Work done per unit.	Net output "−120 grade" (tons 24 hrs.)	Rel. mech. eff. per hp.
	P	lb. 1200	0·5	41	369 ft.	38·0	7·2	6·3	3·89	2·27	4·45
Feed tests	C	1200	0·5	41	369 „	38·0	9·6	5·0	3·36	2·34	6·45
	B	1200	0·5	41	369 „	38·0	12·6	5·1	2·82	2·95	7·02
	O	1200	0·5	41	369 „	38·0	14·4	5·6	2·91	3·31	7·48
	*A	1200	0·5	41	369 „	38·0	18·6	5·8	2·58	3·96	8·29
	R	1200	0·5	41	369 „	38·0	23·0	6·6	2·09	3·79	7·28
Moisture tests	D	1200	0·5	41	369 ft.	30·0	12·6	5·7	2·99	2·93	6·61
	*B	1200	0·5	41	369 „	37·7	12·6	5·0	2·82	2·95	7·11
	E	1200	0·5	41	369 „	50·0	12·6	6·2	3·05	2·95	6·16
	F	1200	0·5	41	369 „	58·0	12·6	6·0	2·84	2·97	5·96
Pebble load tests	*G	900	0·37	41	369 ft.	38·0	12·6	4·9	2·75	2·65	7·07
	B	1200	0·50	41	369 „	38·0	12·6	5·1	2·82	2·78	7·02
	H	1500	0·68	41	369 „	38·0	12·6	6·9	3·31	3·40	6·04
Speed tests	T	1200	0·5	33	297 ft.	38·0	7·2	6·8	4·19	2·45	4·43
	*Q	1200	0·5	37	333 „	38·0	7·2	5·1	4·17	2·59	5·89
	P	1200	0·5	41	369 „	38·0	7·2	6·3	3·89	2·27	4·45
	S	1200	0·5	46	414 „	38·0	7·2	7·5	4·03	2·48	3·87

* Most efficient test of series.

tests is the great efficiency of 37% moisture over all others. This fact corresponds remarkably well with tests carried on in other parts of the world. In those conducted by Walter Neal, results seem to prove the fact that the ideal dilution is in the neighborhood of 39% moisture, although he inclines to the belief that this critical point will vary with the nature and size of the mill. The results of these tests tend to disprove this belief.

Sherrod, experimenting with tube mills at the Guerrero mill, Real del Monte, found that the grinding efficiency increased with the percentage of solids in feed, up to about 55 or 60%, corresponding to 45 to 40% moisture. G. O. Smart[4] claims that in the tests carried out on the Rand he found that 38.5% moisture is the most efficient, while H. W. Fox[5] discovered that, taking the power consumed in conjunction with the fine-grinding, the most efficient moisture would be 39.6%. It will be noticed that all these critical points are from 1 to 2% higher than the one found by the author, but this seems to be explained by the fact that the sands used, being 18 mesh, were of a finer nature than those commonly used in practice. It has been suggested by J. W. Bell[6] that the critical moisture point depends upon the percentage of voids in sand, and that in all probability when the percentage of moisture is numerically equal to the percentage of voids in the sand inside the mill, the moisture is critical. This theory is of interest in that it indicates that sand-feeds with higher or lower percentages of voids may have higher or lower critical moistures.

The second interesting feature of these tests was the use of the 'transition samples' for obtaining intermediate moisture efficiency. This appears to be a practicable method of obtaining a number of points of efficiency and power at various intermediate quantities of moisture, by simply running a long continuous test and at equal periods changing the moisture without stopping the mill. In the compilation of data and curves this should be of great service both as a check on the work and for effecting a substantial economy in time and labor.

Pebble Load Tests.—The result from these tests indicated that the most efficient pebble load is about $^7/_{16}$ of the volume of mill (or for this mill 1030 lb.), whereas, disregarding power, the most effectual 'crushing load' is about 0.6 of the volume; which corresponds to present Rand practice. Whether it would pay to sacrifice power and gain fine grinding, or *vice versa*, would, of course, depend upon conditions at the plant.

Speed Tests.—These tests were most interesting, as they proved conclusively that 37 r.p.m., at a peripheral speed of 333 ft. per minute, was the most efficient, both in relative mechanical efficiency and grinding efficiency, thus demonstrating that at that speed the grinding was decidedly better, and the power required less. It was seen that if this speed of 37 r.p.m. is exceeded or decreased, the crushing effect of the pebbles is much reduced, while the power necessary to drive the mill is increased. In connection with this efficient speed, it is interesting to compare it with that obtained from various formulæ.

Davidson gives as the best practical speed $N = \frac{300}{\sqrt{D}}$ in inches, while White derives a formula $N = \frac{34.21}{\sqrt{D}}$ in metres. ($N =$ speed, $D =$ diam. of mill.) Richards gives 38 r.p.m. as the best speed.

The results are set forth below:

Davidson.	White.	Richards.	By experiment.
34	39	38	37

Thus the result obtained from actual experiment corresponds very closely to the mean of these results.

Calculation of Data.—It is my personal belief that there is a possibility of deducing from the curves obtained from the different tests the probable results that would be derived by running the mill under different conditions. An example of this was shown in the feed tests, where the probable data for Test A were deduced from the curves of Test B. The conclusion from this theory appears startling, for it seems that if one complete set of tests is run with a constant feed, the other factors being varied and the respective curves obtained, it is possible to deduce from them all the necessary information regarding any feed, provided that one test at that particular feed had been previously carried out. As a case in point, it was desired to know what the relative mechanical efficiency for a feed of 7.2 tons per 24 hours would be, with a moisture of 35%, speed of 37 r.p.m., and pebble volume 0.5, a test with 38% moisture having already been run on this feed. The moisture efficiency curve for Test B was used, and the following data extracted:

Moisture. %	Feed. Tons.	Efficiency. %	Difference. %
38	12.6	7.02	0.27
38	7.2	4.45	
35	12.6	6.75	
35	7.2	x	

$$\text{Hence } \frac{0.27}{1} \times \frac{4.45}{7.02} = 0.18$$

$$\therefore = 4.45 - 0.18 = 4.27.$$

By actual experiment the efficiency was found to be 4.32, a difference of 1.1% between the theoretical and the actual result.

Transition Samples.—The calculation of intermediate points of efficiency by the method of transition samples and power readings is of great interest, as the efficiency and power required can be found for any intermediate point of moisture, feed, etc., between the limits of any two tests. This period was found with great accuracy by means of nine tests, the time required being checked by both power readings and screen analyses.

SUMMARY

The more important features disclosed in this investigation may be summed up as follows:

(1) The determination of a rate of feed, which if increased or decreased caused the efficiency of the mill to diminish in a marked manner, and consequently may be defined as a critical feed rate.

(2) The determination of a well-defined critical percentage of moisture in the feed.

(3) The determination of a critical speed for the laboratory mill (34 in. diameter).

(4) The determination of a critical pebble load for this mill.

(5) The determination of the length of time required by the mill to assume a uniform condition following a change in adjustment. This is defined as the transition period of the mill.

(6) The substantial corroboration of the author's hypothesis that samples and power observations taken at intervals during the transition period may be used to determine the efficiency of the mill for the calculated conditions at the times the samples were taken. These samples are called transition samples in contradistinction to normal samples taken after the mill has assumed a uniform condition.

(7) A method by which the data and curves obtained in one series of tests may be transposed and applied, as far as possible, for the purpose of securing further light on the phenomena disclosed by a second series.

MANGANESE ores were mined in 1910 only in Virginia and Arkansas. The production, however, increased from that of 1909, being 2258 tons, valued at $22,892 for 1910, as against 1544 tons, valued at $19,675, for 1909. Large quantities of manganese are imported. These and other statistics of production compiled by E. F. Burchard of the U. S. Geological Survey are contained in an advance chapter from 'Mineral Resources of the United States for 1910.' Of manganiferous ores, which, however, contain only a small percentage of manganese, the production was much greater, amounting in 1910 to 619,735 long tons. Manganese is chiefly used in the production of ferromanganese and spiegeleisen, but has a great variety of other uses and is in constant demand.

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[3] *Min. and Sci. Press*, April 2, 1910.
[4] *Jour. Chem., Met. & Min. Soc. of S. A.*, May 10, 1910.
[5] *Mines and Minerals*, June 1908.
[6] *The Mining Magazine*, April 1911.

The Thiogen Process for Reduction of SO_2 in Smelter Fume

By Stewart W. Young

The difficult situation of the smelting industries of the United States at the present time is too generally understood to need any extended discussion here. The fumes which escape from the various furnaces, especially from roasters, carry in many cases quantities of substances that are destructive to vegetation and in some cases poisonous to stock. The result is that in some cases it becomes impossible to carry on the two industries of agriculture and smelting in the same district, and a number of important smelters have been enjoined from operating by court orders issued on complaint of farmers.

The most important of the deleterious substances contained in smelter fumes are arsenic compounds, sulphur trioxide, and sulphur dioxide. Various devices are at present in successful use for handling the first two of these substances. Both the bag-house systems and the Cottrell apparatus are able to remove the arsenic and the sulphur trioxide from the fumes; but neither is able to remove sulphur dioxide. The reason for this is that the sulphur dioxide is present in the form of a true gas, while the above-mentioned methods are able to handle only substances in the form of solid particles, which is the form of occurrence of the arsenic and the sulphur trioxide.

The only device for mitigating the sulphur dioxide evil that seems to be in use is that of diluting the stack gases with large quantities of fresh air so that the concentration of the sulphur dioxide is at a minimum. The benefits of this method are probably considerable where comparatively small amounts of sulphur dioxide are released, but in case very large quantities are released, its beneficial action is at least questionable. It might be imagined that since sulphur dioxide is quite readily soluble in water, the stack gases might be sprayed, and the sulphur dioxide eliminated in this way. But the solution of sulphur dioxide is equally as poisonous as the gas itself, and there is no practicable way of getting rid of it. The problem, then, seems to narrow itself down to some process for chemically converting the sulphur dioxide into some other substance that may be utilized, or that at least is innocuous. To the chemist there are two, and only two, means which seem at all feasible for the accomplishment of this purpose. They are:

(1) The conversion of the sulphur dioxide into sulphuric acid;

(2) The conversion of the sulphur dioxide into free sulphur or brimstone.

There are various methods whereby the first of these reactions may be brought about, and these are used in some places, as, for example, at the Ducktown smelter. The chief obstacle to its extensive use is the comparatively limited market for the sulphuric acid. It is practically impossible to store the enormous quantities of this substance that would be produced, and still more is it impossible to throw it away in considerable quantities. Like sulphur dioxide, it will kill vegetation, and fish. The possibility of converting the sulphur dioxide into free sulphur seems to have received very little attention up to the present time. Sulphur is an innocuous substance, and, provided a reasonably economical process is devised, its elimination from smelter gases in this form would seem to offer an ideal solution of the problem. Supplies of sulphur for many years to come would be established, and the present serious check to the smelting industry would be overcome. It is the purpose of this paper to give a brief sketch of a process whereby this result may be accomplished.

The elementary chemistry involved in the reduction of sulphur dioxide is extremely simple. The reduction may be accomplished by means of carbon or by means of hydrogen, or, still better, by means of compounds of carbon and hydrogen, such as crude petroleum and the like. Assuming, for simplicity's sake, a hydrocarbon of the formula CH_2, the reduction should proceed as follows:

$$SO_2 + CH_2 = S + CO + H_2O$$

That is, the carbon is converted into carbon monoxide, the hydrogen into water, while the sulphur is left in the free state. It may be stated at the outset, that since the conversion of sulphur dioxide into free sulphur and free oxygen is a reaction that involves an absorption of energy, such reaction cannot be accomplished without supplying such energy. Thus there will always, of necessity, be a fixed cost for materials used in any process operating in this way, and no purely catalytic process can accomplish the result. In the above reaction the energy used is supplied by the hydrocarbon.

While from the above statement of the case, the problem seems to be readily solved, this is, as a matter of fact, not the case. Very serious difficulties stand in the way, and these are partly chemical and partly mechanical. The more important of these difficulties are the following:

(1) The presence of free oxygen in the gases to be treated, bringing about a serious waste of hydrocarbon.

(2) The slowness and incompleteness of the reactions even when oxygen is not present.

(3) The fact that all the available energy of the hydrocarbon is not utilized, since carbon burns to monoxide instead of dioxide.

All of these difficulties have been met and solved in the laboratory, and although it is not possible at present to discuss in detail the devices whereby these things have been accomplished, there is no objection to making public a general sketch of the main points of the process.

The Thiogen process has been put into a practical form by carrying out the reaction discussed above in an indirect way. The sulphur dioxide is first absorbed by means of a basic sulphide, either in the wet or the dry state, the one chosen for most work being calcium sulphide. The reaction which takes place here results in the formation of calcium sulphite and free sulphur. The presence of oxygen in the gases does not interfere in this reaction to any appreciable extent. That is, the reaction with the sulphur dioxide is very rapid, while that with oxygen is very slow.

The second step in the process consists in removing the free sulphur from the calcium sulphite, which may be accomplished by distillation or other suitable means. The third step consists in the reduction of the calcium sulphite by means of hydrocarbons. This reaction results in the regeneration of calcium sulphide which again enters into the reaction in its first stage; that is, it is used for the further absorption of sulphur dioxide. Under ordinary conditions the reduction of the calcium sulphite to sulphide is a matter of considerable difficulty, the reaction being rather slow, even at high temperatures and resulting in the conversion of the carbon into monoxide instead of dioxide as is desirable. A method has, however, been devised whereby the reaction takes place readily even at relatively low temperatures, and whereby the complete combustion of the hydrocarbon is assured. An adaptation of the process has also been devised whereby gases which are free, or nearly free, from oxygen may be handled with a much increased mechanical efficiency. In fact, the fundamental principles upon which the process depends offer very considerable possibilities of adaptation to suit special conditions. Incidentally, considerable progress has been made toward adapting the process to the recovery of flue-dust.

The reactions involved in the indirect method, expressed in chemical symbols, are as follows:

(1) $2CaS + 3SO_2 = 2CaSO_3 + 3S$

(2) $2CaSO_3 + 2CH_2 = 2CaS + 2CO_2 + 2H_2O$

To anyone versed in chemistry, it will appear at once that here, in an indirect manner, is accomplished precisely what is done by the more or less theoretical equation given in the earlier part of this article, except that here the combustion of the hydrocarbon is more complete. In any event, the fixed cost of the process is a quantity of a reducing agent (here hydrocarbons) sufficient to reduce the sulphur dioxide.

Another reaction which is made use of to some extent depends upon the fact that when sulphur dioxide is passed over a heated sulphide ore, the sulphide ore is roasted, and that almost as completely as if air were used. Expressed chemically, this reaction is as follows:

$$3FeS + 2SO_2 = Fe_3O_4 + 5S$$

In this case the ore itself becomes the reducing agent, and the fuel oil charge is avoided. The reaction is, however, slow, and requires external heating to give any great capacity. On the other hand, it is found to be a valuable adjunct to the other processes above described.

The ultimate efficiency in the application of these principles will naturally be greatest in a plant in which the adjustment is so made that the greatest amount of sulphur dioxide may be handled with the least expenditure of hydrocarbon, and with the least expenditure for installation and operating expenses. Whatever may be the most economical plant for accomplishing this purpose can be told only from actual operation, but this much at least seems quite certain, that, from the chemical point of view, the maximum economy of these processes must probably be the maximum economy attainable in any process for the production of free sulphur from sulphur dioxide. The reasons for this are briefly as follows:

(1) A certain perfectly definite expenditure of energy in the form of a reducing agent is absolutely necessary to produce sulphur from sulphur dioxide.

(2) The processes above discussed operate by applying this energy in the cheapest known form, namely, hydrocarbons, and further take advantage of a certain possible saving through a reduction by means of the ore itself.

Thus in order to devise a process whose theoretical chemical efficiency is greater than that of the Thiogen process, it will be necessary to discover a reducing agent cheaper than the hydrocarbon oils, which seems not likely to happen. It would not be fair to close this article without expressing my deepest thanks and appreciation to Messrs. John T. Overbury, H. G. McMahon, and Hamilton Sanborn of San Francisco, whose assistance, financial as well as personal, has made possible the development of the Thiogen process to its present state.

Mine Safety Demonstration

Under the joint auspices of the American Red Cross, Pittsburg Coal Operators' Association, and the United Mine Workers of America, and under the management of the United States Bureau of Mines, a mine safety demonstration will be held at Pittsburg, October 31. Beginning at 9 a.m. at Forbes Field (Pittsburg), Pennsylvania, an exhibit of skill in first aid to the injured will be given by teams of five miners from various coal operations in the United States, five separate events to be exhibited. At 11 a.m. demonstration by the Bureau of Mines in steel-lined mine gallery 200 ft. long, of a permissible shot, followed by an explosion of black powder detonated in the presence of coal dust, with a resulting explosion of coal dust ignited by the non-permissible explosive. This will be followed by demonstration of rescue work; men equipped with oxygen helmets will enter the gallery while still filled with smoke and poisonous gases, will bring out injured men, and give them artificial respiration and first aid. Also a demonstration of dangerous practices within gaseous or dusty mines.

At noon President Taft will deliver the prizes, and short addresses will be made by the President, J. K. Tener, Governor of Pennsylvania, Walter L. Fisher, Secretary of the Department of the Interior, and others.

Porcupine

An interesting glimpse of conditions at Porcupine late in August is given in a private letter from one of the young men at work there, from which we are privileged to make the following extracts:

The big fire is now an old story, and no doubt you saw the articles in the Western papers. It was big all right, and I was up to my neck, both mentally and physically. The loss of life was not as bad as the reports, but the property loss was great. The Dome suffered heavily, as the mill was within two months of completion. Every building and most of the machinery was destroyed. The presses, after a little replacing and retouching, can be used; the tanks can be straightened out and repaired, but 75,000 rivets will have to be cut out by hand. I stayed to fight an impossible fight until too late to get to Lake Edwards and had to run before the fire to a little pond by the powerhouse. There I found 56 others—a regular Heinz pickle vat, with all the varieties. We had a hard time while the mill was burning, as you may well imagine, coming up out of the cold water for a breath of hot smoke and cinders and then ducking down again. The worst was over in about half an hour, but the rest of the night was no picnic. I was pretty well used up and my eyes were bad for a while, but am all right now. I lost all my personal belongings, and it is surprising how much clothing, books, notes, instruments, and incidentals you have had in your trunk and suitcase when they disappear.

OUTCROP AT DOME MINE.

Within a week the Dome had a hundred men at work, and the wreckage was all pulled out. The company arranged with the T. & N. O. railroad to put in a 7000-ft. spur, so men were put to work at once building the grade. The steel is now in and I suppose the ballast will follow shortly. The new concrete mixer is being placed. Most of the concrete foundations were found uninjured, except that changes were necessary to furnish footings for the steel columns of the new buildings. The battery blocks were blown out, but will be replaced. At present there are about 250 men at work, divided as follows: 40 men on the mill, clearing out, overhauling pumps and presses, building derricks, concrete plants, and store-houses; a gang clearing stumps from land; another prospecting; another fixing up the shaft, and a riveting gang taking down tanks and boilers. In prospecting they have uncovered as fine a showing as I ever saw. In a trench they found a vein of quartz about 10 ft. below the surface and followed it about 30 ft. In four different places the quartz is shot full of gold, and at one place a lump of metal as big as your little finger sticks out. There were fully 100 visitors there in less than no time. Two weeks after the big fire a cold rain put out all bush fires, and now the weather varies from warm and dry to cold and wet. The thermometer dropped to about 40° a few days ago, but it still has 80° to go before the 'big cold' is on. The aurora borealis is visible once in a while and is a fine sight. It is getting colder noticeably of nights, and we will all be in tents for at least a month yet. The townsite for the permanent camp is ready and building material should be here shortly. The mosquitoes do not bother me much, but there are many other varieties of flying biters and stingers around, and of these the common fly is the worst just now and we are anxious for a cold snap to finish them. There seems to be no malaria, but some typhoid. We have had one death and several cases. I just escaped it myself, but am now all right again.

New York Metal Markets

The statistics of the Copper Producers' Association for August make possible several very interesting comparisons. In the first place, it is noteworthy that the much-heralded increase of production has not yet materialized, the output for eight months this year being 963,320,648 lb., compared with 963,440,171 lb. during the corresponding period of 1910. According to L. Vogelstein & Co., foreign, domestic, and total deliveries compare as follows for the eight months:

	Foreign.	Domestic.	Total.
1911	497,705,878	454,203,464	951,909,342
1910	423,609,695	512,715,342	936,325,037
1911 over 1910	74,096,183	....	15,584,305
1910 over 1911	....	58,511,878	....

Going back to the beginning of the Producers' statistics, foreign, domestic, and total stocks compare as follows:

	Foreign.	Domestic.	Total.
Dec. 31, 1908	103,548,480	122,357,266	225,905,746
Dec. 31, 1909	228,417,280	141,766,111	370,183,391
Dec. 31, 1910	163,413,280	122,030,195	285,443,475
Aug. 31, 1911	130,791,360	133,441,501	264,232,861

From the above it will be seen that after nearly three years of nervous and erratic markets laboring constantly under the fear of excessive supplies, there is 11,000,000 lb. more copper in this country and 27,000,000 lb. more abroad; a total of 38,000,000 lb. or almost exactly one week's supply. Total world's stocks at the end of August 1911 were less than 50 days' supply. A simple calculation will show that at the present rate of accumulation we shall have two full months' supply by the middle of 1915. Nevertheless, apprehension that the market will shortly be glutted with copper will doubtless continue to exert a disquieting influence. While, as above stated, there is no increase to date in the domestic output, it is quite likely that some new copper will come on the market between now and the end of the year. Even so, assuming the same rate of foreign and domestic consumption as heretofore, we shall finish the year with stocks not greatly changed from the beginning, and certainly much less than two years ago. With any approach to good business in this country, the additional supplies will readily be absorbed. As to the future, L. Vogelstein & Co. look for at least a maintenance of the present volume of business and possible improvement. Dun's Review for last week says:

"Steady improvement in business conditions is indicated by most of the reports which come from the leading industries and from trade centres. This is further confirmed by the gain in bank clearings, the reduction in number of idle cars, and the increase in pig iron production. Apparently there is a much more optimistic sentiment regarding the cotton and grain crops, in spite of the recent Government reports of conditions; and with the prospect of fair average farm returns, low stocks of goods on the shelves of distributing merchants, and an abundant supply of money, the fall season is opening with a considerable growth of confidence."

Reference is also made to improved conditions in the textile and leather trades, to the great activity of building, and to our excellent foreign commerce. In spite of large shipments of steel and iron, unfilled orders on the books of the steel corporation have increased. Everything considered, there seems no reason to be bearish on copper. It must not be forgotten that mines are closing as well as opening.

The lead market is without particular feature, and prices have fluctuated within narrow limits. In New York desilverized remains at 4½c. and in St. Louis at 4.42½c. Missouri brands are selling at 4⅜c. St. Louis, which enables them to compete with desilverized in Eastern markets. Stocks of foreign lead in bonded warehouses have been cut in half; in spite of which the European market has advanced. Trade in lead products is reported active, and a continuance of sound and healthy markets can be expected.

Spelter, after selling at 6c., St. Louis, declined to 5¾c., but not much metal changed hands at the lower prices, and the market is now strong at 5.90c. or better. Spot spelter is in reality scarce and commands a premium over futures, instead of the reverse, as is usually the case. European dealers are bidding parity of 5¾c., East St. Louis, in this country, and would take large quantities if available. Such being the case, lower prices are not likely, but rather an upward movement with any improvement in demand.

Blast-Furnace Slag Cement

Portland cement is made by one of the subsidiaries of the United States Steel Corporation, the Universal Portland Cement Co., from limestone and granulated blast-furnace slag, the latter being the product of the bessemer furnaces of the Carnegie Steel Co. Large bins approached by elevated tracks at one end of the raw-material mill provide the storage room for the raw material. From these bins the limestone is fed directly into gyratory crushers, which prepare it for the dryers into which the stone then enters. The slag is also fed into separate dryers, all of which are maintained at a sufficiently high temperature to drive off all the moisture. After passing through the dryers each of the raw materials is conveyed into separate ball and Williams mills, where rolling and impact reduce them to extreme fineness. The two materials are then carried to separate hoppers from which they are drawn off and properly proportioned by electrically operated weighing devices. The mixture of slag and limestone, already a powder, is then passed into tube-mills where it is thoroughly mixed and completely pulverized. The next step is the calcination of this raw mixture in rotary kilns. Leaving the rotary kilns the clinker, produced by the burning, is dropped into storage pits where it is cooled and cured. Electrically operated cranes then carry the clinker to the finishing mill, where it is passed through jaw-crushers to Kent mills and then over Newyago separators. After the addition of a certain quantity of gypsum, which is done by means of an automatic device, the material again passes through the tube-mills similar to those used in finishing the raw material. Being now ground, the cement passes on to a belt-conveyor and is distributed into the various bins of the storage-house. The cement in passing from the finishing mill into the storage-house is automatically sampled, from which samples the various tests for quality are made in the laboratory.

GEORGIA'S gold production in 1910 was 1722.25 fine ounces, valued at $35,602, and of silver 335 fine ounces valued at $181, according to H. D. McCaskey, of the U. S. Geological Survey. Compared with the figures for 1909, the production of 1910 shows a decrease in gold output of $25,018, and a decrease in production of silver of 21 ounces, but an increase in value of $76. There was no production of copper or lead ore in Georgia in 1910. The placer gold output was 880.96 fine ounces, and the remaining production of gold, all from quartz ores, was 841.29 fine ounces. This shows a considerable increase of placer gold, but a much larger decrease of gold from the deep mines, owing mainly to the idleness of the famous Franklin mine in Cherokee county. The silver output from placer gold in 1910 was 84 fine ounces and from quartz gold 251 fine ounces. There were 13,562 short tons of silicious gold ore mined in Georgia in 1910, with an average recoverable value of $1.29 per ton in gold and silver, against 8549 tons in 1909 with an average extraction of $5.18 per ton. There were 23 placers and 8 deep mines producing in 1910, against 15 placers and 14 deep mines in 1909. Placer mining has been on the increase in Georgia for the past two years, but deep mining in general has not kept pace.

An Important Development at Angels, California

One of the most noted groups of mines in California is that at Angels, in Calaveras county. In the sixties these mines had attracted much attention and some of them had been large producers. The most important of the groups, beginning at the north end, are the claims now consolidated by the Sultana company, including the Bovee; the Angels mine, the Lightner, the Utica, and the Stickle. West of this group is a second group, which includes the Madison and Gold Cliff mines. It is the area from the famous Utica-Stickle northward, however, that has been the most productive, and which now, after an idleness on the part of some of the mines, again gives promise of yielding additional millions in gold. An unusual geological condition exists in these mines, which strangely has only recently come to be understood, or its importance appreciated. The main producing vein coursing through the mines from the Bovee to the Stickle, is a zone of steeply inclined chloritic schist, locally highly silicified in considerable masses and impregnated with gold and auriferous sulphides, principally pyrite. This zone of mineralized schist is intersected by a second vein which lies to the west of it. This latter vein strikes more nearly to the north than the former, and also has a much flatter dip—about 45°. It therefore cuts the mineralized zone of the Bovee-Stickle group both in strike and dip, and is later than the schistose vein, as it faults the latter. The pay-shoots which have made the schist mines famous lie above the plane of this faulting vein. As the intersection of these two important veins occurs at the surface in the Bovee mine, the pay-shoots were found in this property at and near the surface, and the entire zone was worked before 1868 by an open pit which extended the entire length of the property, producing about $600,000. Some ore was also mined from the later vein, which was found to be profitable in spots, particularly near the surface. The condition in the Angels mine was essentially similar to that in the Bovee, though, as already indicated, the faulting vein lies at an increasingly greater distance to the westward, proceeding southward along the schistose vein. It is also deeper to the plane of intersection in that direction. The Angels mine was extensively and profitably worked in early days, to a depth of about 300 to 400 ft., at which depth the heavy masses of talcose and chloritic schist and barren quartz of the faulting vein were reached.

NEW SHAFT, LIGHTNER MINE.

The Lightner, Utica, and Stickle, lying south of the Angels mine in the order named, were worked with varying though not great success, in the early days, and finally were abandoned and remained idle for years until early in the eighties, when work was renewed on each of them. It will be understood that, owing to lack of knowledge of the peculiar geological conditions at these mines, the work of sinking was not extensively undertaken until rich ore was found in the eighties in the Utica mine, near the north shaft, at a depth of about 600 ft. Here the pay-shoot was found to lie upon a heavy stratum of talc schist which was assumed to be the foot-wall, and for years these mines were worked under this erroneous impression. A few years ago it was learned that the schistose zone, which had been so highly profitable in the series of mines through which it passed, was resting on a fault plane, that the heavy stratum of talc schist with its nearly barren lenses of included quartz, was merely a vein later than the Stickle-Bovee vein, and had displaced the latter. This led to the shafts of the Angels, Lightner, and Utica-Stickle mines being sunk through the faulted zone, and the discovery to the eastward of what is now presumed to be the downward continuation of the faulted schistose vein. The Utica workings entered this ore on the 1200 ft. level, and have been in it to the present lowest level, the 1700. In the Angels mine pay-ore has recently been found in a winze sunk from the 950-ft. level. This ore is said to mill $6 per ton, and the vein is 20 to 30 ft. in width. These recent discoveries have greatly stimulated activity among all the mines of this group, and other quite as important discoveries are anticipated.

Westward from the Utica-Stickle mine, and distant about 2500 ft., is the Gold Cliff mine, the vein of which dips at angles varying from 50 to 35° to the eastward, and it is estimated that the Gold Cliff vein will intersect the Utica vein somewhere between 2500 and 3000 ft. in depth, in view of which the main shaft is to be sunk to that depth in search of the intersection of these veins. This proposed development is in anticipation of the possible recurrence of large bodies of payable ore above the plane of intersection, similar to those which have previously been found nearer the surface.

Mr. Pinchot Visits Alaska

Alaska is entertaining many visitors this summer, and among the number is Gifford Pinchot, whose trip is particularly significant in view of his prominence as a conservationist. According to the *Valdez Daily Prospector*, he made the following statement as to his plans and purposes: "My object in visiting Alaska at this time is, first, to meet the people and learn their views; and, second, to see all of the country I can in the time I have. I came here to get information at first hand, and to insist upon my own opinions. If any opinions I have formed hitherto are shown to be wrong, I shall be very glad to change them. What I want is the facts. I am just as anxious as the Alaskans to see the coal opened and the natural resources utilized. It is not good sense or good morals to tie up resources which are needed for immedate consumption. Contrary to the general opinion, the conservation men are not responsible for tying up the resources of Alaska. Since Mr. Roosevelt, while President, sent his first message urging development, in 1906, we have been trying to get Alaska opened under conditions fair to all the people. But we do not believe that development should necessarily mean monopoly.

"The people of the whole United States have become immensely interested in Alaska. They believe that certain questions here are not Alaskan questions alone, but national ones as well. The great interest shown by the people of the United States in Alaska will unquestionably result in promoting the immediate development of the country, and call national attention to the resources and advantages of Alaska. Senator Poindexter and I are anxious to meet the pioneers, the business men, the professional men, and above all the miners and prospectors, who have had practical experience and therefore are best entitled to give advice. One reason why the people of the United States are sensitive about monopoly in Alaska is that they have suffered so much from monopoly at home and are having so hard a time to fight it. They have been through the mill themselves, and are anxious that matters should be taken in hand in time in this new country before the evils against which we are struggling outside are fully fastened on the people."

Mr. Pinchot and party visited the Matanuska and Bering River coalfields and met many of the men concerned with the development of Alaska who are prominent in business circles.

Discussion

Readers of the Mining and Scientific Press are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Porcupine Swastika Mining Co.

The Editor:

Sir—My attention has been called to a statement in the publicity section of the Swastika number of *The Mining Investor*, referring to me as having examined the claims of the Porcupine Swastika Mining Co., Ltd., and reported favorably upon them; also referring to me as the managing director of that company. I write to say that the statement that I have reported favorably upon the claims of the company is contrary to the fact; and I am not and have not, at any time, been managing director, or otherwise officially associated with the company, or a shareholder therein, or otherwise interested in the stock of the company. If further reference is made to me in any of these connections, I shall be compelled to place the matter in the hands of my legal advisor, and take such proceedings against parties responsible therefor as may be necessary to protect my interest.

R. B. Lamb.

Toronto, September 11.

A Case for the Stamp-Mill

The Editor:

Sir—In the *Mining and Scientific Press* of May 6, Algernon Del Mar, though partial to his old friend, the 5-stamp battery, does not by his argument approve of the 5-stamp single-discharge mortar. He is correct in that respect, but I cannot agree with him that a 5-stamp double-discharge mortar will crush as much ore as five 1-stamp mortars. There is some truth in the argument that the screen area in the single-unit battery is in excess of crushing capacity, and it seems to me feasible that 3 stamps suitably arranged with triple or quadruple discharge may crush equally as well as the one-unit stamp, but with a 5-stamp double-discharge mortar I do not see how the splash from the side of the stamps can touch the discharge screens.

In all newly-designed mills on the Witwatersrand the stamp-battery is looked upon as a coarse crushing unit, and there are practically no screen troubles when using a 9-mesh screen, aperture 0.27 in. The screens have a life of about 30 days. With single-unit stamps there would, of course, be a feeder for each stamp, as against one feeder for the 5-stamp double-discharge, as advocated by Mr. Del Mar. Feeders of the present-day type are no trouble whatever, and the difficulties of feeding ore when a 'bit sticky' to light stamps with fine meshing, disappear entirely with heavy stamps and coarse meshing, it being a matter of little consequence whether the ore is wet or dry.

On one mine here four Nissen stamps of 2000 lb. weight are running side by side with stamps of the same weight with single discharge. The stamp duty for the former is, I believe, 23 tons, against 15 tons for the latter. The screen used is 9 mesh.

G. A. Robertson.

Germiston, Transvaal, July 25.

Investing Without Investigation

The Editor:

Sir—I have noted that during the past year progress of a marked character has been made in the effort to suppress 'wild cat' mining, and now that the Federal authorities have taken an active part in exposing and putting this class of enterprise 'out of business' it seems that legitimate industry will soon take its place in the confidence of the public. The press having taken up the exposure of certain well known promotion houses, the general public has become quite familiar with the methods used to defraud, and will hereafter, no doubt, be more cautious when investing; however, there still remains a class of mining promotion with which I have become familiar during the past three years, and which I consider more dangerous than the well known 'wild-cat' companies, for these appear in the guise of respectability. Unfortunately, no action can be taken against them, for they are clearly within the law, and yet their influence destroys confidence. Usually the companies are in the hands of well known business or professional men, who, though honest, and possibly experts in their respective lines, know nothing of mining and are absolutely incompetent to handle such an enterprise.

Generally speaking, this class of mining companies (unlike the 'wild cat' which depends upon a vigorous advertising campaign for securing funds) depends chiefly on securing its money, not only from the officers but from their friends and their friends' friends. Their operations are limited, and when failure ultimately overtakes them, the matter rarely, if ever, becomes public, consequently the average investor is not aware of the pitfall that awaits him. When the property comes into the officers' hands, they immediately read up and soon learn such common terms as dip, strike, drift, shaft, winze, oxidized and sulphide ore, and, above all, true fissure vein; the latter they use constantly, and with a few other terms a profound impression is made on their friends' minds and upon assurance of great success they invest.

The officers themselves are confident of a success; usually for no other reason than that one or more of their number has been to the property and gone over it thoroughly—probably with a prospector who naturally will boom it, if for no other reason than that it might help him to sell his claims or because he might get a job. The thought of an engineer is foreign to their minds. They *know* the mine is good and the few hundred dollars for an engineer's opinion would be wasted, never thinking that in the end it would possibly save them thousands. Their own money and their friends' money goes into the prospect in sums usually limited to a few hundred dollars at a time; they do not realize and cannot be convinced that to open and develop a mine is at best a large undertaking and should be in the hands of experienced men, or that sums limited to a few hundred dollars a month, will not (even if judiciously expended) make a mine within a reasonable time. The consequence of such ignorance is that those who have invested soon become dissatisfied, and the officers must seek funds from others than their friends. This they rarely do, but generally they raise enough among themselves to continue a little longer. In the end they too become discouraged and the mine or prospect is abandoned. From then on all mines are censured and the one in which they placed their money particularly.

Each individual investor in a mining company that has failed has only himself to blame for not investigating, yet such men continue to deride the industry at large, and many promotions of exceptional merit cannot raise sufficient capital to make them successful. There is a certain element of risk in any enterprise, and should a mine that has stood rigid investigation be a failure, it is well to remember that everything cannot always succeed.

There is only one remedy for the evil here discussed, and that is to impress upon the investor the necessity for investigating not only the mine, but the ability of the officers to make it a success, and not to invest because he knows an officer to be honest; unfortunately, honesty, though a great factor, cannot take the place of knowledge. With this class of mining enterprise out of the field, the industry would be looked upon with greater favor, and I sincerely hope everyone connected with mining will, whenever the opportunity affords, try to remedy a condition which can only reflect discredit to their profession.

F. A. Crampton.

San Francisco, August 31.

By far the greater part of the gold found in placer mines occurs as dust. It is remarkable that no great masses of gold have ever been found, the largest being small in comparison to those of copper, iron, and silver.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

PETROLEUM production is quoted in the United States in barrels, in Russia in poods, and elsewhere usually in long tons, 2240 lb. It is convenient to remember that 7 U. S. barrels equal one ton, and that 62 poods equal one ton, or 9 poods one barrel.

SULPHURIC ACID is used for such a variety of purposes that it has been said that the amount of its consumption is an index of the state of industrial advancement of a country. As its cost is low and transportation difficult it is usually produced near the place of consumption.

BLASTING mats are woven mats of rope which are spread on the ground above the bore-holes when blasting is done where flying pieces of rock will be dangerous. If heavy charges of explosives are used it is the custom to place logs or railroad ties directly over the bore-holes, and the blasting mats on top of these.

ENARGITE is a sulphide of arsenic and copper and is a black, brittle mineral of metallic lustre, usually columnar or granular in structure. Before the blowpipe it yields white fumes with a garlic odor, and a button of copper. Enargite is frequently associated with other copper minerals, and occurs mainly in the mountains of Chile and Peru, but is found at Butte and in other parts of the United States.

HALITE is the mineralogical name of rock salt, which occurs with rocks of all ages in beds of great thickness that have been formed by the gradual and complete evaporation of bodies of water into which the salt has been brought in small increments by inflowing streams. These exist in all parts of the world, but those in Poland, Austria, and Germany are most noted because of their size and the large scale upon which they are worked.

PENCIL MANUFACTURERS have been buying old cedar rails and cedar boards from the old barns of the farmers for the reason that such wood, having been exposed for many years to the elements, is in far better condition than new cedar. The new cedar carries a large amount of resinous matter and it is difficult and expensive to get rid of this. When not thoroughly eliminated, it tends to warp the pencils and to ooze out, marring if not destroying the finish.

DRYING pulp and slime samples is accomplished simply and effectively at the laboratory of the Mines Company of America, at La Colorado, by an unusual device. Instead of drying the samples by heat, the moisture is extracted by a vacuum process employing the principle of the vacuum-filter. A canvas is stretched across the bottom of a small sample-drying pan, and the vacuum applied at the bottom by a hand-pump. The pans are 6 in. across and 2 in. deep.

MEAN sea-level, is the level that the sea would assume if the influence of tides and winds were eliminated. This level is not the elevation determined from the mean of the highest and lowest tides, nor is it the half sum of the mean of all the high tides and the mean of all the low tides, which is called the high-tide level. Mean sea-level is the average height of the water, all stages of the tide being considered. These elevations have been determined by the United States Geological Survey in connection with its topographic surveying.

TELLURIDES of gold and silver are of much more widespread occurrence than is generally realized. The various tellurides of gold and silver were first identified in Hungary and later were found in small quantities in the Colorado districts north of Denver and in the veins of the Mother Lode in California. They were not of much economic importance, except for the difficulty of milling ores containing them, until Kalgoorlie and Cripple Creek were discovered almost simultaneously. These two districts have each produced large quantities of gold from telluride ores. In spite of this the nature of the telluride minerals is not thoroughly understood, and there is much ground for supposing that they are simply alloys of gold, silver, and tellurium in variable proportions.

RADIUM commands a price at present of $80,000 per gram (approximately 0.035 oz.). The total quantity so far produced is 3½ grams, and 'banks' have been established in Paris and London which loan small quantities at the rate of $200 per day. Radium is chiefly produced from the uranium ore at Joachimsthal in Bohemia, and as large quantities of this must be handled to obtain small quantities of radium, the cost of the latter is largely dependent upon the market for uranium. Ores containing radium are known to occur in many other places, but have not been made the basis of an industry as yet, nor have the waters of the many springs that exhibit radium emanations as yet been utilized.

THE principal use of fuller's earth in this country is in bleaching, clarifying, or filtering of fats, greases, and oils. The common practice with mineral oils is to dry the earth carefully after it has been finely ground, and run it into long cylinders, through which the crude black mineral oils are allowed to percolate very slowly. As a result, the oil that first comes out is perfectly white and much thinner than that which follows. The oil is allowed to continue percolating through the earth until the color reaches a certain maximum shade. Then the fuller's earth itself is clarified by a steaming process and used over again. With vegetable oils, however, the process is radically different. The oil is heated beyond the boiling point of water in large tanks, from 5 to 10% of its weight of fuller's earth is added, and the mixture is vigorously stirred and then filtered off through bag filters. The coloring matter remains with the earth, the filtered oil being of a very pale straw color. American fuller's earths are better adapted than the English earths for use on mineral oils, but the English earths are superior for the treatment of fats and vegetable oils. In clarifying vegetable and animal fats with American earths a more or less disagreeable taste is left, but the reason for this has never been determined.

ZINC DUST is a by-product of spelter making. The zinc vapors escaping from the muffles during the reduction of the ore are never completely condensed in the receiver to liquid zinc, but a considerable portion is caught in the form of metallic dust by special collectors connected as closely as possible with the receivers. In order to avoid the loss of any zinc vapors that are not precipitated in these collectors, the latter are further connected with collecting channels and similar appliances. The proportion of the zinc-dust recovery to the spelter production depends on the zinc content of the furnace charge, as well as on the temperature of the distilling furnaces. With a rich charge and a hot furnace, which means a high tension of the zinc vapors, the zinc-dust recovery may reach from 10 to 15% of the spelter production. The best quality of zinc dust, so far as the percentage of the metal content is concerned, is derived from the special collectors, because the stuff precipitated in them is least exposed to the oxidizing influence of the air. This dust is composed of from 88 to 93% metallic Zn, and contains from 6 to 10% ZnO, as well as small quantities of Pb, Cd, As, and Sb. The initial dust, a product which is formed three or four hours after the distilling process has been started, possesses a comparatively high percentage of oxide of zinc, but it also holds nearly the whole cadmium content of the furnace charge. It is, therefore, used by preference for the production of the latter metal. Merchantable zinc dust must contain at least 90% of metallic zinc.

Special Correspondence

LONDON

Coal in Ireland.—Sir William Ramsay's Lucubrations on the Future of Great Britain.—Lead and Zinc Markets.—New Developments at Broken Hill

A few weeks ago I referred to the reported revival of placer gold mining in the north of Scotland and described how this event recurs with a certain amount of regularity whenever the newspapers are short of more interesting matter. This week prominence has been given to a similar event in connection with coal in Ireland. Ireland is a distressful country, and its bad luck started ages ago, geologically. The middle part of the island is a wide and flat plain, having Carboniferous limestone as the basal rock, with a covering of peat and alluvium. At one time it was overlain by coal measures, but these have been almost entirely removed by erosion and only a few patches remain. One of these spots is in Kilkenny, another is at the boundary of Kerry, Limerick, and Cork, while in the northern part of the island some small isolated spots remain in Tyrone and Leitrim. Some of these are worked in a desultory and restricted way. Railway communication is poor and transport is confined to carts. At the present time attempts are being made to exploit the deposits at Castlecomer in Kilkenny, where it is reported that a good seam of steam coal can be worked on a scale of 400 tons per day, and a railway through the property is to be built connecting the towns of Kilkenney and Athy. All these reports have to be taken with the proverbial grain of salt, and people who know the district are skeptical as to the existence of the seam. It is, of course, perfectly well known that there are seams of anthracite of limited extent and varying thickness, but that is not the same as an extensive bed of steam coal. I am afraid that the scheme will fizzle out, just like so many that are trotted forward during the summer holidays.

While writing about coal, it is of interest to give some comments on Sir William Ramsay's gloomy prophesy of ruin and starvation that is to overtake the British nation 175 years hence when the coal resources of the British Islands are to suddenly become exhausted. There never was so unpractical a scientist as Sir William Ramsay or one so prepared to offer opinions on subjects with which he is unfamiliar. He starts with the official figures of a Royal Commission which stated in 1906 that at depths not exceeding 4000 ft. there were known seams that could be worked under present circumstances containing 100,000 million tons. The present consumption is roughly 250 million tons per annum, and if the consumption did not increase this would last 400 years. But Sir William figures that the consumption will gradually increase until in the year 2050 it will be 770 million. It may legitimately be asked whether this supposition of increase is logical. However, I will let that pass. If he takes it for granted that the consumption of coal is to increase, why not also admit that inventors will continue to improve the mechanical advantages at our command? The history of the advance in mechanical achievements at our collieries shows immense strides during the past twenty years, and there is every reason to believe that within the next twenty years work will be [illegible] power [illegible]. Then what about the [illegible]? Certainly, England has [illegible] water power, but why not stretch our imagination and see visions of [illegible] cables over the North Sea from Norway and Sweden. And what about oil? And [illegible] can be obtained for coal, surely the country will [illegible] and leave a large [illegible] food, work, and wages. The [illegible] exhaustion of the fuel resources would be seen in advance, and over a series of years the [illegible] would gradually change. Times would change, and people with them. Sir William was also inaccurate in his details. His calculation as to the relative power of a man and a horse deduced from his own observation of an Eastern potter's capabilities contained a mistake in multiplication of which a first year's student in applied mechanics would be ashamed. Then again, his claim that the steam turbine reduces the coal consumption per horse-power hour from 4 or 5 lb. to 1 or 1½ lb. was an absurd travesty of the real facts, while his reference to the Mond gas plant as a type of efficient application of the calorific power of fuel was quite inappropriate because it happens to be the least efficient of all on the market.

The lead and zinc markets are at present attracting general attention in London, for it is admitted that we are in for another period of high prices. Consequently the shares in Broken Hill mines have been pretty firm recently. The most important event is the reopening of the Broken Hill Proprietary. For the last two years this company has lived on its smelting works and on custom ores, and no great profit has been made. But the company is now approaching a new lease of life, for the zinc distilling furnaces are practically complete. The difficulty of obtaining suitable clay for the retorts has been solved, and the local workmen have been properly instructed by a European expert. There will be no difficulty in marketing the zinc without the aid of the European ring, and any obstacle that there may be in this direction will be insignificant compared with the difficulties fifteen or more years ago when the company took the sale of lead into its own hands. An even more important step to be taken is the starting of iron manufacture and the utilization of the great deposit of iron ore at Iron Knob. Hitherto this ore has been used solely as flux in lead smelting, but the time appears to have arrived when the company is to embark on iron smelting. Nothing official has been divulged as to this policy, though there can hardly be any doubt as to the correctness of my information. The manager, G. D. Delprat, is about to pay a visit to Europe and elsewhere, and the study of iron metallurgy will undoubtedly be one of his occupations during his tour.

JOHANNESBURG, TRANSVAAL

Record Output for July.—Brakpan Record.—Lack of Labor and Power.—Individual Records.

Record monthly outputs of gold have been making their appearance more frequently of late, but that for July possesses all the more significance because it is the first time in the history of the gold-mining industry of the Transvaal when the monthly output has exceeded three millions sterling in value. In fact, the output for July constitutes many other records. The total output for the Transvaal was 709,258 oz., valued at £3,012,738, but of this large value the Rand is credited with no less than £2,887,953, leaving for the outside districts only £124,785. It is clear that it will only need another such improvement to enable the Rand to claim a three million sterling output all to itself, and were it not for the scarcity of unskilled labor such a high standard of production would have been reached long ago on the Rand. Nevertheless, with so many stamps at Randfontein, City Deep, and elsewhere standing idle for lack of labor and power, it cannot be many months now before the Rand output alone is valued at three millions sterling. Seeing that July was a long month, the total ought to have been even better, for more than a third of the mines recorded decreased outputs when under ordinary circumstances they ought to have recorded improvements. Brakpan was perhaps the most notable individual producer, because this was its first declaration, recovering in June £18,087 from 18,133 tons treated. In July, however, there was a marked improvement, for from 25,400 tons treated, a recovery of 9594 oz. was obtained; equaling 7.5 dwt. per ton. This was even a better recovery than the City Deep, which only managed to show a recovery for the month of 7 dwt. per ton. The classification of the July output was as follows: mill £1,849,574, sand £1,110,369, and miscellaneous sources £52,795. Another striking feature of this record output was the fact that it was obtained in the face of diminishing labor supply, as during the month there were only 181,582 natives employed on the average, as against 186,940 in June, 190,392 in May, and 194,328 in April, when the record high-water mark was reached. The average daily yield on the Rand was also a record, having increased from £93,028 for June to £95,160 for July. Of course, there were more stamps at work, both on the Rand and in the outside districts, the total number being 10,177, of which 9580 were on the Rand and 597 in the outside districts. Tube mills increased in number from 219 to 223. The following are the twelve leading producers, which succeeded in producing more than half the total Rand output:

	Tons Milled.	Oz.	Value.
East Rand Prop. Mines ..	202,400	60,000	£254,864
Crown Mines	143,000	59,024	250,718
Randfontein Estate	200,534	56,955	241,929
Robinson Mine	47,100	25,028	106,312
Geldenhuis Estate	68,970	23,375	99,291
Simmer & Jack	75,500	22,409	95,088
Mourse Mines	54,200	19,373	82,185
Rose Deep	59,400	19,276	81,879
Village Main	41,200	18,178	77,215
Robinson Deep	49,800	17,507	74,365
New Modderfontein	47,700	17,390	73,868
Ferreira Deep	30,850	16.246	69,009

BUTTE, MONTANA

Butte & Superior Mill.—Progress at Raven.—Smelter Additions at East Butte.—Moulton Closed.—Legal Decisions.—Shaft Sinking at Black Rock.

At the Butte & Superior excavations for the new concentrator are being made, but none of the material has yet arrived. The machinery to be used will practically all be taken from the Basin Reduction Works and will be removed in such a way as not to interfere materially with the treatment of ore. The lease on the Basin Works expires early in the summer of next year, and it is expected that the 500-ton concentrator will be ready for use early next spring and will be so constructed that units can be added at any time. The Butte & Superior company is at present shipping 400 tons per day, and this amount could easily be increased, as a very large amount of ore has been blocked out. The Butte & Superior company is said to be earning around $30,000 per month net.

Little work is being done in the Raven mine except by lessees. Nothing can be done on the lower levels until the water is removed from the 1300-ft. level, but the lessees working on the upper levels are doing a lot of development work and are getting out some high-grade silver ore.

1300-ft. level, but the lessees working on the upper levels are doing a lot of development work and are getting out some high-grade silver ore.

The East Butte company is developing orebodies on the 1000-ft. level said to carry 7% copper. Up to recently this level was never explored, but it appears equally as rich as on the 800, 1300, and 1400-ft. levels, on which a large amount of ore is being blocked out. The company is maintaining a production of about 1,000,000 lb. per month from its smelter, and no effort will be made to increase this output until market conditions considerably improve. All the ore treated at the company smelter practically comes from the East Butte mines, the only custom copper ore being received coming from the Butte-Alex Scott. A third blast-furnace is being built, but this will not be completed before next spring, and by that time it is hoped that the market conditions will have so far improved that production can be increased enough for putting into commission the new furnace. A dust-chamber, 300 ft. long and 50 ft. wide, will be completed about the first of the year. This contains three flues and will save all the flue-dust which is now lost through the stacks, making quite a saving in the cost of production.

A shipment of 50 tons of silver ore from the Moulton mine, owned by W. A. Clark, was sent to Salt Lake for experimental purposes, but after a very extensive series of tests, the conclusion has been reached that the ore can not be handled at a profit, and the mine has been closed.

An attempt was made to compel the North Butte Mining Co. to pay taxes on new property and improvements in addition to the tax on the net proceeds of the mine, amounting to over $20,000. The company took the matter into the courts and won its contention. The Barnes-King Co. has had a judgment of $5000 recorded against it in an action for damages through a man falling down the shaft. The man who sustained the injury sued for $30,000.

The cross-cutting from the Black Rock mine of the Butte & Superior at a depth of 1300 ft. under the Pilot Butte shaft will be completed in about another two weeks, which is considered record-breaking time. A crew will then start raising to meet the shaft sinking party, and before the first of the year, Mr. Sheehan, the superintendent, says, the two parties will meet. No effort has yet been made to definitely determine whether the rich body of copper ore found when running the cross-cut is in Elm Orlu or Pilot ground.

SILVERTON, COLORADO

Sound Democrat Leased.—Consolidated Eureka Finds Ore.—Iowa Tiger Again in Good Ore.—Silver Lake Milling.—Gold King Lease.—Hercules Resumes. Silver Ledge Shows Improved Saving.

The month of August was the most active of the present season, and a number of examinations were made, some of which may lead to active operations with the beginning of next season. The Sound Democrat mine, formerly leased to Messrs. Smith and Terry, is now controlled, under bond and lease, by Messrs. Ross and Nickels, who announce that milling will be resumed at an early date. The mill has been repaired and the mine is being cleaned up and placed in shape for active operation. The Vermillion mill is crushing 75 tons daily and shipping two cars of zinc and one car of lead concentrate per week. The Bagley is still inactive and will probably remain so until the spring of 1912, when a mill will be built. The Columbus is also idle, except for one shift of two men, who are driving on a new vein discovered in the lower Laura tunnel. This vein is 14 ft. wide, but is low grade. The lessees hope to find better ore with depth. The Consolidated Eureka company recently cut a vein in the Domingo adit, which carries good ore, but is too small for profitable mining. The company is now driving on the vein.

The Sunnyside continues its steady production and there is little new of note at the property. The water supply for the new hydro-electric plant has failed, and the company has been compelled to revert to the San Juan Water & Power Co. for electric power. The mines of Minnie gulch are all idle, except for a small leasing company operating a part of the Esmeralda mine. In Maggie gulch, the Intersection Leasing Co. is operating the Intersection mine, but without very favorable results. The Danforth Leasing Co. is operating the Little Maud mine under bond and lease, the work being confined entirely to development. The Iowa Tiger Leasing Co. is again in good ore in the Iowa mine and is milling 100 tons per day and shipping 25 tons of 40% lead concentrate. The Silver Lake, operated under lease by the American Smelting & Refining Co., is milling from 40 to 50 tons per day. The ore is rather low grade. but it is reported that some high-grade ore has been found and that a shipment will be made soon. Messrs. Mears and Slattery have applied for a lease on the Gold King mine. The stockholders have approved the application, but as the mine is in litigation between the stock and bondholders, the approval of the bondholders is necessary, and this has not yet been obtained. The Hercules is again operating, under the management of Thomas Kane. Development work is being pushed, and milling will be resumed as soon as the ore reserves warrant. Lead ore of good grade has been found on the lowest level.

Denver capitalists are investigating the Idaho with a view to purchasing, and it is probable that the mine will be examined in their interest. The Silver Ledge is milling an average of 125 tons per day, and the management reports a saving of 85% of the lead and 65% of the zinc in the crude, a much better result than has heretofore been attained at that property. The mine is in excellent condition and the ore reserve is well ahead of production. The San Antonio is idle except for a few men on assessments. The Congress lessees are driving in virgin territory, but without results as yet. The American Mining Congress has organized a Silverton branch, and twenty-five applications for membership have been received. The Congress is endeavoring to organize the mining men of the State in an effort to secure State and National appropriations for mining investigations.

TORONTO, CANADA

Resumption of Construction at Porcupine.—Capitalization of Dome Increased. — New Goldfield. — Semi-annual Statement of the Mineral Output.—Crown Reserve.

Nearly all the Porcupine mines which suffered by the fire in July are again in operation and preparing for an active winter's work, which will be carried on with fewer difficulties than last year on account of the improvement in the roads. Heavy teaming will now be practicable without waiting for the setting in of the cold weather. Building is going forward with great activity, though complaints are made as to the difficulty of getting supplies of material as required. In Porcupine some 400 buildings have gone up and operations are likely to be brisk as long as the open season lasts. It is estimated that about 2000 men are now employed in connection with mining and 1000 in building and road-making.

The West Dome has installed three boilers of 150-hp. capacity and a 20-hp. hoist, and is putting in machinery in the power-house. The damage caused by the fire at the Preston East Dome has been repaired and the shafts are being pumped out for the resumption of operations. The capitalization of the Dome has been increased from $2,500,000 to $3,500,000, the new stock being taken up by present shareholders in the ratio of two new shares to every five already held. The Reciprocity Mines, Ltd., recently organized with a capital of $1,000,000, has taken over the McKenzie Veteran claim of 160 acres some distance to the north of the Rea.

J. B. Tyrrell, in a special report on the Lucky Cross, Swastika district, states that gold is visible in a number of quartz veins uncovered on the surface and recommends the sinking of a shaft on vein No. 16. A plant has been ordered for the purpose. The Sutherland claims in Bristol Township have been purchased by a Duluth syndicate for about $300,000. At the Thompson claim in Bristol, about a mile south of the first discovery in the district, a 6-in. quartz vein carrying free gold has been found.

The new goldfield at West Shining Tree is attracting much attention, and seems likely to prove a second Porcupine. Prospectors are pouring in and a large area in the townships of Churchill, Asquith, Fawcett, and McMurchy has been staked. The first big deal is announced, the Gosselin property, on which the original find was made, having been sold to Mackenzie & Mann of Toronto for a sum said to be $300,000. The Dome interests are represented in the camp and are reported to be negotiating for claims. The field will shortly be easier of access, as the Canadian Northern railway is building an extension which will run within 15 miles of the camp. Numerous finds of free gold have lately been reported from outlying townships around Porcupine, including Cody, Thomas, and Timmins.

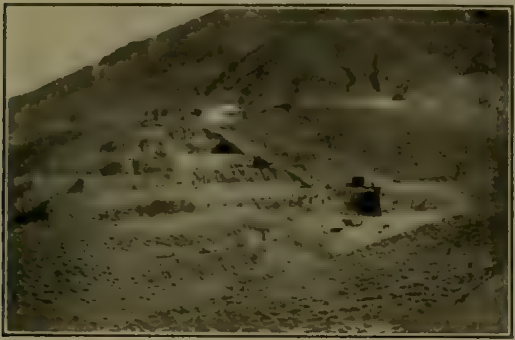
The statement of the output of the metalliferous mines and works of Ontario issued by the Ontario Bureau of Mines for the six months ended June 30, shows a substantial increase in the production of silver. The total output from all sources was 15,231,969 oz., valued at $7,644,200, being an increase of 2,417,142 oz., in quantity and 1,376,670 in value, as compared with the first six months of 1910. Of the current year's product the great bulk came from Cobalt, the shipments from Gowganda and South Lorrain being only 430,540 oz. Shipments from Cobalt have dropped 20% owing to the increased tonnage in the form of concentrate. A new item in the list is furnished by the by-products of the separation and refining processes carried on at Cobalt, namely, cobalt and nickel oxides, produced to the amount of 219,584 lb., of the value of $54,876. The yield of gold continues small, as was to be expected, considering the delay in Porcupine production caused by the fire. The output was only 2276 oz., of the value of $42,320. The Crown Reserve has found its No. 14 vein on the 150-ft. level in the Keewatin formation. The vein at this depth is 3 in. wide and runs 5000 oz. per ton. This company has declared its regular quarterly dividend of 2% and the monthly bonus of 3%, and when these are paid will have returned to the shareholders a total amount of $3,449,181, being over double the capitalization. The new shaft on the Gould Consolidated is down 88 ft. and another vein has been cut. Native silver is showing in the wall rock. The Beaver has substantially improved its position. A statement for the quarter ended August 31 shows shipments valued at $133,500. The company has $59,960 cash in hand and approximately $135,000 to be received from the smelters, being an increase of $68,718 in liquid assets over the previous quarter. The Buffalo has declared the regular quarterly dividend of 5 per cent.

NEW YORK

Reaction Against Wall Street.—Corner in Porcupine Central.—Nevada Hills.—The Copper Market.—Inspiration Ore Reserve.—Ore Treatment at Nipissing Mines.—Increase of Capital of Dome.

The high records shown on the tape during the wave of liquidation that for the past month has been and is still rolling in upon the stock market, have been 'high for the day' as against new 'low levels for the year,' recessions which have likewise been matters of almost daily record. The tensity of the situation is apparent. The occasional ebbs in the tide of selling orders have been marked by almost complete stagnation, and the ever-present hope that the market might be about to turn, has from time to time taken definite form, only to find itself overwhelmed and the market again helplessly adrift. What is to be the end is a question. Rumors of financial trouble here and there in high places are afloat in the street, but up to the present moment no failures of importance have been chronicled. As a matter of fact, Wall Street is paying a just penalty for the abuse of a longsuffering and confiding public. For more than one generation Wall Street had a following that perpetually maintained a reverent attitude and asked no questions, but paid, paid, paid. Now, the same Wall Street is a part of a painful practical exhibition of the wonderful working of the law of compensation. Having, after some years of experiment, taken proper measure of some so-called high financiers, and having had a rude but salutary awakening, the public, which for so long furnished the power for Wall Street's speculative machine, has resolutely turned its back, and now, when its support is wanted, is gaily buying a new automobile or a new set of tires for the old one. This determination is probably attained by reasoning similar to that of the man who, importuned by a beggar for the price of a drink, said that if anyone was to spend the money for whisky, he would do it himself. If Wall Street could regain any definite degree of public confidence, the present acute situation would be quickly relieved.

In the mining market the principal feature of the week was the engineering of a corner in Porcupine Central. For some months the usefulness of the outside market has been impaired by the tactics of traders who resolutely took the short side of the market on all new issues as they appeared, either ostensibly carrying the stock on margin for customers, or delaying deliveries to customers buying outright, in each case trusting to a decline in the market to either wipe out the margin trader or to allow the shares for actual delivery to be purchased at lower levels and correspondingly greater profit. These tactics absolutely prevented any distribution of shares in new enterprises, which is the chief function of any stock exchange, organized or open. When Porcupine Central was offered in the open market, there were many margin orders placed with the houses that accept this class of business. Execution of these orders around 70c. per share was reported, but, following the usual custom, no order was actually executed. A little later the stock began to move up, and, there being little or no real stock in the hands of the public, the house which offered the shares had no trouble in advancing the issue. The orders which had been placed on a margin basis were all taken up, the balance due tendered, and delivery demanded. The result was a squeezing of the house playing short in the manner outlined to the tune of some $200,000; and the hope is general that margin business in mining stocks, which is impossible on any legitimate basis, will no longer be carried on in the illegitimate manner which has heretofore prevailed, and which has done more than any other one factor to retard the growth of the New York mining market.


MILLSITE AND MILL CONSTRUCTION, NEVADA HILLS.

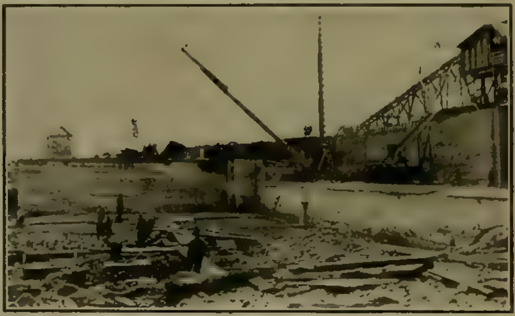
Next to this sensational coup in Porcupine Central, the movement in Nevada Hills has been the chief feature. There has been heavy liquidation of the shares, apparently coming from Salt Lake. Nevada Hills has always been fairly well held in the East; many holders went into the stock because of the Wingfield connection and because of the leadership which was held by Goldfield Consolidated as long as it was dealt in in the outside market. These holders have been anxious and insistent in their inquiries as to who is selling, and why. The resignation of W. H. Webber engendered a fear that he and his friends were getting out.

The copper metal market appears to have a long and difficult gauntlet to run. The decrease in accumulated stocks shown by the August figures was hardly posted where it could be pointed to as an argument for better prices, when the Franco-German war cloud began to assume threatening proportions, and as Germany has been a tremendous consumer for some time, not only was the effect of the improved technical position nullified, but a distinctly weaker tone was made manifest. Germany has been taking copper at such an abnormal rate that a reaction was in order in any event, but the copper market is in no position to withstand such a decrease in consumption as would be inevitable in the event of actual hostilities between France and Germany. The added production for next year is a vital factor. The 'porphyries' are the subject of many analyses, as these properties are so fully in command of the metal market. An illustration of the anomalous position in copper is contained in the estimated increase of production next year of 200,000,000 lb. and in the remarks of J. Parke Channing to the effect that:

"Owing to the exhaustion of the older mines, there soon will be a shortage in the world's supply of copper, unless, in the meantime, great orebodies are found. The basic condition of the mineral industry is that the world's supply of gold, copper, and lead is short, while there are ample supplies of iron, zinc, and silver already developed or known to exist."

It is reported that Greene Cananea is maintaining a copper cost of 9c. This is the best figure the company has ever made, and it is now possible only by reason of the complete reconstruction of the plant at heavy cost. Greene-Cananea is producing a little more than three and a half million pounds of copper monthly. On the present basis, improved conditions would be reflected in the market, if the company were not loaded down with an enormous capitalization. Inspiration Copper, which adjoins the Miami, while not so far along with its development as its neighbor, will undoubtedly reach the stage of initial production in 1912. The company's ore reserve is now estimated at 26,569,400 tons of developed and 81,000 tons of partly developed ore, and about 3,000,000 tons of lower-grade ore, giving a total of 29,453,100 tons containing an average of 39 lb. of copper per ton, or a total of 1,150,000,000 lb. of copper. The plant, which is to be erected under the supervision of C. H. Repath, is expected to produce between 40,000,000 and 50,000,000 lb. annually. Mr. Repath is in charge of some very important construction work, including the new smelter at Jerome for the United Verde and the additions to the smelting plant now being erected at Bisbee for the Calumet & Arizona. Mr. Repath was also one of the engineers in the construction of the International plant at Tooele, Utah.

J. R. Finlay's report upon the copper mines of the Lake district continues to set the New Englanders by the ears. Discussing the Superior mine, Mr. Finlay arrives at a present value of about $1,000,000, as against an appraisal by the Calumet & Hecla committee of $5,272,000. Mr. Finlay's popularity in Boston may be estimated as considerably less than nothing. New England's attitude toward the public in regard to Lake coppers has always been absurdly exclusive, and the jar which Mr. Finlay has given them is not at all liked.


PUTTING IN PRECIPITATION TANK FORMS, DOME MILL.

The Dome Mines Co., Ltd., is increasing its capitalization from $2,500,000 to $3,500,000. The additional $1,000,000 of stock is to be offered to shareholders at par, $10, in the proportion of two shares of new stock for each five shares held. The proceeds are to be utilized in the completion of the plant and in extension of the underground work. The public has very little line on the Dome. It has not been made a market offering, as was the case with Hollinger, though there has recently been a little trading in the stock around $40 per share on a basis of $10,000,000 for the property. The company is controlled by W. S. Edwards and his associates, who were the original owners, and the International Nickel people, and it has been practically run as a close corporation.

The Nipissing Mines Co. is now refining its high-grade ore at its new plant and making shipments of bullion. It is expected that the plant will be able to handle second-grade ores with slight modification. The company has a very large quantity of 30 to 40-oz. ore, from which it is now anticipated a much greater profit can be derived than under the old method of paying high treatment and shipping charges. A custom jigging-plant is to be erected on the Nipissing property to handle ores from all the surrounding shafts.

General Mining News

ALASKA

Copper River

Chitina news despatches state that F. A. Smith and John Delanders have found a vein of free-milling ore near mile 111. Two claims have been staked. The vein varies from four inches to four feet in width.

Juneau

An 18-inch vein of gold ore, in a phonolite and quartzite formation is reported to have been discovered in the Devil's Creek district by Wallace Erwin.

The Alaska Treadwell G. M. Co., in the month ended August 15, crushed 83,412 tons of ore, and saved 1530 tons of sulphide. The estimated value of the free gold obtained is $128,786, and of the sulphide is $102,525, making a total production of $231,311. The estimated realizable value of the production is $225,534. The operating expenses were $89,802, leaving a net operating profit of $135,732. Construction expenses during the month were $15,701. The development work done amounted to 805 feet.

Prince William Sound

Joe Stanton and Abe Bell are reported to have found tellurium at the head of Sheep creek. For several miles the creek runs through a box canyon and the country is difficult of access.

Norman Merchant, after returning to Valdez with associates from an inspection of the Klutina Lake district, states that as yet there have been no discoveries warranting the belief that gold is there in paying quantities.

Five claims on Shoup glacier, located by Dave Olson and said to be the richest discovered there, have been bonded to O. Roberts and Herbert Johnson, who are reported to be affiliated with Los Angeles capitalists in the deal. The price named is said to be $15,000.

An important discovery of ore is reported near the Silver Gem property in the Shoup bay district. It was made by M. L. McAllister and W. W. Harvey.

ARIZONA

Yavapai County

(Special Correspondence.)—The United Verde Extension Co. at Jerome closed down last week. The shut-down is said to be caused by the death of J. J. Fisher, who was a heavy stockholder and general manager for the company.

A contract has been let to Joe Peila to drive 70 ft. in the main adit of the Eureka property. This is a very promising prospect situated in the Cherry Creek district. This work will cut the main vein at a depth of more than 200 ft. The outcrop on the surface shows gold and there is evidence of copper at depth.

The oil excitement still rages in the Verde valley. The Verde Valley Oil Co. and the Pittsburg & Verde Oil Co. have been incorporated, and both propose to begin active exploration for oil very shortly. P. L. Griffin and D. V. Snowgoose of San Francisco are named as being interested in oil development in the valley.

Prescott, September 16.

CALIFORNIA

California fuel oil will be used by the Cordova Power Co., of Cordova, Alaska, and George C. Hazlett, manager of the power company, has contracted with the Copper River & Northwestern railroad for 1500 barrels. A pipeline is being laid at the plant so that oil can be piped from the steamer to the tank. The company expects to save $33\frac{1}{3}\%$ in operating cost, as at present it is paying $12.50 per ton for the poorest grade of steaming coal delivered at the power-house.

Mariposa County

(Special Correspondence.)—The Treasure Gold M. Co. at Hornitos is about to increase its 5-stamp mill to 10 stamps, and in the near future will change from gasoline to electric power. Specimens of ore have assayed $10 per ton. The vein varies from 6 in. to 6 ft. in width, and on the average is 3 ft. wide. The mine is near the old Washington mine, four miles from Mt. Gaines. The mine formerly was worked by open-cut, but under the present ownership in the last five months $14,000 worth of ore has been mined on the 150-ft. level.

Hornitos, September 16.

Nevada County

It is now asserted that the recent discoveries at the Golden Gate mine, near Grass Valley, were grossly exaggerated, and that the ore in question is of ordinary grade.

(Special Correspondence.)—The North Star Mines Co. has about 100 men employed at the Champion mines, the August disbursement for wages surpassing $6000. This is the largest force employed in the mines for years. The road from Deer Creek to the Providence mine is being placed in excellent condition. With the new electric pump the Providence shaft will be the principal pumping avenue, and it is understood that the Merrifield shaft will then be abandoned. The North Star company is gradually concentrating operations, resulting in more economic working charges. Vigorous developments are under way from the Champion shaft and nearby workings. With the completion of repairs to the ditches and flumes of the Northern Water & Power Co., the Gaston, Erie, Anchu, and other mines in the Graniteville district are enabled to resume milling. The Gaston company has been greatly hampered throughout the summer by lack of water and has been compelled to proceed slowly. The Erie mill recently started, after lying idle many months. Other properties also have been adversely affected by lack of water-power. It is expected to have the new Tightner 10-stamp mill completed by October 1. The delayed arrival of the 75-hp. motor may postpone the initial operation of the plant. A tramway has been completed from the mine to the mill. The compressor is operating three machine-drills.

It is rumored that Eastern capitalists are considering the bonding of the Rose Hill mine, at Grass Valley. An 860-ft. adit intersects two veins. The property is credited with a production of $175,000.

Nevada City, September 18.

Sierra County

Rich ore has been found in the Osceola quartz mine at Alleghany, according to Dan McGonigal, who is opening the old mine. The vein is believed to be a continuation of the Tightner.

Siskiyou County

(Special Correspondence.)—The Golden Eagle and New York mines, in the Indian Creek district, have passed into the hands of Eastern capitalists. Both properties have yielded rich ore in past years, although operated in a small way. The purchasers are represented by Frank J. Spare. R. S. Taylor, owner of the Homestake mine, Salmon River district, reports the extraction of considerable rich ore from the recently opened vein. About 50 lb. of bonanza was taken out last week, running several hundred dollars per ton in value. From 150 to 200 tons of high-grade quartz have been recently taken out. The vein is showing a width of over 2 ft., according to reports. The Siskiyou Syndicate recently built a 5-stamp mill at the Keating mine, Coffee Creek district, and the plant is operating on several hundred tons of ore, stored on the dumps. Extensive development is under way in the mine. The syndicate continues to block out high-grade ore in the Cub Bear mine. Arrangements have been made for the driving of a lower adit at the Big Cliff group. It is designed to intersect the big vein parallel to the main orebody, which shows an average width of 15 to 20 ft. The main orebody is of immense size, but the owners are devoting attention to the opening of the smaller vein, because of its superior richness. The Big Cliff is situated on South Russian creek. F. H. Osgood and H. B. Wintering are principal owners. A Huntington mill is being erected at the Foster mine, in the Six-Mile section. It is expected to commence production before the snow flies.

It is rumored that operations will shortly be resumed at the Black Bear group. Several placer-mining companies are preparing for the winter season. Flumes and ditches are being repaired, plants improved, and other arrangements completed for an active season.

Yreka, September 15.

YUBA COUNTY

Newspaper despatches report a discovery of a vein at the Red Ravine mine, near Dobbins, about 30 miles from Marysville, specimens of which assay from $847 to $50,000 per ton.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence.)—A body of ore 12 in. wide that runs 365 oz. silver and 1.36 oz. gold per ton has been uncovered on the sixth level west of the Little Mattie mine. Williams & Sherman are operating under lease. The Ouida mine on Ute creek has been taken over by W. H. Maxton, a representative of Ohio capitalists. The shaft is to be sunk 250 ft. A test run of the McKelvey mill is under way. A number of operators have sent in ore of a sulphide character to be treated. The inventor and builder claims to be able to save 90% of the gold content, but does not claim to save the by-products. The plant has a capacity of 50 tons per day, according to McKelvey. Work has been resumed on the Little Giant mine on Red Elephant mountain. A cross-cut has been started to intersect the 100-ft. level. J. A. Young is manager. Work on the Bonnie Briar property is going steadily forward. H. Nimmo is manager. During the month of August 161 cars of ore left the C. & S. depot, the average value of which was $15. This was an increase of 64 cars over the same month of the preceding year, as well as the largest during any August in 12 years.

IDAHO SPRINGS, COLORADO.

Idaho Springs, September 13.

(Special Correspondence.)—Work in the advance of the Homestake adit was put under way this week. The bore is in 538 ft. A. L. Stephens is manager. The Clyde Hill M. Co., with a capitalization of $400,000, has been incorporated. The company owns a group of seven lode mining claims at Camp Beshears, Lincoln mountain. W. S. Crumley is manager. David Kennedy has resumed work on the Brazil mine at Freeland. Regular shipments are going out from the Welsh property on Leavenworth mountain, the ore milling on an average $90 per ton in gold and silver. J. Fowler is manager. Franchini & Co., leasing on the fourth level of the Smuggler mine on Brown mountain, made a shipment of 20 tons of concentrate last week that brought a mill settlement of 352 oz. silver and 52% lead. The zinc product brought 75 oz. silver and 40% zinc.

Georgetown, September 12.

SAN JUAN COUNTY

Harry Hilderman, S. W. F. Anderson, and Lloyd C. Sheets have taken a bond and lease on the group of claims owned by T. J. Shea, J. H. Sutherlin, and S. W. F. Anderson, in Georgia gulch, Red Mountain district, adjoining the Kansas City group, state advices from Silverton. The claims include the Sunrise, Early Morn, My Kid, Hazel Kirk, and Last Find. A cross-cut 150 ft. long is being driven to connect with the Kansas City vein.

SAN MIGUEL COUNTY

(Special Correspondence.)—The Lake Superior Ophir M. Co., capitalized at $1,000,000, has been organized under the laws of Arizona, to take over the property of the Calumet Telluride M. Co. Stock will be exchanged equally for stock in the Calumet Telluride company. The main offices will be in Hancock and the mine offices at Ophir. The Calumet Telluride company owns 44 claims in Colorado.

Ophir, September 15.

IDAHO

IDAHO COUNTY

The Welch Tunnel G. M. Co. has been formed to intercept by cross-cutting the Black Pine and June Bug groups of claims bonded to the incorporators by J. H. Williams. A millsite has been located on the American river. R. Kemp Welch, manager of the Idaho-Champion mine, is consulting engineer and general manager for the new company, in which the principal stockholders are Philadelphia business men already interested in mines.

This is an active season. The Monarch property, about three miles from this camp, is in steady operation on a grade of ore which assays $15 per ton and yields 50% by amalgamation. The company has a 5-stamp mill in operation and plans to add 10 more stamps this season. A large crew of men is building a wagon-road from the mine to connect with the road to Edwardsburg.

The Eagle M. Co. is erecting a 10-ton capacity Tremain stamp-mill and a cyanide plant and will have them in operation in a few days. This property is situated at Edwardsburg in the centre of what is known as the Big Creek region of central Idaho. Through the lack of transportation this country has been held in the background for many years, but indications point to this camp soon having transportation.

SHOSHONE COUNTY

Beartop-Orofino M. Co., capitalized at $4,000,000, in 2,000,000 shares of a par value of $2, which was organized as a result of the consolidation of the Beartop and Orofino mines, near Murray, is the latest shipper in the Coeur d'Alene district. The Beartop already has produced ore of a value exceeding $70,000, while the Orofino is opened by an adit, with a drift of 470 ft. on the vein and a raise now 178 ft. in ore. George J. Kiehler, manager of the Beartop, who will have charge of the consolidated properties, is a member of the first board of directors, others being John Costello, Chicago; Robert Sheffels, Govan, Wash.; William Tracy, Galesburg, Ill.; Fritz Marschante, J. N. Thennes, and George Rohrer, Spokane.

H. F. Samuels, of Wallace, president of the Success M. Co., while in Spokane announced the payment of the third dividend of $15,000 at the rate of 1c. per share, making a total of $45,000 for this year. The property paid $45,000 in three dividends of $15,000 each in 1907, and prior to that time, when operated as the Granite, its profits amounted to $600,000. The mill on the property is being improved, and the output increased month by month. The net profit in August exceeded $10,000.

Reports from Kellogg state that one of the richest finds yet made in the Pine Creek district is credited to the Nabob mine. A 14-ft. vein of high-grade silver-lead concentrating ore was encountered in the 2000-ft. adit, which has been driven to strike the ore.

The Federal Mining & Smelting Co. paid its regular quarterly dividend of 1¾%, or $210,000, on its preferred stock on September 15. This makes a total of $630,000 paid so far this year. The dividends paid on preferred stock to date total $6,431,000. In addition to this there have been paid on the common stock dividends of $2,708,750. The grand total of dividends to date is $9,139,750.

KANSAS

CHEROKEE COUNTY

The Edgar Zinc Co., represented by J. P. Walker, has purchased the 250-ton dump of the North Empire Tailing Co. The dump had been held two years on account of low prices. It is rumored that the price was a little over $20,000.

MICHIGAN

HOUGHTON COUNTY

The shaft being sunk on the Osceola vein, now 200 ft. deep, has not reached commercial copper in appreciable quantities. Thirty feet of driving was done at the 100-ft. level, but no copper of favorable quality was found. No. 3 shaft has dropped to the thirty-seventh level and No. 4 to the thirty-fifth. The shafts soon will be connected on the thirty-fifth level, as at all levels above.

MONTANA

JEFFERSON COUNTY

Arrangements for the new financing of the Boston & Corbin Copper Co., one of the Amster companies, have been completed. Some $200,000 of bonds have been underwritten, the funds to be used in making a thorough examination and report upon the property, and, if conditions justify it, in the immediate erection of a small concentrator.

LINCOLN COUNTY

(Special Correspondence.)—J. W. Allen and Wm. Williams of this place are developing what promises to be one of the best gold mines in this district, for they have a large amount of ore in sight which is quite rich. The property is situated on Great Northern mountain, 25 miles south of Libby, where they have eight claims, and on these are ten veins of ore, all carrying gold. The owners expect to install a stamp-mill on the property within the next year.

The first of the automobile trucks to be used in hauling ore from the Snowshoe mine to the Libby Lumber Co.'s logging railroad, a distance of eight miles, has arrived.

Libby, September 16.

SILVERBOW COUNTY

The official report of the Anaconda Copper M. Co. shows that 22,500,000 lb. of copper was produced in August. In July the production was 21,052,000 lb. Of the production last month, the Washoe smelter produced 16,000,000 lb., while the Great Falls smelter produced the remainder. The Butte-Ballaklava company, after many months of idleness, has resumed operation. The High Ore mine will be ready to resume under the compressor system by October 1.

NEVADA

ELKO COUNTY

(Special Correspondence.)—What is said to be the best find ever made in the Gold Circle district was made recently in the Elko Prince, at a depth of 400 ft., and 800 ft. from the mouth of the adit. The vein is said to be a high-grade quartz, 3 to 5 ft. wide, heavily impregnated with wire gold. W. C. Savage of New York, principal owner, is on his way there. The company soon will start construction for a mill.

Elko, September 9.

ESMERALDA COUNTY

The Goldfield Con. M. Co. has started construction for a roasting plant with a capacity of 75 tons per day, in which the tailing will be roasted to extract the remaining metal. The tailing carries 20 to 30 oz. of gold per ton. The plant, which will be equipped with two 54-spindle Edwards duplex furnaces, furnished by the Stearns-Roger Mfg. Co. of Denver, will be built near the concentrator. The present treatment makes a recovery of about 95%. The new furnaces will do away with sending the tailing to the smelter. After concentration the tailing will be roasted, then sent to the tube-mills for regrinding, thence to the Pachuca tanks, and lastly to the Butters filters. The remaining pulp will go to the dump. It will be a practically 100% extraction.

(Special Correspondence.)—The net profit of the Goldfield Con. M. Co. for August, according to a preliminary estimate, is $630,000, with a total production of $850,000 and operating expenses amounting to $220,000. The tonnage of ore produced (30,580) was the largest for any month this year, but the gross value and net earnings were lower than for any other month excepting January and July.

Goldfield, September 19.

LYON COUNTY

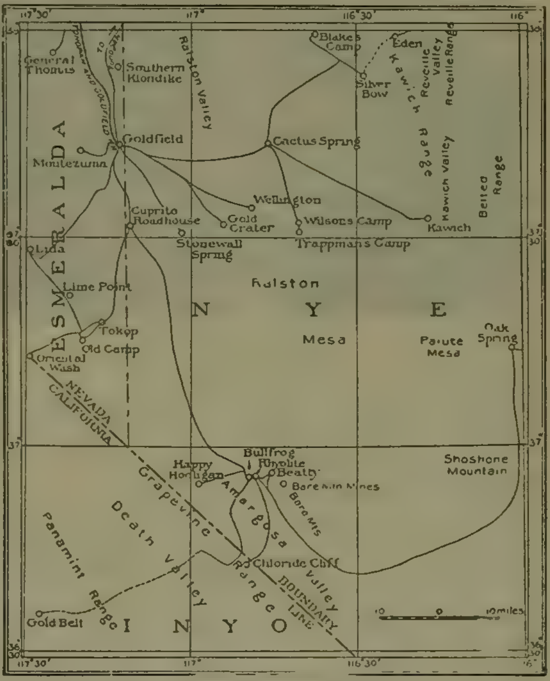
Reports for August from Silver City show a total of 1700 tons of ore treated at the stamp-mills and 1500 tons of tailing treated at the cyanide plants of that place.

Work on the Northern Light Copper Co.'s property will be resumed next month, as the result of action taken at a meeting at Yerington, when an option on 51% of the stock was granted to N. G. Douglass, Jr., of Los Angeles. Mr. Douglass agreed to spend $10,000 per year in development work and the minimum depth of work is to be 500 feet.

NYE COUNTY

Ore of exceptionally rich appearance has been discovered on the Diamond Bullfrog company. The completion of the Beatty mill in the near future will make profitable much milling-grade ore now on the dump.

The Nevada Leasing & Ore Purchasing Co. has been organized by W. S. Taylor to operate the proposed Beatty mill at Rhyolite and to assume the assets and pay the debts of the Nevada Ore Treating Co. A. E. Vinton, of Winnipeg, Canada, is one of the capitalists interested. The plant will be a custom mill, although it is to be operated in connection with the Murphy lease on the Diamond Bullfrog property.



PART OF NEVADA.

At the annual stockholders' meeting of the Montana-Tonopah M. Co., held at Salt Lake City, Utah, September 12, it was reported that the company last year treated 52,092 tons of ore, against 50,245 tons during the previous year. The net profit last year was $172,602, against $134,715 the year before. A. H. Lawry, mine superintendent, reported that there was a reduction in mining costs of 26.8c.

per ton over the previous year, and it also was reported that the mill costs had been reduced 64.1c., and that the mill had made an average metallic extraction of 90.7%. W. B. Alexander, treasurer and secretary, reported that dividends amounting to $120,000 had been paid during the year, leaving on hand $264,180. There is no indebtedness. To facilitate making complete reports for the fiscal year, which ends August 31, the time of the meeting was changed to the first Tuesday in October. On the board of directors Dudley Baldwin of Cleveland succeeds F. M. Kirk, and P. M. Braun succeeds J. W. Myers. The directors reelected last year's officers. Thomas K. Stevens was appointed agent for Utah, with an office at 204 Newhouse building, Salt Lake City.

White Pine County

The Ely Central Copper Co. has again commenced development of its property by churn-drill work.

S. M. Levy, president and general manager for the Ely Con. Copper Co., is quoted as saying that negotiations are under way for the development of the Ely Central property through the Zack shaft of the Ely Consolidated company. The 600-ft. level may be used. The affairs of the Ely Central company are in the hands of a committee which has decided to abandon the old Eureka shaft and to develop the property through neighboring groups.

The Pony Express Syndicate has made the final payment on a group of five claims at Hogum gulch, in the eastern part of the county. The claims formerly were owned by the Panguitch company. F. O. Morse is manager for the company.

(Special Correspondence.)—The coroner's jury, at the inquest into the deaths of Ed. Walsh, M. E. Foley, and Dan Drea, miners killed in the Giroux shaft fire on August 23, found the men came to their death from "the inhalation of fire, smoke, and gases from the Giroux shaft", and that the origin of the fire was unknown. The jury blamed the Giroux company for alleged failure to comply with the State mining laws. The Giroux shaft was again reopened September 15. The water was found to have risen to the 1134-ft. point. The pumps on the twelfth level have been 'drowned out' and the water will be removed by bailing.

Ely, September 17.

NEW MEXICO

Socorro County

Ore crushed at the Socorro mines in August amounted to 5100 tons, with a bullion product of 47,000 oz. Several tons of high-grade concentrate was shipped. The mill averaged 165 tons per day during the month. Rapid progress is being made in the erection of the new power-house. The new power-house of the Ernestine Mining Co. is nearing completion and will be ready to receive its equipment of high-compression oil engines, generator, and compressor, on delivery. The machinery will be shipped this month. The clean-up for the first 10-day period of September is now in progress. The week's ore treatment was 465 tons, with 50 sacks of concentrate. The new developments in the mine continue to show up well. A body of $12 ore has been opened on the 300-ft. level north, of the Deadwood mines. The mill handled 275 tons in the past week. A bullion product of 4000 oz. was made at the last clean-up. Twenty sacks of concentrate was produced during the week. A new rich discovery was recently made in the 150-ft. level east, of the Treasure Mining & Reduction Co. The vein is said to be 8 ft. wide and is a good average-grade milling ore. A large tonnage is broken in the mines. Sixty tons per day is now being treated.

Mogollon, September 15.

OREGON

Baker County

The North Pole mine at Bourne has been sold by Alexander Baring of London to capitalists represented by Albert Geiser, a mining man of Baker. The Eastern Oregon G. M. Co. is to be incorporated to operate the mine. No milling will be done this year, but development work will be pushed with a large force. Jim Duckworth, of Sumpter, this county, discovered the mine in 1887 and sold it to Mr. Baring for $10,000. Since the sale, under the management of Emil Melzer, the mine has produced several million dollars worth of ore, according to newspaper reports.

Benton County

(Special Correspondence.)—The School of Mines of the Oregon Agricultural College is collecting specimens of the geological and mineralogical deposits of the State for use in the school laboratory and museum. H. M. Parks, head of the school, accompanied by Arthur Swartley, his assistant, has just returned from one of a series of extended trips through the mining districts of the State for this purpose. It is hoped eventually to make up small exhibits for the use of the students in high schools in districts where geology and mining are of special interest.

Corvallis, September 17.

TEXAS

Brewster County

(Special Correspondence.)—The production of quicksilver in the Terlingua district for the present year will be considerably larger than that for 1910. Prospects are favorable for the construction of two or more new furnaces before the close of the year. New claims are being opened and good cinnabar ore is being developed. The official statistics of the production of the Terlingua district for 1910 show that the total output was 3320 flasks, valued at $154,413. Most of this quicksilver was produced by the Chisos M. Co. Its workings are down more than 400 ft., and at that depth the orebody has increased very much in size and richness. The 15-ton furnace is kept in constant operation. The Marfa and Mariposa mines were operated during the early part of 1910, but have since been closed down. It is reported that they are to be reopened soon and important improvements made with a view to again placing them on a good producing basis.

Good cinnabar ore has also been found in the mountains about fifty miles east of Terlingua and steps are soon to be taken for opening properties in that section. Now that the revolutionary troubles in the northern part of Mexico are over, American prospectors are crossing the Rio Grande below Terlingua and some good claims have been filed. It is reported that the cinnabar ores that characterize the Terlingua district are also found across the river in Mexico within a distance of thirty to forty miles. The agitation for the construction of a railroad into the Terlingua district has been revived. At present it is about ninety miles from the nearest railroad point to Terlingua. This makes the cost of hauling supplies into the camp very heavy.

Alpine, September 16.

UTAH

Salt Lake County

The new Bingham & Garfield railroad, operating between Bingham and Salt Lake to handle the traffic of the Utah Copper Co., has been placed in commission. There are two passenger trains daily in each direction.

Tooele County

Construction of the lead plant at the Tooele smelter will be resumed at once, after a delay to consider sintering methods. The Dwight-Lloyd process has been adopted, and an expert is now looking over the field. The stack and the foundations for the lead plant have been finished, and construction steel is arriving. Much lead ore is on hand and more is being mined. H. N. Thompson is superintendent.

Utah County

The annual report of the Mineral Flat M. Co. states that only sufficient work to retain title to the unpatented claims of the company has been done since June 1910, when operation was suspended, and two men are now doing individual assessment work and extending the south drift of the main adit. The only source of revenue at present is the company's power plant, which is being rented at $50 per month. The company during the year purchased at delinquent assessment sales 145,958 shares. All protests filed by adjoining companies and by the Government have been adjusted excepting one by the Government on five claims said to be on non-mineral land. The officers of the company were reëlected.

WASHINGTON

Ferry County

(Special Correspondence.)—The Ben Hur Leasing Co. has begun sinking the shaft below the 300-ft. level with three eight-hour shifts. The Imperator-Quilp company has received returns from the first shipment of ore to the Washoe sampler, at Butte, Montana, consisting of 135 tons, of a gross value of $7811. The net returns, after paying the freight and treatment charges, amounted to $6688.

At the Surprise mine the stope on the 600-ft. level is up about 40 ft. and is from 60 to 70 ft. long. The ore content has changed but little during the past week from that shipped during the previous week, assaying from $25 to $30 per ton. On the 200-ft. level the south cross-cut has intersected the vein about 60 ft., and, it is estimated, will have about 25 ft. farther to run to get under the original lessee's stope on the dip of the vein. On the 300-ft. level the north drift has about 45 ft. to run to get under the Wallek stope. The ore at the face of the drift has good shipping value. The south drift is in 80 ft. from the turn-sheet. The raise from near the end of that drift is in excellent shipping ore.

In the Insurgent mine the winze is about 500 ft. below the apex of the vein and in high-grade shipping ore.

Republic, September 18.

Stevens County

(Special Correspondence.)—The United Copper mine, in Chewelah district, has shipped about 6000 tons of ore in less than 18 months from development work. The ore is of gray copper and chalcopyrite, and contains gold and copper. The company has a favorable shipping contract with the Granby Con. M. S. & D. Company.

Chewelah, September 19.

CANADA

British Columbia

Development work, including diamond-drilling, has demonstrated that the orebodies in the Hidden Creek mine on Goose bay, near Prince Rupert, are larger and of higher grade than at first reported, according to Jay P. Graves, of Spokane, vice-president and general manager for the Granby Con. M. & S. Co., on returning from an inspection of the property, which was recently bought outright for $500,000 by the Granby corporation after a few months work under a bond. The orebodies, he added, extend at least to sea-level, or 1200 ft. below the outcrop.

"Data are being gathered to determine what the company's policy will be with regard to the treatment of the ores," Mr. Graves said in a reply to a question, adding: "We expect to reach a decision within 30 days whether we shall ship to custom smelters for a time or erect a plant to take care of our output and do a general business or treat our own ores. Should a smelter plant be built it will have a capacity of not less than 5000 tons a day. Already we have a saw-mill of 40,000 ft. capacity in operation and work will soon begin on a dam, which will give us a head of 350 ft. and develop 3500 hp. electrical energy for our new plant. A lighting plant is being built."

Charles F. Caldwell, of Kaslo, who was in Spokane a few days ago, reports awarding a contract for transporting 1000 tons of ore from the Utica mine over a rawhide trail to a siding on the Kaslo & Slocan railroad, having received assurance from the syndicate owning that road that it will be reconstructed and permanently operated in a short time. He also announced that he expects to finish the raise from the No. 5 to the No. 4 adit in 40 or 45 days, when a good force of miners will be put to work drifting and stoping. The Utica mine is situated on the Kaslo slope of the high range of mountains between Kootenai and Slocan lakes. It has been opened to depth by five adits. Several shoots of unusually high-grade ore have been developed.

Ontario

(Special Correspondence.)—Through diamond-drilling free gold has been found at the Pearl Lake mine at a depth of between 650 and 700 ft. in the schist as well as in the quartz stringers. The ore assays from $4 to $58 per ton. At the Rea mines a second shaft has been opened 160 ft. from the main workings, by making a raise from the 200-ft. level. No. 1 will be sunk 500 ft. farther, when it will be the deepest shaft worked in the camp. Much driving was done at the 200-ft. level, where free gold was found in the vein, which is 4 ft. wide at that depth. A continuation of the main vein has been found on the surface more than 1000 ft. from the shaft. Two shafts are being sunk on veins on the American Goldfields property, and ore extracted in development is being bagged. A rich vein showing much free gold has been discovered at the Eldorado mine. A new vein carrying high gold content has been stripped for 300 ft. on the Hollinger property. At the Jupiter, two shafts are down 100 ft., and cross-cutting has been started. The Apex has purchased a shot-drill and has ordered a compressor, two 50-hp. boilers, and two rock-drills.

Asbestos has been found by W. C. Richards on Falcon island, in the Lake of the Woods. The vein, which is 60 inches wide on the surface, has been traced for half a mile, and samples indicate that the deposit is of good quality. It is near a mica deposit.

Porcupine, September 15.

Porcupine news despatches state that J. W. Northrop has organized a $2,000,000 syndicate to develop claims in Bristol.

The vein has been uncovered for 300 ft. on the E. S. Chapin claims near Southeast bay, on Kenogami lake, Swastika, according to A. G. Terrill, who is in charge of the property. Sulphides are shown for the entire length uncovered.

(Special Correspondence.)—The Porcupine G. M. Co.'s engineer has completed his examination of the Vipond, and reports the vein to be 16 ft. wide and to assay $20.10 per ton. The cross-cut has not reached the south wall.

Porcupine, September 13.

MEXICO

Chihuahua

(Special Correspondence.)—The Rio Plata M. Co. has declared a quarterly dividend of 2%, payable September 29 to stockholders of record September 18.

Chihuahua, September 12.

Colima

It is reported that the Mamey iron deposits, owned by Arturo Le Harivel, of Colima, and associates, have been bonded to French interests, and that modern iron and steel works will be established there. The property was examined a short time ago by Ferdinand Sustersic. The price named is reported to be ₱500,000.

Sonora

La Cobriza Copper Co. has ordered three 100-hp. boilers, a double-drum hoist, and a 12-drill air-compressor for its mine 14 miles west of Noria. It owns 51 *pertenencias*, and has 3000 ft. of workings. The smelter will be blown in when F. C. Emery, president of the company, returns from London.

It is reported that the Richfield Copper Co. is constructing a smelter on its property, 18 miles southwest of the Santa Rosalia mine. A cyanide plant is being built at the Guergrito silver mine, on the Sherman ranch, between Cumpas and Nacozari. Ore will be treated direct. J. E. Humphries is manager of the property.

Most of the activity in this State is in gold, silver, lead, and zinc properties, and not in copper, partly owing to unsettled conditions and partly to the low price of copper. The situation has improved in the last few weeks, and there has been comparatively little labor trouble.

Ore assaying $20 to $129 in silver per ton has been discovered on the Rivera G. M. Co.'s property, in the Montezuma district. George J. Cole is manager of the mine.

Decisions Relating to Mining

Specially reported for the Mining and Scientific Press

Inspection of Mine—Judicial Notice

In the absence of testimony tending to prove the necessity of an inspection, a court cannot take judicial notice of the fact that general inspection of a mine is necessary.

Lewis v. Detroit Vitrified Brick Co., (Mich.) 129 Northwestern, 726. Feb. 1911.

Liability of Mine Owner for Injury to Miner—Independent Contractor

Miners who were paid by the hour for shale mined, and their hours of labor were fixed by themselves, except as it was necessary to adapt them to the hours when power controlled by the mine was furnished for hoisting cars, are not independent contractors so as to relieve the employer of liability for injuries to one of such miners, where it appeared that the mine owner furnished the track, cars, and place to work, and an agent who exploded the dynamite used, and where he reserved the right to discharge the men at any time.

Lewis v. Detroit Vitrified Brick Co., (Mich.) 129 Northwestern, 726. Feb. 1911.

Deed Reserving Minerals.

A deed conveying a tract of land contained the following reservation: "Reserving and excepting from said lands such as are now known, or shall hereafter be ascertained, to contain coal or iron, and also the use of such surface ground as may be necessary for mining operations, and the right to access to such reserved and excepted coal and iron lands for the purpose of exploring, developing, and working the same." This exception is not repugnant to the grant and is not void for uncertainty. The deed operates as a conveyance of the land with the exception of the coal and iron contained therein, reserving to the grantor the right to enter upon the same for the purpose of exploring and mining the minerals.

Carlson v. Minnesota Land & Colonization Co., (Minn.) 129 Northwestern, 768. Feb. 1911.

Injury to Miner—Contributory Negligence

A driver of a mule car in an entry of a coal mine discovered a derailed car in front of him too late to prevent a collision, because of a curtain hung across the entry. In order to avoid the impending danger he jumped from his car and was injured because of insufficient space between the side of the entry and the car. Under such circumstances the questions as to whether the space only six feet wide in the entry in which cars four feet wide are driven is a reassonably safe place for a driver to work, in view of the fact that there was a curtain across the entry preventing a view of any derailed car, and where it appeared that the track was not properly gauged and the cars often ran off the track, and whether it was contributory negligence for the driver to jump off his car, or whether he should have waited and tried to save himself, are questions for the jury. But the fact that the injured driver had disobeyed orders given him on the morning of the injury to the effect that he was to drive in front of the particular car that was derailed, is not sufficient to prevent a recovery where it is shown that his mule balked and on that account he was compelled to change places with the other car, as this was customary in the mine for the reason that a mule will frequently follow another car when he will not proceed otherwise.

Central Coal & Iron Co., v. Owens, (Ken.) 133 Southwestern, 966. Feb. 1911.

The American Zinc, Lead & Smelting Co. has declared a regular quarterly dividend of 50c. a share, payable October 10 to stock of record September 30.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

Fritz Wolf has gone to Eldorado county.

Philip Moore was in Denver recently.

W. S. Noyes has returned to San Francisco.

Courtenay De Kalb is in San Francisco.

W. G. Weber, of Chicago, is at Miami, Arizona.

F. W. Bradley is on his way home from Alaska.

W. C. Mendenhall was in San Francisco this week.

E. W. Walter, of Johnson, Arizona, is at Silverton, Colorado.

Frederick Lyon, of Kennet, California, is in San Francisco.

S. J. Weis has returned to London on his way to West Africa.

Gelasio Caetani is expected in San Francisco September 28.

Walter L. Reid, of Telluride, Colorado, was in San Francisco.

R. B. Lamb, of Toronto, has left for an extended visit to Porcupine.

W. B. Baggaley has left Mexico and is now at Short Hills, New Jersey.

H. L. Hollis hs returned from Valdez and was in San Francisco this week.

L. B. Herdman, formerly of Copper Hill, Arizona, has moved to Los Angeles.

I. Daimpre has left Tonopah, Nevada, for South Porcupine, Ontario, Canada.

R. B. Green, of Coram, is now with the Garfield Smelting Co. at Garfield, Utah.

B. B. Thayer, president of the Anaconda Copper Co., has returned from abroad.

Heath Steele, formerly of Goldfield, Nevada, is now with J. R. Finlay at New York.

W. H. Emmons, of the University of Minnesota, has returned to Minneapolis from Creede, Colorado.

H. W. Hardinge is now in Denmark examining mines, and will return to New York about November 1.

Alexander McLeod, of Nova Scotia, is examining the Cape Breton limestone areas for London people.

Inquiry is being made for the present address of B. M. Bates, who is requested to communicate with this office.

John Redington has been appointed manager of the Swastika mine in place of M. W. Summerhayes, resigned.

Ellard W. Carson, of Los Angeles, for the past two weeks has been making mine examinations near Victorville, San Bernardino county.

R. H. Elliott, of Pacific Grove, California, is now with the Ancobra Exp. & Dev. Co. at Tarkwa, Gold Coast Colony, British West Africa.

E. V. Daveler, of the metallurgical staff of the Utah Copper Co., is engaged in special work at the Ray Consolidated Copper Company.

A. P. Rogers, who has been engaged on professional work in Brazil during the past eight months, is now in London; he will return to New York shortly.

Frank H. Probert left Los Angeles for New York September 20 to be in consultation with Ray Central Copper Mining Co., and expects to be gone two weeks.

John D. Ryan is on an inspection trip to Cananea, Sonora, Mexico, accompanied by W. E. Corey, the former president of the United States Steel Corporation.

John M. Boutwell has finished a detailed survey of the mining geology of the Moctezuma Copper Co.'s property at Nacozari, Sonora, Mexico, and is now at Bisbee, Arizona, on his way to Santa Barbara, California.

Book Reviews

Any of the books noticed in these columns are for sale by or can be procured from, the Mining and Scientific Press.

The Mining Industry of Mexico; No. 1. State of Hidalgo. Part I. Compiled and edited by F. Gonzales, A. Grothe, and L. Salazar. Pp. 74, ill., maps, and charts. For sale by the *Mining and Scientific Press*. Price 50c., postage 15c. additional.

This admirable volume, the first of twenty parts dealing in an accurate and comprehensive manner with the mining industry of Mexico, has been compiled by a group of well known mining engineers on the initiative and with the assistance of the Department of Fomento. After a discussion of the topography and geology of Hidalgo, communications, postal facilities, and taxes, a list of the dividends paid by mining companies within the State during the last 18 years is given. The detailed description of the mining industry by districts follows, illustrated by numerous photographs, maps, and drawings, showing the equipment, ore deposits, and methods of working. Much of this information has not previously been easily available to the public and this gathering of it in one volume is of great service. Unfortunately, the mistake, so common in publications of this character, of not providing a copious index, greatly detracts from the usefulness of a work so painstakingly prepared. The volume concludes with a list of the institutions maintained by the mining companies for the benefit of their workmen.

Recent Publications

Coals of the Licking Valley Region. By A. R. Crandall. Kentucky Geological Survey, Bull. 10. Pp. 90, ill., maps, index. Lexington, 1910.

Results of Spirit Leveling in California, 1907 to 1910. By R. B. Marshall. Bull. 481, U. S. Geological Survey. Pp. 115. Washington, 1911.

Coals of the Three Forks of Kentucky River. By James M. Hodge. Kentucky Geological Survey, Bull. 11. Pp. 280, ill., maps, index. Lexington, 1910.

Coals of the Western Border of the Eastern Coal-field. By A. M. Miller. Kentucky Geological Survey, Bull. 12. Pp. 83, ill., maps, index. Lexington, 1910.

Production of Manganese Ore in 1910. By Ernest F. Burchard. Advance chapter from Mineral Resources, 1910, U. S. Geological Survey. Pp. 15. Washington, 1911.

Production of Fluorspar and Cryolite in 1910. By Ernest F. Burchard. Advance chapter from Mineral Resources, 1910. U. S. Geological Survey. Pp. 16. Washington, 1911.

Ground Water in Juab, Millard, and Iron Counties, Utah. By Oscar E. Meinzer. Water-Supply Paper 277, U. S. Geological Survey. Pp. 162, ill., index, maps. Washington, 1911.

Commercial Paragraphs

Lawrence N. B. Bullock, the well known metallurgical engineer, is now with the Mexico Mine & Smelter Supply Co., with headquarters at Mexico City.

The El Oro Mining & Railway Co., of El Oro, Mexico, has recently installed one of the largest motor-driven pump equipments ever built for unwatering a mine. The pump, which was built by the Goulds Mfg. Co., Seneca Falls, New York, has a capacity of 500 gallons per minute. The construction is such that the pump can be readily dismantled and lowered down an ordinary mine shaft and when assembled it requires very little head room. The pump will be installed in the bottom of the mine and will pump against a head of 1300 ft. The driving motor is a 200-hp., 3-phase, 50-cycle, 440-volt, 485 r.p.m. Westinghouse motor, which is connected with double reduction gearing giving the crankshaft of the pump a speed of 35 r.p.m.

Market Reports

LOCAL METAL PRICES.

San Francisco, September 21.

Antimony	12—12½c	Quicksilver (flask)	47½
Electrolytic Copper	14—15½c	Tin	47—48½c
Pig Lead	4.75—5.70c	Spelter	7½—8½c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50—9.75; large $7.50—8.50

METAL PRICES.

(By wire from New York.)

Average daily prices in cents per pound.

	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Sept. 14	12.23	4.49	5.87	52⅝
" 15	12.23	4.49	5.87	52½
" 16	12.23	4.49	5.87	52⅝
" 17	Sunday.	No market.		
" 18	12.18	4.48	5.86	52⅝
" 19	12.18	4.48	5.86	52⅝
" 20	12.18	4.48	5.86	52½

ANGLO-AMERICAN SHARES.

(Cabled from London.)

	Sept. 14. £ s. d.	Sept. 21. £ s. d.
Camp Bird	1 8 9	1 7 4½
El Oro	1 3 3	1 3 0
Esperanza	1 13 9	1 12 9
Dolores	1 5 0	1 5 0
Oroville Dredging	0 5 7½	0 5 7½
Mexico Mines	6 17 6	6 17 6
Tomboy	0 17 6	0 17 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK

(By wire from C. S. Burton & Co., New York.)

	Closing Prices. Sept. 21.		Closing Prices. Sept. 21.
Amalgamated Copper	$ 52	La Rose	$ 4
A. S. & R. Co	65⅞	Mason Valley	7⅝
Braden Copper	4½	Miami Copper	17¾
B. C. Copper Co	3⅞	Mines Co. of America	4⅞
Butte Coalition	14½	Nevada Con	16¼
Chino	17½	Nevada Utah	¼
Davis Daly	⅞	Nipissing	7⅛
Dobie	1⅛	Ohio Copper	1⅜
Dolores	4½	Ray Central	1¼
First National	1	Ray Con	13
Foley O'Brien	⅜	South Utah	¾
Giroux	3½	Superior & Pittsburg	13
Goldfield Con	5⅝	Tenn. Copper	32½
Greene-Cananea	6⅞	Trinity	4
Guanajuato Con	¼	Tuolumne Copper	3⅜
Hollinger	12	United Copper	1¼
Inspiration	5⅛	Utah Copper	41½
Kerr Lake	3⅝	Yukon Gold	3⅜

COPPER SHARES—BOSTON.

(By courtesy of J. C. Wilson, Mills Building.)

	Closing prices. Sept. 21.		Closing Prices. Sept. 21.
Adventure	4	Mohawk	$ 37½
Allouez	23	North Butte	22½
Calumet & Arizona	48	Old Dominion	36
Calumet & Hecla	368	Osceola	82
Centennial	8	Parrot	8
Copper Range	50	Shannon	7½
Daly West	5	Superior & Boston	2½
Franklin	6½	Tamarack	19
Granby	29	Trinity	3
Greene Cananea, ctf.	6	Utah Con	11¼
Isle-Royale	12	Victoria	1⅞
La Salle	3⅝	Winona	4½
Mass.Copper	5	Wolverine	91

NEVADA STOCKS.

(By courtesy of San Francisco Stock Exchange.)

San Francisco, September 21

Atlanta	$ .16	Mayflower	$ .04
Belcher	.42	Mexican	3.15
Belmont	6.85	Midway	.25
B. & B.	.17	Montana-Tonopah	.72
Booth	.08	Nevada Hills	3.00
Choller	.12	Ophir	1.65
Combination Fraction	.08	Pittsburg Silver Peak	.90
Con. Virgina	.80	Round Mountain	.65
Florence	1.27	Sandstorm Kendall	.04
Goldfield Con.	5.75	Savage	.23
Gould & Curry	.05	Tonopah Extension	.94
Jim Butler	.24	Tonopah of Nevada	6.25
Jumbo Extension	.25	Union	95
MacNamara	.18	West End	.58

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EDITORIAL

MEXICO has been advertised mainly in the last year by the revolution, but a reading of the admirable presidential message submitted by Señor de la Barra September 16 shows that amid the noise and trouble incident to political change, matters have moved rather smoothly after all. A country that not only contracts no debt, but piles up a surplus during a period of civil war is manifestly far from needing surgical treatment by either native or foreign physicians.

AMERICAN ENGINEERS have been engaged to take charge of the operations of the Tata Iron & Steel Company at Sakchi, in Bengal, of which Mr. C. T. Perin has been consulting engineer. As the Government of India has guaranteed the new plant orders for steel rails and the Indian market is a large one, the new enterprise should be successful. American finance has recently played a prominent part in Persia and China, and new evidence of the spread of American influence is most gratifying.

MUTUALIZATION in a novel form was shown in the development of a mine in the Ely district, where a company, appropriately known as the Greek-American, arranged to board the miners and pay for their labor with stock in the company. The plan was surprisingly successful, and the mine has progressed to a stage where it has been able to contract with the smelter at Midvale for the treatment of its ore. The commissariat as the most important element in the finance of a mine is an unusual situation and the success of the venture is of much interest.

RAILWAY organs are protesting that if the lines must reduce through fares to the sum of the local fares, one-third of their passenger revenue will be lost. This is nonsense, as is apparent to anyone familiar with passenger rates. The average fare is not and has not been three cents per mile for years, and reduction to a two-cent base, the maximum threatened cut, would not therefore reduce revenues a third. Stopping the giving of passes and rebates has actually raised the average rate. The railways have their troubles and deserve sympathy in many particulars, but foolish pleas like the one now being made will do them harm rather than good.

SAN FRANCISCO has just passed through a hotly contested municipal election. Mr. P. H. McCarthy, candidate for re-election as Mayor, was defeated, not because he was a union labor candidate, but because he was a notably poor Mayor. Vice and inefficiency ruled in the city. The new election law assured an honest primary and required a majority to elect. This prevented the usual three-cornered fight. Mr. James Rolph, Jr., was elected Mayor and will serve through the period of the Panama-Pacific Exposition because the majority of San Franciscans are decent people and want honest government. In that they are representative of the great mass of the common people of the United States, who may be relied upon to decide a question right when it is placed fairly before them and opportunity is given for effective action.

ECONOMY of power is a large factor in the securing of low costs, and the performance of the new cyanide plant of the Portland Gold Mining Company, at Victor, Colorado, where the power consumption is given as $1\frac{1}{8}$ horse-power per ton-day, is worthy of notice. This mill, which is engaged in cyaniding the low-grade ores of Cripple Creek, without a preliminary roast, was devised and designed by the officers of the company, of which Mr. G. M. Taylor is manager, and in many ways exhibits notable steps in the progress of cyanidation.

A CITIZEN of the world passed away in England on September 20. Born in Ireland in 1835, Sir Robert Hart was for more than fifty years in the employ of the Chinese Government. As the reorganizer and director of the Imperial Maritime Customs he did signal service, sharing with 'Chinese' Gordon the honor of being the most distinguished foreigner of recent times who has aided in the development of China. Through his influence the postal service, telegraphs, and telephones were gradually introduced throughout the Empire, and have now reached a high state of development. Like most public servants, he was not free from criticism, and it has been urged that the keeping of the customs service largely independent of Chinese control and the gradual alteration of its personnel from international to predominantly British, were mistaken policies. The appreciation of his notable service by the Chinese Government was exhibited in the numerous honors accorded him, and the great reluctance with which he was allowed to resign when advanced age and ill-health made the duties of his high office too great a task. He was one of the born leaders of men, whom all delight to honor.

SYNTHETIC studies of geological problems are gradually clearing up many mysteries. The old notion that you could not determine how the world was made by looking into a crucible, has been shown to be properly susceptible to considerable modification. The classic work of Daubrée is being reinforced by researches of other investigators in many quarters of the globe. One of the groups that is doing most to solve fundamental problems of rock genesis is the staff of the Geophysical Laboratory of the Carnegie Institute of Washington. The chemical-physical studies of artificial feldspar by Messrs. Arthur L. Day and E. T. Allen, supplemented by microscopic work by Mr. Fred E. Wright, have gone to the root of many petrologic problems. Gradually a geological thermometer is being constructed whereby it is possible to tell from the minerals present the temperature at which rocks have been formed. In the last year the attention of these investigators has been turned to the study of ore minerals and of those associated with ores. We are privileged to publish this week a summary of the results of the work to date on the sulphides of iron, written by Mr. E. T. Allen. This will be read with great interest by all students of ore deposits. Definite criteria are given by Mr. Allen whereby the engineer may discriminate between deposits containing iron sulphide which were formed by heated, and those formed by cold waters. That marcasite is associated only with deposits formed by surface agencies, while pyrite characterizes ores of deep-seated origin, has been the belief of best informed students for some time. The belief, however, rested only on deduction from facts of field occurrence. Now the matter has been put to the test of experiment and the opinion of the geologists confirmed by the physical chemist. The significance of the rule is large. Any criterion for determining the pressure at which the minerals were formed and any positive means for discriminating the source of the heated waters is still lacking, but so good a start presages even more significant results.

DEFEAT of reciprocity by the voters of Canada is a disappointment to those who hoped for closer relations between the northern Dominion and the United States. Sentimental fear of annexation seems to have been largely responsible. It is difficult for those of us who live south of the line to realize that an occasional bombastic speech by some American politician has been taken so seriously. Certainly annexation is not in any sense a live subject in the United States. What was wanted was closer business relations. The proposed treaty was radically defective, but it was a step toward the closer relations that we would all like to see. To the plain average citizen there appears to be no more reason for a string of customs houses along the Canadian border than for one along the Mississippi. However, nothing but admiration can be expressed for the Canadian system which permitted a direct vote by the people on this important subject. We, with others, are sorry that the majority was against the treaty, but the acceptance or rejection of the American proposal was obviously a matter for Canadians to decide in accordance with their own belief as to which would further their best interests.

CONSISTENCY is said to be the bane of great minds. Evidently the *Canadian Mining Journal*, one of the cleverest and most readable of our contemporaries, is under no baleful influence. In a recent issue it very properly takes the *Canadian Courier* to task for ridiculous extravagance in 'writing up' the inventions of a former dental practitioner, now a self-made metallurgist. To this we say amen; more power to your arm. But it is closely followed by an editorial appreciation of the Evans-Stansfield electric furnace, which the *Journal* believes "has solved the riddle of cheap direct steel and * * * placed a premium upon numerous hitherto worthless orebodies in Ontario and Quebec." We have no special knowledge of the Evans-Stansfield process, but we prefer to believe that neither this nor any other small-scale furnace is likely to produce any immediate revolutions in the steel industry. The steel user is in no confusion of mind regarding all such processes. He knows that one of his essential requisites is the ability to secure steel of absolutely uniform and unvarying quality, in any desired quantity, over long periods of time. Five-hundred-ton blast-furnaces, sending their product to mixers that supply 50-ton steel furnaces are able to make a reasonable approach to absolute uniformity of product. Furnaces which produce but a few tons per day from ores of variable character will obviously make a variable product. Adequate methods for the treatment of Canadian magnetites would be a great asset to that country, but the desire for them should not lead to a too hasty proclamation of their advent.

Alaskan Problems

ALASKA and its coal problems seem likely to vex the Nation for some time to come, though real information about the fields is beginning to be available. It is evident that the present value of the coal has been grossly overestimated; in part by those interested in floating securities based in some form on the coal, and in part by conservation writers unfamiliar with practical coal mining. In the Bering River field this summer there were about a half dozen men at work, and they were acting mainly as caretakers. In the Matanuska field there were two watchmen, and while much money had been spent on trails and other necessary preliminary work, no real mining had been undertaken. Apparently the development of both fields has been in the hands of promoters and men familiar only with Western metal mining. Coal miners have been conspicuously absent. It is well also to remember that rival townsites enter into the problem, and who does not know the wiles of the real estate man? A recent visitor to both coalfields, himself formerly foreman of coal mines, writes that it "would break a foreman's heart" to mine under the conditions obtaining in either. In the Bering River field the coal is pockety and faulted, and it is by no means certain that the less well known Matanuska field does not afford the better opportunity for a commercial enterprise. We have already expressed our opinion that all the needs of the present situation can be met by opening a mine to supply Government and local needs for coal. At moderate expenditure the real value of the field can be readily determined. In our opinion there is much more apt to be loss than profit, so far as the mine is concerned, but it will be the cheapest way to get desirable information. Further steps should be taken only after careful consideration of details. In this issue Mr. Bain discusses one plan for meeting the broader problems involved. It is evident that these run into the larger question of control of monopoly and as to that there is room for much difference of opinion. The subject is big and important. The committee on mines and mining of the House of Representatives has appointed a sub-committee to draft and present a bill covering the Alaska situation, and now is the time for thorough discussion.

The Mint and Its Critics

Whenever the Government undertakes any form of business, prompt conflict with private concerns ensues, and there is widespread recognition of the unfairness of the Government's competing with its own citizens. We do not believe that this is a sufficient reason why the Government should never undertake a business enterprise, but it does emphasize the need of most careful consideration before either the State or the Nation enters any such field. In many countries schools are private enterprises, and in the United States there are many private schools, yet one would go far to find a man who considered the business of educating citizens an improper field for governmental activities. The postoffice, though a great business enterprise, is so manifestly for the general good that there were no serious proposals to turn it over to a private corporation, even during the long years when it was conducted at a loss. Mr. Frank R. Stockton once wrote amusingly of the 'Great War Syndicate' which he pictured as offering to conduct a foreign war for the unprepared Government. Military defense, though a business, is so clearly a Government function that there was humor even in the suggestion of letting a war out by contract. Evidently there is no hard and fast rule by which to determine what business is proper and what improper for the Government, and each case must be considered on its merits.

For many years the coining of money has been conceded to be exclusively a Government function, and in the practical operation of the mints a big business has developed in buying and refining gold and silver. As a practical convenience assay offices have been established at many points where bullion may be sold to the Government, and the Mint service has expanded with the growth of the country. There have been good reasons why the service should expand, but there should also have been a concurrent lopping off of old plants as changed conditions made them useless. Improved transportation facilities have made unnecessary the maintenance of some of the assay offices, but it is as difficult to get one abandoned as to cut off appropriations for an outgrown and useless navy yard. This is one of the defects of the system under which Government business is done. The great appropriation bills are never really debated and never understood by more than two or three men. It is impossible that they should be carefully revised each year, and an item once placed in one of the regular bills is apt to remain undisturbed for years. It is related that the Superintendent at West Point put in a request year after year for funds for building a stone wall, but that in the interest of economy the item was always cut out by the committee. One year a more lenient chairman let it stand, and thereafter for a series of years Congress solemnly voted money for that stone wall, until walls became so common at the Academy that more ground had to be bought to accommodate them. In the same way old plants have remained in the Mint service long after their usefulness was ended, and this has given a leverage to critics.

Last winter Congress passed a sensible and proper measure making it possible for the Director of the Mint to receive and refine gold and issue certificates against it without coining. This reduces expenses, decreases loss by abrasion, and does away with the absurd practice of coining gold eagles for shipment to England where they are melted down and recoined into sovereigns. Gold bars are much better for settling foreign balances, and in ordinary trade gold certificates are superior to gold itself. The change will necessarily throw out of employment certain employees. Little economy would otherwise result. From this, from pressure for abolishment of useless assay offices, and from the circumstance that the new law does not state the fineness of the bullion against which the Director of the Mint may issue certificates, has arisen a fear in some quarters that the Mint will go out of business and all refining will be turned over to private companies. In our discussion department this week the matter is treated at length by Mr. Harold French, who approaches it from a frankly prejudiced viewpoint. For our own part we do not believe that any attempt is being made 'to put the Mint out of business,' and a project "to corner the gold supply," of which one hears whispers, seems to us too absurd to receive serious consideration. The Mint, we believe, should receive and refine all gold offered it and for which a Government certificate is asked. It should have a reasonable number of properly placed branches and receiving stations, and we have no doubt that this service will be maintained, even though a great decrease in operating force and expenses results under the new law. But the Mint, as well as other branches of the Government service, should no longer be obliged to bear the expense of maintaining branches whose chief usefulness is to advance the fortunes of some group of politicians. The Bureau of the Mint is doing excellent work. It is in the hands of a particularly competent Director and has in its service a force of exceedingly capable employees. So long as its affairs be conducted on a business basis, it has nothing to fear from opposition of business interests.

It is interesting to note, in passing, that the plan of exchange of gold bars upon the basis of their weight and fineness is essentially an adaptation of the method which has been followed in China for many centuries. All large business transactions throughout China are paid in warrants calling for the requisite number of ounces of silver of a specified fineness. Unfortunately, each province formerly employed a different degree of fineness and the ounce was equally variable, leading to an extremely complicated financial system. Some years since, the United States Government loaned to China the services of Mr. J. W. Jenks to devise a method of simplification, and more recently Mr. L. J. Hatch, of the Bureau of Printing and Engraving, has been engaged in organizing the work of the issuing of banknotes by the Ta-Ching, or National, Bank.

Alaska Coal Mines and a Coal Monopoly

By H. Foster Bain

In discussing the Alaska coal-land situation it is commonly assumed that the matter is primarily one of conservation. This is far from being true. Any analysis of the speeches that have been made and of the papers written on the subject, will make clear that distribution of profit rather than waste of coal is what the proponents of change have chiefly in mind. Engineers, on the other hand, are primarily concerned with development, and as conservationists their interest centres mainly upon securing development with the minimum of waste. As has been repeatedly pointed out, development can be expected only if some profit accrue to, or be anticipated by, the developers. Avoidance of waste is a matter of securing the best technical service in the actual conduct of an industry. Economic considerations determine the conditions under which development may or must proceed; the engineer determines how best to meet a given set of conditions. Any circumstance which permits more money to be spent on a given process or a larger control of an industry to be exercised, makes possible a greater saving of material. Higher prices and larger units of business organization make for a less waste of coal or any other material. A single syndicate mining and selling Alaska coal would undoubtedly conserve both coal and capital better than any other organization. To turn the matter over to such a syndicate would be the simple and business-like method of procedure—if these were the only considerations. It is evident, however, that such a bald solution of the problem would satisfy no one except the members of the syndicate, and some other method or some modification of this one must be found if progress is to be made.

In examining the matter, two different points of view must be kept in mind. On the one hand there are those who believe in progress under existing laws and customs, and, on the other, those who demand change. The first group includes those who have been active in development of the West and to whom the old ways, if not entirely satisfactory, are at least understandable. They point to the fact that under existing laws and customs the resources of the various Western States have been successfully utilized to the great benefit of the country at large as well as of the individuals active in the industry. Some injustice has resulted; some injustice results under any system of government or business. The country has, however, actually developed, and the people have been materially benefited. The men in this group are anxious and willing to apply the same methods to the opening of Alaska—our last great frontier territory. On the other hand, there are those who, admitting the good that has flowed from the past, point to the accompanying evils and insist that even better methods for securing development may be found. Specifically they desire to protect the average citizen from extortion following monopoly, and to prevent the accruing to individuals of the unearned increment on mineral lands now in public ownership. Stated in this form it becomes evident that the matter goes deep. The problem is world-wide and is to be faced in every industry. Its solution as regards the existing public mineral lands would be but an incomplete answer to the great needs of present civilization—(1) the realization of the benefits of large business organizations without loss of control of monopoly; (2) the equitable distribution of the surplus earnings of mankind. Solution of the Alaskan coal problem will be at best but one small step in the solution of the general problem, and any method applied in Alaska and based upon Government ownership of the land can be of but small immediate importance, since for many years to come the people of the United States will draw the bulk of their fuel from fields that have already passed into private ownership. It is true that approximately one-third of the known coal is still owned by the general Government. This, however, is undeveloped. The practical question is whether it can be opened under regulations that will rectify mistakes flowing from past policies, or at least prevent similar mistakes in the future.

The great anthracite deposits of Pennsylvania are already in the hands of a monopoly and in a large measure the enhanced value of the land has already gone to the individuals concerned in organizing and maintaining it. There is no question but that the industry has been benefited, but there is widespread popular dissatisfaction with the control exercised in this case by private individuals, and the Government finds itself estopped from effective regulation of the industry by the fact that the lands are owned privately. In the bituminous coal-mining industry, on the other hand, conditions are chaotic and intensely unsatisfactory to everyone concerned except those large users of steam coal who put low price above every other consideration. The average citizen who buys in small quantities is already paying high prices. By stringent anti-monopoly laws, especially the Sherman act, the tendency toward monopoly was halted before the bituminous coal-mining industry became completely organized. It would, however, be extremely difficult to reach a fair and disinterested conclusion as to whether, from the point of view of the general public, present conditions are more unsatisfactory in the anthracite or the bituminous fields. Low prices do not tell the whole tale. Wasted capital, wasted coal, low wages, and lost lives, the formation of a large class of permanently discontented workmen, all these must be counted against low prices of coal used by railroads and power companies, granted even that low prices to the latter mean some benefit to the ultimate consumer of transportation and power. In any event, the coal lands of the East and Middle West have passed into private hands, and, however successful a leasing system or Government ownership of mines might prove in the West, the main problems would remain unsolved in territory where the most people live.

An instructive lesson none the less may be drawn from the anthracite fields. Many persons forget that for years coal was mined and sold there under fiercely competitive conditions. At a time when it cost but $1000 to open a mine and $10,000 sufficed "for quite a respectable business", many rushed into the industry. Overproduction worked the inevitable result of low prices and no profit. Since, however, there was a profit to the railroads in transporting the coal to the market, mining was stimulated by loans from the railroads to the struggling coal companies. Eventually the railroads had to take the mines to protect their loans and then discrimination in rates and service became inevitable. In time the cost of opening mines rose to almost prohibitive figures and no one could afford to invest the large sum necessary unless he also controlled transportation. All these factors worked together to produce the inevitable result, a monopoly of anthracite mining in the hands of the railroads. From many points of view the results have been excellent. The properties, however, are operated, not for the sake of the mines, but for the railroads, and a great national industry is subordinated to the immediate necessities of a group of roads. For many years there was no profit in mining anthracite; probably there is little now. Millions have been paid in royalties to fortunate owners, more millions have been made in the business of transporting and marketing the coal; but in the business of mining itself, there has been no considerable profit. There has always been a surplus of mines and of railroads in the anthracite fields, and, the larger capital being invested in the railroads, it was inevitable that they came to dominate the situation. The State and the National legislators never aided the industry by constructive legislation based upon any real consideration of the larger problems of the people and the coal. When they acted they merely pecked at the industry with petty restrictive acts. The net result is a firmly seated private monopoly of a great national resource.

In the bituminous coalfields the story is similar to that of the anthracite fields in the early years: an abundance of coal and of capital, investments made on the basis of an inflated industry during boom times, overproduction, idle plants and men, wasted money and coal, attempts of the railroads to control production each in its own interest, and the formation of monopolies in limited areas. The tendency toward a larger monopoly has been checked by anti-monopoly legislation, and the regulation of interstate commerce. In the meantime many idle collieries stand gaunt and rusting in the valleys and on the prairies, and an idle plant does no service for any man. It is useful only as a club in considerations of rates and prices. Clubs, it is well to remember, are the weapons of the stone age.

The two industries exemplify the effects of combination on the one hand and of competition on the other. In 1891 under competitive conditions anthracite sold at the mine for an average price of $1.73 per ton. In 1910, under monopoly conditions, the price had risen to $2 per ton, an increase of 16 per cent. In the same years bituminous coal under competitive conditions rose in price from $0.99 to $1.12 per ton, an increase of 13 per cent. These figures are no measure of retail prices, but it is evident that whatever may have been the effect as regards consumers, the creation of a monopoly in the anthracite fields has benefited producers of coal more in other directions than by increase in price. It is important to remember in this connection that the cost of selling and delivery is a large element in retail price of coal, as of other products, and often the buyer of small lots imputes to the original producer charges that originate long after the coal reaches the top of the ground. It seems clear, on the whole, when the two industries are contrasted, that combination rather than competition yields better results. To secure its full benefits without injury to the public is the real problem, and some form of public control is evidently desirable. The simplest form of control yet found is ownership. It does not follow that public ownership of all the coal mines is either desirable or necessary, but, so long as the Government already owns one-third of the coal reserve of the Nation, this coal should not be allowed to pass into private hands until some adequate means of meeting the problems outlined, has been found and tested. It has repeatedly been proved that ownership of a majority of the stock is not necessary in order to control a corporation, and a holding of one-third of the coal is so much greater than any possible combination of lands privately owned, that, particularly in combination with its other powers, the Government can determine absolutely the future of the coal business of this country. The Government ought not sell the coal lands until the whole matter is settled. In the meantime, all the demands for development can be amply met by a simple leasing system such as has been proposed by the Administration. There is no benefit to be derived from locking up the coal lands in either Government or private hands, but to sell them irrevocably at nominal prices and in quantities in excess of the needs of present development, is on a par with the giving of perpetual franchise for municipal utilities. The leasing system may or may not prove the correct procedure as a permanent policy, but for the present it has many advantages over any other.

The problems that now confront our bituminous coal-mining industry arose a few years ago in the same form in Germany. In that land of orderly industry, the coal business was in as bad condition as was ever that of Pennsylvania or any other American State. There was this difference, the Prussian Government as the owner of many miles of railroad was concerned, in place of, as in America, a group of private individuals; but further, the Government there did not, as here, own a large part of the known coal. Difficulties in railroad operation, as well as the general disorganization of industry, focused public attention on the coal industry. The State railways sometimes enjoyed cheap coal and at other times paid dearly for it. At times the lines had much traffic and at other times little. For short periods the collieries made large profits, and these periods were succeeded by long lean years. The methodical Germans studied the situation and then met it in a practical manner undeterred by theoretical considerations of what might happen. The Government purchased enough mines to give it control of approximately 40% of the coal producing capacity of the country. Then, on the basis of the ownership of these mines and a thorough knowledge of the business, the Government joined in a syndicate for mining and marketing coal. While there has been some criticism of the results, there has been steady work, moderate but regular profits, and better prices. English coal companies, it is true, have made inroads on the Berlin market, but the Germans gaze with equanimity upon this. They regard the low-priced coal furnished by competing English companies as just so much gain. Germany has regulated the coal monopoly by becoming a party to it.

I am among those who believe that 'trusts,' meaning thereby large business organizations, are inevitable. The conditions of modern industry favor them, and their economic advantages outweigh their evils. It is not necessary, however, to allow them to proceed unregulated, and to do so is as foolish as to allow unrestricted employment of any other new device, such as automobiles or wireless telegraphy. Trusts need regulation, but if business is to be conserved, it must be by informed and sympathetic regulation. The best way to control a trust is through the board of directors. Even a minority there will be listened to with respect, and suggestions, if sensible, will be adopted.

In Alaska the conditions of industry are naturally adverse. It is extremely difficult to successfully develop an enterprise, and only the most efficient form of organization can hope for more than sporadic success. The coalfields may be developed more quickly, economically, and efficiently by a single great syndicate than by a number of small warring concerns. The *Mining and Scientific Press* has already expressed the opinion that the first step in the solution of the Alaskan coal-land problems should be the opening of a Government mine, primarily to supply the Government needs of coal, and that, if necessary, the Government should build the needed railway to the mines. The second step should be the opening of private collieries on leased ground and the formation of a selling syndicate to pro-rate all contracts. The Government itself should be a member of this syndicate and should be represented in its management by an expert resident official of ample authority. If any of the present claimants of lands succeed in getting patents, they should be invited to become participants in the syndicate, and they would probably find it greatly to their advantage to join.

In putting forward suggestions for solution of the larger problems involved I would not be understood as urging them as either final or complete. It is hoped rather that they may provoke discussion that will result in evolution of a satisfactory general policy. In the meantime I cannot forbear recording again my own belief that the immediate value of the Alaska coalfields is small and their future value is problematical. If the plan of opening a Government mine be adopted, and if patents be promptly granted to any claimants entitled to them, the present situation will be relieved and ample time can be taken to determine the best possible policy for the future. The most essential thing is to provide for mining some coal now and still leave the policy of the future to be shaped to meet its own needs. This seems to me to be most easily accomplished by following the opening of the Government mine with an offer of a limited number of leases to anyone who may care to undertake the risks involved in opening collieries in Alaska. These risks, from a business point of view, are bound to be large for many years, and the Government in offering a lease should be prepared to safeguard in every reasonable way the lessees as well as the public.

Leases should be granted upon liberal terms, fixed in advance, should run for a period of preferably 25 years, and should cover in each case sufficient area to permit continuous operation of a modern plant through the life of the lease. The royalty should be low, since a healthy industry is more important than is revenue to the Government, and it is no proper function of the Government to make money out of one industry or class of citizens to the profit of others. The number of leases operated at any one time should be restricted to correspond to the probable market for coal. Whenever, however, the existing collieries become unable to supply the demand, or the profit on the business for two successive seasons amounts to more than a fixed percentage on the capital invested, due allowance having been made for maintenance and sinking fund, the Government should offer additional blocks of ground for lease, and the new collieries, when open, should become members of the selling syndicate and should receive their *pro rata* of contracts. Leases had best be let by competitive bidding. By this method the companies would fix their own royalties. In the initial competition they should be allowed to offer alternative bids based upon the number of leases that it may be decided to let. Clearly, a company having the whole business can pay a higher royalty than one which must divide the trade with others. It is true that competitive bidding has disadvantages as compared with assignment by lot or in order of application, but among those familiar with the business and having the capital to carry out the terms of the lease, bidding would be equal, and there can be no advantage in having others undertake to open collieries.

All applications for leases should be accompanied by bond, and after two years within which to open the mine, royalties should be collected for the proportionate tonnage of each year whether coal be mined or not. Such royalties should apply on future production, their payment being merely required to prevent indefinite suspension of operation. The detailed terms of the suggested leases might profitably be varied somewhat, but the following general principles should be held to: (1) Terms liberal and known in advance; (2) all companies to participate in sales and contracts; (3) the Government to be fully informed of all details; (4) the Government to be in position to prevent extortion by permitting the opening of additional mines; (5) royalties to be determined by the companies themselves by means of competitive bidding; (6) revenue over and above the cost of maintaining the service should go in large part, if not entirely, to the local Territorial Government; (7) leases should be freely transferable and subject to cancellation only for material failure to observe their terms and after court review.

Until the California oilfields begin to show signs of depletion, it is not likely that development of an Alaska coal-mining industry will be rapid, but under the plan suggested above, every opportunity would be afforded for opening mines as fast as the market could be developed, and that without sacrifice of any interest present or future. Such a complete change in policy should not be attempted on too large a scale at once, and for that reason it is suggested that the plan be applied to Alaska only at present. If the results prove satisfactory the same system can be extended to the remaining coal lands in the States, and there can be little question that a selling syndicate of this sort could bring to the bituminous coal industry all the benefits now apparent in the anthracite mining region, without sacrifice of public interests. The advantage of the leasing system is that it does not unduly commit the future of the industry, and as new leases came to be given from time to time the companies would offer higher royalties if the business warranted, or the price of coal would fall. In either event the 'unearned increment' would accrue to the public rather than to private individuals. The plan does away with speculation in the land, which is exactly what it is designed to accomplish. It limits the amount of speculation possible in leases by fixing a maximum profit that may be realized. By way of compensation it also limits the chances of loss by restricting competition, and by throwing on the Government much of the expense of pioneering, in that the Government mine, to be opened first, must have transportation facilities and later comers may enjoy these equally with the Government. It meets or attempts to meet the Western objection to leases, namely, government from Washington, and constant interference as to details, by requiring the terms of the lease to be fixed in advance and that leases shall only be canceled in the same manner and on the same grounds as are private contracts. A further important feature of the plan is a resident official with ample authority to exercise the somewhat limited discretion proposed. No attempt is made to fix prices. These will be determined by competition of Canadian and American coal, California oil, and the cost of hydro-electric power. The limitation is as to profits and that is to be enforced in the normal method by bringing in additional competition when profits become too large. An orderly rather than speculative method of setting this force into play is provided. The official whose duty it will be to offer new leases will be fully informed as to the facts and must proceed according to fixed conditions known in advance. Finally, his judgment will be put to test, since unless the showing of large profits or insufficient supply be satisfactory, no competent bidder will be found when the leases are offered. In the meantime the producers are protected against cut-throat competition among themselves, the power of the Government is available to compel fair transportation rates, and the selling of the product, the most difficult and delicate part of the coal business, is in the hands of the companies and not of the Government. The plan provides for placing the producing companies upon the best economic basis that competition of other fields will permit, and under these conditions they will be prepared to mine coal according to the best practice that is now possible. Conservation of coal and protection of life in the mines must be enforced through the police power of the State and regulations directed to that end must be matters of law. In order to secure good regulations and their vigorous enforcement, however, the operating companies must be placed in a satisfactory financial position. This is only possible when they are protected against unfair competition and unreasonable capitalization.

It is too much to assume that any plan will prove entirely satisfactory, but the above is offered as one which at least takes account of the difficulties and provides means of meeting those that can be foreseen.

Resoiling Dredged Areas

When, a couple of years or so ago, the conflicting claims of agriculture and gold dredging were being vehemently discussed, P. J. Tewksbury, on behalf of the Tewksbury Proprietary G. D. Co., undertook to plant a large area of dredged ground in order to show that the soil had not been rendered unfertile by the process. Black wattle was the tree selected for the experiment, and the seed was duly sowed. It is satisfactory to learn that an officer of the Mines Department has reported favorably on the result. The crop is said to be thriving well, some of the young trees being already $7\frac{1}{2}$ ft. high, and measuring $1\frac{1}{4}$ in. diam. at 6 in. from the ground. The trees range in height from $1\frac{1}{2}$ to $7\frac{1}{2}$ ft. Several other instances have been mentioned from time to time in which proof has been forthcoming that dredged ground is not sterilized. Certainly, wherever it is possible, a sufficient depth of surface soil, secured by advance stripping, should be replaced on the surface, so that the least possible injury should be done, and it is well that, in general, this should be required of lessees. But where the surface soil previously covering the gravel was shallow, it is clear that an insistence on resoiling only deters the dredging industry without aiding agriculture in the slightest degree. A dredge master states that it is advantageous to his company to use a chute when there is a fair quantity of overburden, because of increased gold return when the washes are separately treated.—*Australian Mining Standard.*

Historical Notes on the Air-Lift Agitator

By J. W. Swaren

Early in the year 1880, the Tonite Powder Co., a British corporation, built a powder factory in Contra Costa county, California, to supply the Pacific Coast States with 'tonite,' a safety powder made from gun-cotton and barium nitrate. To wash the gun-cotton and remove the last traces of acid a pneumatic agitating device, identical in theory and similar in design to the agitator now known as the Pachuca or Brown tank, was built. The original idea came from England and how long it had previously been used in the English factory of this company I have been unable to ascertain.

Referring to Fig. 1, accompanying, the general dimensions and appearance of the tank will be seen. It was built of redwood, like a truncated pyramid, with the smaller base down. It was 16 ft. high, the upper base being 8 ft. square and the lower base 3 ft. As first constructed no central tube was used. Air under a pressure of 12 to 15 lb. per square inch was admitted into the bottom through a nozzle, and agitated the mixture of gun-cotton and water with which the tank was filled to within about four feet of the top. This tank was operated with fair results until about 1882, when William Letts Oliver, the manager for the Tonite Powder Co., conceived the idea of using a central tube, as shown in the illustration. A tapering tube 18 in. at the top and 12 in. at the bottom, 7 ft. long, was constructed, with its lower end 2 ft. above the bottom of the tank. The nozzle of the air-pipe was extended to reach just inside this central tube. The agitation was very much improved by this tube, and was found to be best when the larger diameter of the tube was at the top. After this tube was introduced, the charge would settle in the bottom when agitation was stopped to permit decanting, and the air did not have sufficient force to set the charge in motion again. To overcome this a jet of air was admitted through a pipe entering at one corner, as shown. This effectively broke up the cake and started the charge. This tank is still in use for agitating gun-cotton at the works of the California Cap Co., which purchased the plant of the Tonite Powder Company.

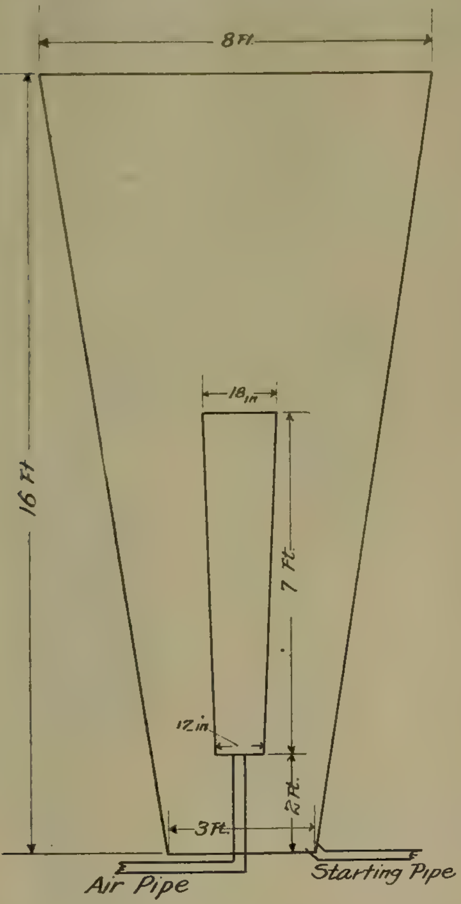

FIG. 1.

In the late eighties, Mr. Sommers, of the University of California, discovered that sulphur bichloride (SCl_2) had the extraordinary property of changing the nature of animal oils, and the discovery was believed to be of great commercial value. However, the reactions set up were of such violence that difficulty was experienced in getting a proper mixture. He consulted Mr. Oliver, who suggested using an agitator similar to that described above. In 1890, the American Lucol Co., of which Mr. Oliver was manager, erected a plant at Stege, to manufacture lucol, a composition of fish oil, kerosene, and sulphur bichloride, an excellent substitute for linseed oil. Fig. 2 shows the general scheme of agitation employed. A redwood tank, 16 ft. high and 8 ft. diam. was erected. The central tube was 18 in. diam., 8 ft. long, and 1 ft. above the bottom of the tank. This tank was filled with fish oil above the central tube, and the air admitted. Sulphur bichloride and kerosene were then run in simultaneously from tanks arranged as shown in the sketch. Considerable care had to be exercised in mixing

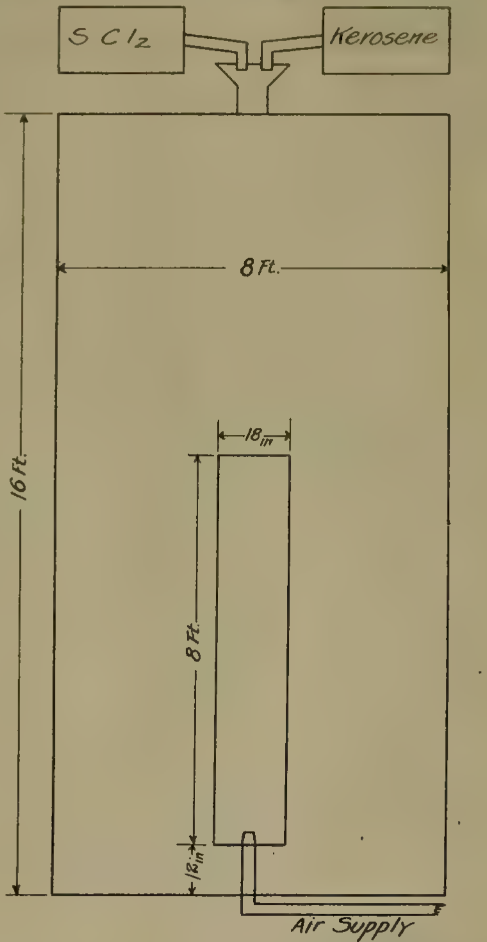

FIG. 2.

these ingredients, as the sulphur bichloride and fish oil mixed alone made a hard rubbery mass, while the kerosene and fish oil emulsified. To prevent this, the mixing of the ingredients had to be very rapid and thorough. An air pressure of 12 to 20 lb. was used in the central tube.

The operation of this agitator was so satisfactory that in 1894 four similar tanks were constructed in a new plant for the American Lucol Co. at Carteret, New Jersey. These tanks were steel, with 18-ft. sides and 10 ft. diam., with 16-in. central tubes 12 ft. long, as shown in Fig. 3. These tanks were used continuously until the American Lucol Co. went out of existence in 1896. A novel means for determining the rate of agitation was employed in this process. Small bits of colored paper were introduced in the tank one color at a time, and a sample taken from the different parts of the tank gave a visible indication of the remarkable efficiency of the agitation. These pneumatic agitators antedate the experiments of F. C. Brown at Komata Reefs by some years. According to his contributions to the *Mining and Scientific Press* September 26, 1908, the first pneumatic tanks were installed early in 1902, and the central tube was not introduced until 1904. Pneumatic agitators with central tubes had been employed at the North Star Mines, Grass Valley, California, previous to 1904.

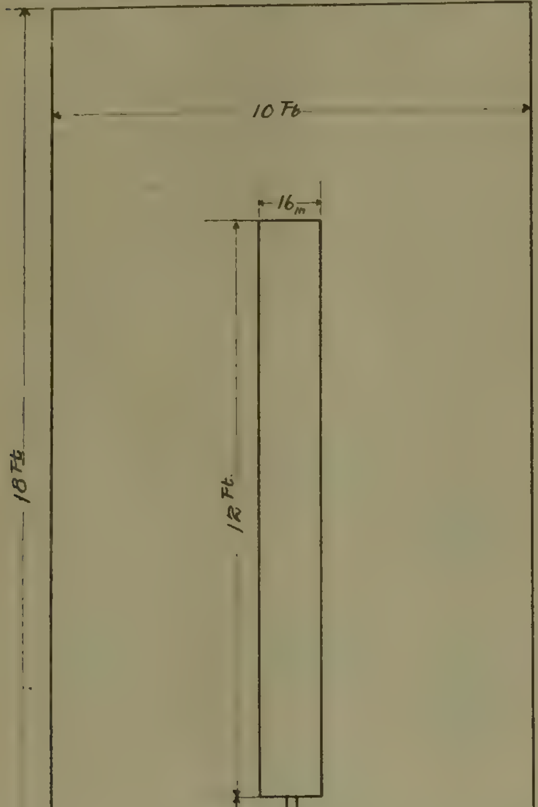

FIG. 3.

During the summer of 1903, Edwin Letts Oliver, metallurgist for the North Star Mines Co., Grass Valley, California, and son of W. L. Oliver, began experimenting with electrolytic processes for recovering the metal content direct from cyanide treated pulp without separating the solutions or using zinc. In this work thorough agitation for the pulp was necessary, as well as some means of bringing the pulp into the electrolytic field of action. A steel tank with 5-ft. sides and 20 in. diam., with a 45° conical bottom was constructed. A 2-in. central tube was used with the lower end 5 in. above the apex of the cone, and its upper end 10 in. below the top of the tank. The nozzle of the air-pipe extended into the central tube. A spreader board was suspended over the top of this tube. The amalgamated copper and iron electrolytic plates were suspended in the annular space, surrounding the upper end of the central tube. Fig. 4 shows the general arrangement of this agitator. This tank was constructed in August 1903, and proved sufficiently efficient to warrant the construction of additional tanks.

In December 1903 two additional tanks were built of wood, with 12-ft. sides and 60° cone, and 6 ft. diam. The central tube extended from 1 ft. above the apex of the bottom to about 18 in. from the top of the tank. A spreader board 10 in. diam. was suspended 6 in. above this tube. The first tube used was 3 in. diam., but this did not give sufficient agitation and was replaced by an 8-in. tube. The nozzle was placed inside the tube at first, but was gradually shortened until it was inside the 4-in. discharge pipe, and just below the apex of the cone. When the central tube choked, as it did occasionally before the nozzle was shortened, the spreader board was removed and a cover board attached. A lever was placed on top of the tube. This lever was held under a cleat at one side of the tank and forced up tight by a screw device on the opposite side. Air under 80 lb. pressure was then turned into the air-supply pipe, quickly and effectively breaking up the compacted pulp. Fig. 5 shows the general arrangement of these tanks.

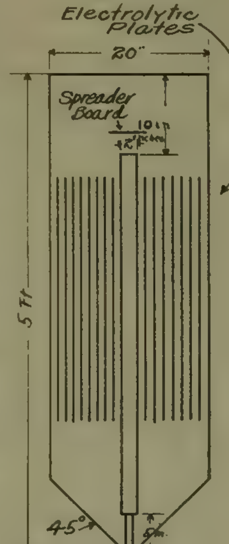

FIG. 4.

A few weeks after these two were completed a third tank was built. In the spring of 1904 twelve larger tanks, six for the North Star and six for the Central cyanide plant were built, 8 ft. diam., 14-ft. sides, with 60° cones and 8-in. central tubes with spreader board and cover board for breaking the pulp when the tube became choked, as shown in Fig. 6. The pulp originally sent to these tanks was concentrator tailing crushed through a 30-mesh screen at the battery. Later, to increase the capacity of the cyanide plant, the sand was classified out, and leached. The electrolytic plant worked as described until January 1905, giving approximately 75% recovery. This process, which is described fully in U. S. Letters Patent No. 784,120, worked beautifully in theory. Copper plates were used for cathodes and 1/8-in. iron plates for anodes, 1000 sq. ft. of cathode per agitator being used. The pulp was agitated in a solution containing 0.05% KCN and 0.05% CaO. No salt was needed to increase the electric conductivity of the solution. Contact was made between the cathode and current supply by specially shaped mercury cups, which permitted the mercury to spread over the plate, thus constantly refreshing the mercury surface. The layer of amalgam was formed on the copper plates as in ordinary amalgamating practice. The most economical density was found to be about 50c. gold per square foot. Agitation was intermittent, 6 hours being the usual length of time given to each charge. For cleaning up a smaller tank was used. Once a month the copper plates were transferred to the clean-up tank. The direction of current flow was reversed, the amalgamated copper plates becoming the anodes and planished iron plates were used as cathodes. Clear cyanide solution was used for electrolyte. In precipitating a current density of 0.05 amperes per square foot of cathode was found to give best results. In the clean-up tank, however, this was raised to 20 amperes per square foot, the object being to strip the copper plates as rapidly as possible. Usually three or four minutes sufficed to strip the copper plate of amalgam, which was then removed and re-amalgamated with fresh mercury.

The amalgam formed on the planished iron cathodes during the clean-up as a thick grayish sponge, 1/4 in. or more thick. With such a thick layer of amalgam, more or less would shake off in handling the plates. The clean-up of the sludge in the bottom of the tank usually yielded two or three hundred dollars. When a sufficiently thick layer of amalgam was formed, the plates were removed, the amalgam wiped off, and excess mercury removed by squeezing through canvas in the usual way. On retorting, the bullion ran approximately 400 gold, 350 silver, and 250 copper, when all parts of the equipment were operating to the best advantage. The clean-up could be controlled by the current density, weak currents scarcely affecting the mercury, and depositing copper only on the iron cathode. A stronger current dissolved and deposited some silver and mercury, while a very strong current density formed a deposit high in gold, silver, and mercury, but low in copper. Complete separation of gold and silver was never attempted. The most satisfactory working was obtained when depositing an amalgam retorting a bullion of the composition given above. The electrical equipment used for this work consisted of a generator rated at 1200 amp., 5 v., driven by a 10-hp. motor.

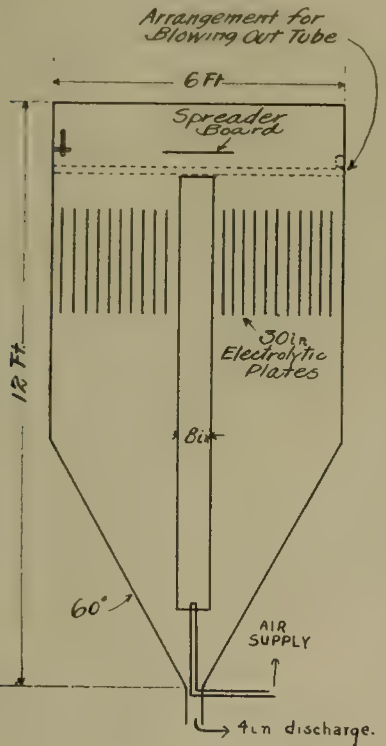

FIG. 5.

When leaching the sand was begun, new conditions were met, as the solutions from the sand vats were precipitated by zinc. Barren solution from the zinc-boxes was pumped into the electrolytic tanks. The zinc in solution was precipitated with the gold and silver. When the plates were cleaned up, and the amalgam retorted, the gold-silver-copper-zinc bullion resulting was a brass, having the color of good gold bars. The weight, however, was light. In one instance the assay value of a beautiful bar was guessed from $5 to $12 by different employees. The assay showed $3. This bar would have turned any gold brick artist green with envy. The iron oxide, ferrocyanide, and other ferric and ferrous compounds, of which considerable quantities were formed, were at first discharged in the creek. After the plant had been in operation some time, an assay was made of these compounds. This showed a value in excess of $200 per ton. After this all scrapings and rust were saved, even broken and discarded plates yielding $75 per ton. In January 1905, Acheson graphite was substituted for the iron anodes in the treatment tanks. The same current density was employed. Following the introduction of the graphite, an attempt was made to cyanide concentrate, but the sulphides attacked the graphite, disintegrating it very quickly. The experimental work here described was carried on at the North Star mill. During the summer of 1905 the three original agitators were transferred to the Central mill of the North Star Mines Co., for treating concentrates. In October of that year the Central plant was enlarged by the addition of sand leaching.

Early in 1906 electrolytic precipitation was abandoned. Pneumatic agitation was retained, however, using the same agitators, but removing the electrolytic plates. Decantation in settling vats was employed for separating solution and slime, a number of additional vats being erected for this purpose. During the time of these experiments, about thirty months, over $200,000 was recovered at a good profit.

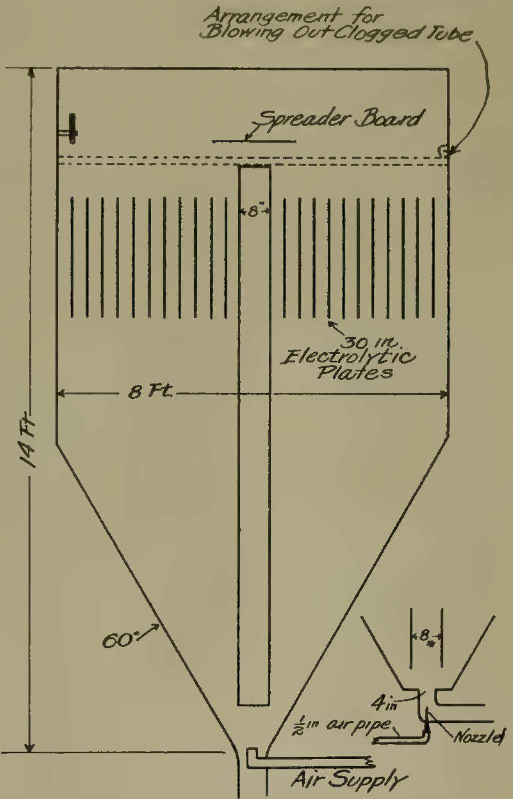
Arrangement for Blowing Out Clogged Tube
Spreader Board
8"
30 in. Electrolytic Plates
8 Ft.
14 Ft
60°
8"
4in
1/2in air pipe
Nozzle
Air Supply

FIG. 6.

The cyanide consumption was high, running about 7½ lb. per ton of ore and about the same consumption of lime. The 'holdover' was high; more than twice that of zinc-boxes. The anodes, whether iron or graphite, were always troublesome, recovery never checked within 10% of assays (these showing good extraction); while the whole process required extreme care in manipulation.

With a view to finding an economical method for handling the slime Mr. Oliver, early in 1907, began a series of experiments with filtration devices. The first drum filter was built April 1907, having a diameter of 20 in., and 12 in. long. This worked splendidly, as it was turned by hand, and never operated longer than ten or fifteen minutes without stopping. Assays showed excellent extraction, and the quantity of material handled showed the possibilities, if a machine of large size were constructed.

In June 1907 the first full working size filters were put in operation. Two filters with drums 6 ft. long and 6 ft.

diam. were built at this time. The filters as originally constructed did not work satisfactorily. The cake would not discharge properly and a thin impervious coating would form, preventing a new cake from building. When an attempt was made to remove the discharged or the barren cake by scraping, much difficulty was experienced with the tearing of the canvas. Different schemes were tried with varying success, until the plan of holding the filter-cloth in place by a wire winding was adopted. This method of construction solved the last difficult mechanical problem encountered. This experimental work was also done at the North Star mill. Early in 1908 four filters with drums 10 ft. diam. and 7 ft. long were built for the North Star cyanide plants. To make room for these machines, three of the agitators described above were removed, and the capacity of the remaining three increased by raising the sides 6 ft.; making the total height 20 ft. The central tube was not lengthened, and the spreader board was retained, as it gives a better distribution of the slime, and throws the heavy sand to the outer edge of the tank.

The accompanying illustrations show the six original agitators, three of which are still operating at the Central mill of the North Star Mines Co. The filters first installed are also working, not a single change in construction having been made. Further descriptions would lead to the discussion of present-day devices, so that these notes are submitted as an indication of a few of the difficulties encountered in the metallurgical advances here recorded. Through the courtesy of those responsible for the work described in this article, I have been permitted to examine correspondence and drawings covering the erection of the apparatus here illustrated and described.

Health of Miners

English and Colonial governments are engaged in closely studying health conditions in mines. In Queensland a commission was appointed to investigate several points in connection with the health of underground workers. The first field of inquiry was a general one relating to the conditions of work in relation to the health of the miners; the second related to the amount of pulmonary disease prevalent; and the third was a consideration of the expediency of preventing tuberculous subjects from doing mining work and of suitably compensating them for the loss of their employment. As regards general conditions, the commissioners are of opinion that the regulation of 1910 relating to efficient ventilation is sufficient for the purpose of maintaining a pure atmosphere and of reducing the temperature of the workings, except perhaps at Charters Towers, where the atmosphere in the deep mines is hot and moist. The law already allows inspectors to enforce the use of sprays or other allayers of dust in rock-drill operations, but the commissioners recommend similar powers in connection with the handling of ore at other points such as after blasting and during loading into skips. They also have many recommendations about drinking water, sanitation, etc. Their inquiries into the subject of pulmonary complaints disclosed the fact that fibrosis and tuberculosis are prevalent only to a limited extent and are confined to dry and dusty quartz mines, but that they are gradually on the increase. The recommendations in Part 1 of the inquiry will go a long way toward improving the conditions, but the commissioners are in favor of the additional drastic proposition under Part 3, namely, that men with lung troubles should not be allowed underground, that miners should be required to obtain medical certificates once a year to prove their immunity from pulmonary complaints, and that some sort of general insurance scheme should be inaugurated by the State to provide for such as are rejected. This part of the recommendations is of far-reaching importance, and will raise much discussion in other countries as well as Queensland. It stands to reason that in the confined space of the end of a drift or even of a stope, the proximity of a tuberculous subject must be a danger to the other workers. In Queensland and other countries it may be possible at a small cost to the community to check the spread of lung diseases by taking this drastic step, but whether the same policy can be adopted elsewhere without a great burden may be debated.

Giesecke Tube-Mill

Several of the leaders of the mining industry on the Rand have gone into ecstacies lately over the adoption of the Giesecke patent tube-mill, evidently under the impression that it was likely to revolutionize milling operations. It is even claimed that it may result in the total elimination of the gravity stamp, as by its use ordinary broken ore is easily reduced to such a fineness as to readily pass a 200-mesh screen. The mill is a German invention and has been hitherto principally used in the manufacture of cement. It may be described as a modified tube-mill some 24 ft. long, one-fourth of which is 7 ft. 6 inches in diameter and the remainder about 6 ft. in diameter. Its capacity is 50 tons of pulp, weight 68 tons, and when in action the mill revolves at the rate of 25 r.p.m., a 400-hp. motor being used to drive it. As far as can be gathered, it appears to be crushing 350 tons per day of ore broken previously into various sizes up to 6-in. cubes, with the result that 81% passes through 200-mesh, 6% over 200, 7% over 120, 5% over 90, and only 0.5% over 60-mesh. The method of working is to feed into the larger end of the mill, the coarse particles being confined to this until sufficiently reduced in size to pass through a screen dividing the large diameter portion from that with a 6-ft. diameter. The reduction is effected by steel balls varying in diameter from 2½ in. to 4 in. diameter in the large or breaking chamber, and down to 1¼ in. diameter in the grinding portion of the mill. As already shown, the pulp leaves the mill in a remarkable condition of fineness, the coarser particles being returned to the mill for further attrition. Water to the amount of less than a third in weight of rock treated is required, and as the mill is fitted with automatic lubricating devices, it seems to require a minimum of personal attention. The capital cost of such a mill is stated to be £6000 net, without including buildings, erection, or motive power. It is estimated to equal in capacity a 50-stamp mill, but so far no idea can be given as to the actual running costs. From what can be gathered, these are not lower than the lowest on the Rand—say, for instance, at the Roodeport United mine, where, with heavy stamps, a half-inch screen is used and 20 tons per stamp per day crushed, the pulp being finished by ordinary tube-mills at a total cost of 2s. 6d. per ton. Considering the reputed duty, the capital cost is low, but the question of most concern is the efficiency and the actual cost per ton treated. These do not seem to have yet been fully ascertained. When the design of the mill is taken into consideration, it is evident that the cost of maintenance will be large. At all events the experiments being made with the mill under local conditions by a committee of the Transvaal Chamber of Mines were for some time suspended because the steel balls used inside the mill became too worn to be effective, and the local agents and patentee did not seem to have any spares on hand to replace the worn ones. It would thus appear that the wear and tear was greater than anticipated, and to have over 20 tons of steel balls continually undergoing wear and tear must in itself constitute an expense far more than the total cost of running an ordinary tube-mill, not to mention the cyanide consumption this iron would cause. Other parts of the mill also do not seem able to stand the severe and prolonged strains thrown upon them. Before it can be said to justify the good opinions formed concerning it, some important vital alterations may become necessary. Even with such improvements it is doubtful whether the stamp-mill will be dispensed with, and as to reducing the ore to the necessary fineness of pulp at one operation, there are grave doubts among milling engineers here as to whether that is possible.

Iron rails make better sluice riffles than any other material and are laid lengthwise on a 4 by 6 scantling. The gold settles admirably in the space between them.

Sulphides of Iron and Their Genesis

By E. T. Allen

General Principles

*The genesis of ores is essentially a chemical problem. It involves in each individual case the formation of one or more minerals. Barring those rare instances in which the geologist may be able to observe a mineral in the actual process of formation, the conditions of formation have to be inferred from the data obtained by field observation, supplemented by what chemical information is available. At the present time our chemical knowledge of minerals generally embraces something of their behavior toward certain reagents, and often little, if any, more. Accurate data on the genesis of most of them is still wanting. This will have to be accumulated by actually forming the minerals in the laboratory and studying the conditions in systematic fashion. The questions of first importance in mineral synthesis concern, of course, the conditions of temperature and pressure and the composition of the systems in which the minerals have formed.

By laboratory study, certain limits to these conditions may be set, outside of which the mineral cannot exist, though in general the limits will be wide. Thus if it be learned that a certain mineral cannot exist above 450°, it is known only that the mineral in nature must have formed somewhere between this point and the lowest temperature which prevails in the earth's crust. It is quite probable that we shall be able in many cases to narrow this range of temperature by the study of paragenesis. Thus if we could determine the temperature limits of two different minerals which, on account of their intergrowth or otherwise, could be shown to have formed at the same time, it would be certain in that particular instance that the minerals formed inside the temperature range which is common to both. Thus far, we have been able to set these temperature limits for comparatively few minerals, chiefly those which are capable of existing in more than one crystal form. Here the temperature is often the most important condition determining *which* crystal form shall appear, and this characteristic of the mineral may be taken as an index of the temperature which prevailed in its genesis. In a similar way, the composition of original solutions has to a slight extent been determined, since it has been observed that crystal form is sometimes determined by the composition of the solution in which the crystal grew. For the determinations of pressure limits, there is at present no method.

In drawing inferences regarding the genesis of natural minerals from experiments in mineral synthesis, the investigator must be constantly on guard lest he mistake secondary for essential conditions. It is therefore necessary for the chemist who works in this field to keep in constant touch with the geologist.

The Sulphides of Iron

In this paper will be considered the application of some of the above principles to the mineral sulphides of iron which form one of the most important classes of the sulphide ores. The frequent association of these minerals, pyrite, marcasite, and pyrrhotite, with other valuable minerals of the sulphide group would indicate that the knowledge of the conditions of the genesis of the former might be applied to the latter as well. Also the association of the different sulphides of iron with one another have suggested several interesting problems of more particular nature which will here be considered.

Pyrite and Marcasite.—Pyrite and marcasite, the disulphides of iron, often occur in such geological formations as to lead to the belief that they were precipitated from cold surface solutions. Typical deposits of this character are those of the Mississippi Valley. Geologists have reasoned that these and similar deposits have been precipitated from sulphate solutions because surface waters have frequently been observed by them to carry ferrous and ferric sulphates which have formed by the oxidation of older deposits of pyrite or marcasite through the action of atmospheric influences:

$$FeS_2 + 7O + H_2O = FeSO_4 + H_2SO_4.$$

Observation has gone a step farther. Recent pyrite has been observed in wooden conduits, and on the twigs of trees in hot springs, and the fact that the same mineral occurs on coal, and sometimes associated with asphalt, has led to the conclusion that the ferrous sulphate has been reduced in some way by carbonaceous matter to FeS_2. A disulphide obviously could not be formed by simple reduction, but a more complicated process in which ferrous carbonate would be one of the products may be conceived. The following equation in a very imperfect way conveys this notion:

$$7C + 4FeSO_4 = 2FeS_2 + 2FeCO_3 + 5CO_2.$$

Omitting details, it may be stated that experiments which have been directed toward the formation of pyrite and marcasite through the agency of carbonaceous matter, have been entirely without result. A possibility of synthesis is suggested by the fact that pyrite and marcasite are commonly associated with other sulphides of a simpler nature, such as sphalerite and galena which are directly precipitated by hydrogen sulphide. Experiments have in fact shown that both pyrite and marcasite may be obtained by the action of hydrogen sulphide on ferric sulphate solutions. It is well known that ferric sulphate is directly reduced by hydrogen sulphide to ferrous sulphate with a simultaneous precipitation of sulphur, but it had not previously been noticed that the further action of hydrogen sulphide and sulphur on ferrous sulphate slowly gives rise to a dark precipitate having the composition FeS_2. This reaction, which may be represented by the equation: $FeSO_4 + H_2S + S = FeS_2 + H_2SO_4$, takes place even at ordinary temperature, though quite slowly. A microscopic examination of the product proves it to be distinctly crystalline, though the crystals are minute. If the reaction is allowed to go on at a sufficiently high temperature in a sealed glass tube, say at 200°C., the crystals grow large enough to measure, and it has been found that they are partly marcasite—a mineral which had not previously been made artificially. A method was devised by H. N. Stokes for the analysis of mixtures of natural pyrite and marcasite which we have used to great advantage in studying the laboratory products. It consists in the oxidation of the sulphides by a dilute solution of ferric sulphate. The products of the reaction are ferrous sulphate, sulphur, and sulphuric acid for both minerals, but the relative quantities of the products are decidedly different. Only 14% of the sulphur in marcasite is thus oxidized to sulphuric acid, the rest being precipitated as free sulphur, while 56% of the sulphur in pyrite is oxidized. It is thus possible to determine in any mixture of the two sulphides the percentage of pyrite and the percentage of marcasite. As was stated above, the action of hydrogen sulphide on a mixture of ferrous sulphate and sulphur gives in general a mixture of both pyrite and marcasite, and the application of Stokes' method has proved that there are two essential conditions which determine the proportions of the two. These are temperature and acidity. The higher the temperature during the reaction, the greater is the percentage of pyrite obtained. It is also true that the lower the acidity of the solution, the greater is the percentage of pyrite formed, until, when the solution becomes neutral or alkaline, the product is practically all pyrite. The equation above shows that it is not possible to maintain the solution neutral when hydrogen sulphide acts on ferrous sulphate and sulphur, for sulphuric acid is one of the products, but if we substitute suspended ferric hydroxide for the ferrous salt, the solution remains neutral (if we waive the question of the weakly acid nature of hydrogen sulphide itself). Another way in which we can command the same essential conditions is to heat pyrrhotite or ferrous sulphide with free sulphur and a water solution of hydrogen sulphide which contains a very little sodium bicarbonate. This solution dissolves and carries over the sulphur to the pyrrhotite, thus forming FeS_2 in a practically neutral solution, and the result is pyrite.

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*Studies in ore deposition from the Geophysical Laboratory, Carnegie Institute of Washington.

An alkaline solution of sodium polysulphide precipitates from a ferrous salt an amorphous mixture of ferrous sulphide and sulphur, but these combine slowly under the influence of heat, and probably, even at the ordinary temperature, with the formation of pyrite.[1] These data enable us to draw some important conclusions relating to the formation of these minerals in nature:

1. We know that the mineral marcasite can be formed by the action of hydrogen sulphide on ferric sulphate solutions, or, what comes to the same thing, a solution containing ferrous sulphate[2] and hydrogen sulphide to which the air finds some access. If the solution contains as much as 1% of free sulphuric acid and the temperature is not above 100°, the product is all marcasite. It is also not improbable that pure marcasite can form at a higher temperature if the solution is still more acid. Now, these conditions agree strikingly with what we find about the genesis of marcasite from field study. It is always a surface mineral, presumably formed from surface solutions at *low* temperatures. It is also a matter of common knowledge that such solutions when they contain iron usually carry it in the form of sulphate, together with sulphuric acid, since they result from the oxidation of an older body of pyrite or marcasite.

2. We know that pyrite forms from solutions which are neutral or alkaline by the action of alkaline polysulphides on ferrous salts and by the action of hydrogen sulphide on ferric hydroxide. Both reactions are essentially the union of ferrous sulphide and sulphur in a neutral or alkaline medium. Coming again to the deductions from field observation, it is found that pyrite is always deposited by hot waters instead of marcasite, and also that deep veins which formed under comparatively high temperatures contain pyrite, never marcasite. Now, hot terrestrial waters are practically always alkaline, not only because silicates are hydrolized by hot waters with the necessary formation of an alkaline solution,[3] but because if a strong acid were allowed to act on rocks at the high temperatures which prevail in the depths of the earth's crust, chemical action would soon neutralize it by the decomposition of carbonates, silicates, and the like.

3. Pyrite and marcasite form together when hydrogen sulphide acts on ferric sulphate unless the percentage of free acid and the temperature are sufficiently low. The quantity of free sulphuric acid must be about 1% at 100° to insure the formation of marcasite free from pyrite, while at 300° it must be considerably more, if indeed it is possible to get a product free from pyrite at that temperature. Pyrite and marcasite are very commonly found together in nature—often in the same hand specimen and sometimes intergrown. Although in some cases the two minerals probably belong to different periods of deposition, it seems entirely probable, in view of the laboratory results, that in other cases they are contemporaneous.

Relation of Marcasite to Pyrite.—When marcasite is heated to a temperature of 450° C., under conditions which preclude oxidation, it changes to pyrite. Not only does its color become yellower and its density higher (the density of marcasite is 4.889, that of pyrite 5.02), but its behavior with a ferric sulphate solution proves conclusively that it has become pure pyrite; for while at the start the ferric sulphate oxidized only 14% of the sulphur of all the marcasite it decomposed, now it oxidizes 56%. In a comparatively simple way, it can be shown that heat is set free during this change, which proves, of course, that marcasite possesses more energy than pyrite. Pyrite cannot be changed directly into marcasite, that is, the change is irreversible and marcasite is what is called a monotropic form. The question of the chemical constitution of the two forms will not be discussed here, except that it may be remarked that they *appear* to be polymorphic forms in which the difference is one of crystalline structure rather than of a chemical nature. More important for the problems of ore deposition is the significance of the temperature at which the change occurs. It goes on at 450° very slowly and could not be detected at 400° in a period of four hours. It will be observed, therefore, that marcasite cannot have formed in nature above 450°, and any minerals which can be shown to have been precipitated at the same time with marcasite are subject, of course, to the same limitation. Pressure cannot be invoked to qualify this statement, for a pressure of several thousand atmospheres was found not to accelerate the change. We may also conclude that a paramorph of pyrite after marcasite would show that the original crystal had been subjected to a temperature the lowest limit of which lies somewhere between 300 and 450°, because at 300° marcasite crystals were found not to be changed to pyrite, either by acid or alkaline solutions.

Pyrrhotite.—This mineral can be readily formed by the decomposition of pyrite in hydrogen sulphide at temperatures above 575°. The higher the temperature is carried, the more sulphur is lost, and a product formed at high temperatures, say at 800 to 1100°C., takes up more sulphur when heated in hydrogen sulphide below that temperature. Although it is somewhat aside from the main purpose of this article, which is to discuss certain problems of ore deposition, it may nevertheless be of sufficient interest to remark in regard to the mooted question of the true chemical formula for pyrrhotite, that this mineral is really variable in composition, at the same time preserving its homogeneity; in other words, ferrous sulphide can dissolve a quantity of sulphur depending on the temperature like any other solubility. At 600° the maximum quantity dissolved is 6%. We may, if we please, represent such a solid solution by the formula $(FeS)S_x$.

Under the experimental conditions thus far tested (heating pyrrhotite in dry H_2S) a solution containing only about 6% of sulphur can be obtained, the addition of more sulphur changing the pyrrhotite into pyrite. The pyrrhotite of nature doubtless formed from solution, yet it is remarkable that the highest percentages of sulphur in the natural mineral range in the neighborhood of 6% dissolved sulphur, corresponding to about 40% of total sulphur.

Geological observations lead to the conclusion that vein forming solutions containing, doubtless, polysulphides, change pyrrhotite to pyrite, and phenomena are observed about contacts which lead to the belief that the reverse action, the decomposition of pyrite into pyrrhotite and sulphur, occurs. In the neighborhood of contact intrusive masses, where the sulphides of iron occur, pyrrhotite is found close to the contact where the temperature was highest and pyrite in the colder zones. It is commonly held by geologists that in nature pyrrhotite was formed from the same solutions as silicates like olivine and augite. The experimental difficulties are at present too great to permit attack of this question.

In conclusion, I wish to express indebtedness to J. L. Crenshaw, John Johnston, and Esper Larsen, in collaboration with whom the experimental data for this article were worked out; and to F. L. Ransome, W. H. Emmons, and especially to W. Lindgren, for geological data.

PYRITE is isometric ferric sulphide, FeS_2; marcasite is orthorhombic, FeS_2. The latter can be distinguished by its crystal form and cleavage.

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[1] At the lower temperatures (100°) amorphous disulphide appears to be the first product.

[2] It is not essential that the sulphate be used; any other ferrous salt may be substituted.

[3] This of course postulates the presence of some alkali or alkaline earth metal in the rocks, but some of these metals are practically always present.

Perliminary Treatment of Water and Air in Cyanide Processes

By George A. James

Where water is used in other technical processes the importance of its analysis and proper chemical treatment is recognized, but it seems almost neglected in cyanide practice, where it stands in most vital relation. All natural waters contain impurities that have an influence on the results obtained by their use, and which can be corrected or improved by well known chemical and physical methods. There are various impurities found in natural waters, which have an effect on cyanide solutions, or ores; sulphates, chlorides, and nitrogen compounds of the various alkalis and metals, the carbonates and free sulphuric, carbonic, and hydrosulphuric acids. In addition to these, there is always organic matter in suspension and combined.

In cyanide practice many cases have occurred where preliminary tests have not agreed with later results. It is more than probable that such discrepancies can be traced to the water used. This indicates that the water should receive as thorough attention as the material to be treated, before a safe report on the results to be expected in practice can be given. A comparison of results obtained with distilled water, and the water to be used should always be made, and where differences are found, the reason should be sought and methods worked out for their correction. In experiments with waters, cyanide losses of two pounds have been found, and extraction losses of several per cent. My experience is that recovery in the majority of cases warrants the preparation of water before its use in any part of the cyanide process. The reasons for this can only be outlined, as the chemical reactions are obscure, and only a small part of the work necessary completed.

The first influence of water impurities is in preliminary washing of ore charges. The object of this is to remove soluble portions such as ferrous sulphate, copper sulphate, and free acid contents, which are destructive to cyanide solutions and retard percolation. The effect of ordinary water is to precipitate part of these impurities, very often adding other injurious compounds. Basic salts are formed (hydrates and carbonates), and as the sand acts as a filter medium, what organic matter there may be in the water is collected, to later destroy the leaching solution. Water containing acids may decompose iron compounds into a condition where they consume cyanide and form insoluble double salts. Sulphides are decomposed, resulting in sulphuretted hydrogen, another destructive agent for cyanide. This indicates the bearing water may have in this part of the process. In preparing stock solutions, annoying physical conditions and material loss of cyanide can be prevented by the proper treatment of water before the introduction of cyanide. Although my experiments have not reached the point where absolute conclusions can be drawn, they indicate that cyanide destruction by carbonic acid is far greater than generally supposed. Natural waters contain 0.5 to 122 grains of this per gallon, and excessive cyanide destruction may result from this acid alone. Water containing free sulphuric and hydrosulphuric acid are obviously unfitted for cyanide solution until properly corrected, and the same applies in a lesser degree where water holds an appreciable amount of suspended organic matter.

The physical condition is also important in considering the independent treatment of water before its use in cyanide solutions. Where water contains a large excess of calcium hydrate as protective alkali, calcium carbonate is precipitated wherever it comes in contact with carbonic acid in the air or other solutions. This precipitate clogs filter-presses and zinc-boxes. Where water receives previous treatment, a large part of this trouble can be prevented. In the final washing of charges of ore, the chemical contents of water may produce the re-precipitation of metals and a further loss of cyanide. In conclusion, it may be stated that almost all waters can be cheaply corrected, and even slight improvements would warrant this correction.

All air contains impurities destructive to cyanide. Cyanide plants often exist in neighborhoods where, in addition to the carbonic acid always present, admixtures of sulphuric, sulphurous, and hydrosulphurous acid can be found in large quantities; in fact, the roasting process may be part of such plants. The need of removing such impurities before using air for agitation or aeration can be seen. There are simple methods of doing this.

Making Use of Hydraulic Power

By Dennis H. Stovall

Practical use can often be made of the power afforded by the gravity-head pipe-lines of the hydraulic placer mine. Many surface properties in northern California and southern Oregon use power of this sort to operate dynamos, by which electric energy is furnished for night work in the diggings, as well as all the camp buildings. A small wheel, operated by a small 'tap' from the main line, does not reduce the pressure in the giants to any appreciable degree, and the convenience is worth many times the trouble and expense involved. A number of placer mines use power from the pipe-lines, or by penstock from the high-line ditch, to operate a sawmill; and by this means cut all the lumber needed for repairing flumes, constructing additional buildings, and for general improvement purposes. Sawmills can be had these days that are easily and quickly moved from one point to another, the entire outfit, including the power-wheel, being of such bulk as to allow packing on ponies or burros.

PORTABLE HYDRAULIC MOTOR.

A 'general utility' motor, operated by water from the pipe-line, is a handy contrivance. A motor of this type, built by a foreman, was seen on a southern Oregon property, and is shown in the accompanying illustration. It is employed regularly for a variety of purposes; it hauls the steel cable connected with the derrick and crane in lifting huge boulders from the diggings, and, by attaching a fly-wheel, it may be used in the machine shops and everywhere else about the mine that power of any sort is demanded. This portable water motor is very simple. It consists of an undershot wheel, with connecting shafts and pinions, and operating levers, all built on a substantial wooden frame. To this frame a drum is also attached, operating a cable. The adjustment for the cable drum is the same as that employed wherever cables are used. Water to operate the movable motor is taken from the main pipe-line through a fire hose; the latter being of such length as to allow several moves of the motor with only one connection on the main line. Any work round the mine that requires, or needs a donkey-engine and cable, can be done by this motor. The power is, of course, limited by the size of the water-wheel, and can be made as small or as large as the work demands.

Treatment of Mill Concentrate

By R. Lindsay

*As much attention has been given of late to the more careful collection and treatment of mill concentrate, a few notes on the procedure adopted at the Geldenhuis Deep, Ltd., may not be without interest. It will be understood that the following remarks apply more particularly to reduction works where operations are conducted on a fairly large scale, or to amalgamated mines working as sectional units over a reasonably limited area. The concentrate treated here results from the daily scrape from the mills at north, east, and west sections, also the big barrel residue from the respective mills; the concentrate retained on the plates with the amalgam being taken off together and transported to the central amalgam room by 11 a.m. in locked amalgam safes provided for the purpose. The scrape is then ground in barrels (a separate barrel being provided for each section) for 4 or 5 hours, and cleaned in the usual way over a stationary copper plate, the black sand settling in a tank 4 ft. 6 in. by 2 ft. by 2 ft., fitted with a baffle at 18 in. from the end adjacent to the plate, the heavy material grading 45% −200 (0.003 in.), settling behind the baffle; what remains on the farther side overflowing through a 2-in. pipe to a tank outside the building, the grading of the fine product carried over being 98% −200.

The first tank is cleaned out daily and produces about 250 lb. dry weight of concentrate, grading 45% −200 as already stated, and assaying about 30 oz. fine gold per ton. This product is then fed to a tube-mill 4 ft. 6 in. by 3 ft. 6 in., lined with 6 by 6 by 3 in. silex blocks and running at 26 r.p.m. using pebbles as the grinding medium. The product from the tube-mill, grading 98% −200, now flows into a batea running at 100 r.p.m. with a 3-in. stroke, a bath of 250 oz. of mercury being maintained therein. The batea acts most effectively as a trap, 7 oz. of mercury and 50 oz. of amalgam per ton being regularly caught. This 50 oz. of amalgam yields 11.28 oz. fine gold at a cost per ton of 3s. for power and 5s. for labor.

From the batea the concentrate pulp passes over a riffled launder and trap to the second tank, thus joining the overflow from the first tank. The overflow from the second tank passes into a third larger settling tank, the overflow from which is perfectly clear and is allowed to run to waste. The product in the last tank grades very fine, being all −200, and assays 12 to 14 oz. fine gold per ton, and represents about 5% of the total solids caught in the second tank. The concentrate from the big barrels in the respective mills is washed over a stationary plate in the usual way and is caught in a large tank divided into two by a partition crosswise in the centre. The product from the first compartment, amounting to 3.5 tons per month, grading 60% −200 and assaying 7.5 oz. fine gold per ton is transported to the central amalgam room every month and is tube-milled. The product from the second compartment, amounting to 2 tons per month, grading a little over 90% −200, and assaying 6.75 oz. fine gold per ton is transported direct to the reduction works at east section for cyanide treatment.

For cyaniding the finely ground concentrate, the conical tank designed by Andrew F. Crosse and described by him,[1] has been adopted and has proved most satisfactory. The tank, 7 ft. 6 in. diam. and 8 ft. 4 in. deep and having a content of about 122 cu. ft., treats comfortably 1800 lb. dry weight of material, and there is no trouble whatever in obtaining a clear solution for decanting, agitation with air going on meanwhile. As one would expect in treating material in so fine a state of division, the gold goes rapidly into solution, a charge assaying 250 dwt. fine gold per ton being reduced to under 30 dwt. after one hour's agitation.

The practice here is to agitate the charge with air for 12 hours before commencing to wash with 0.02% cyanide solution. At the end of 12 hours agitation the undissolved gold in the concentrate is down to 6 dwt. per ton, while the cyanide solution has a gold value of 56 dwt. per ton. Washing is then proceeded with at the rate of half a ton of solution per hour, 18% of the solution in the tank being thus displaced every hour, agitation going on meanwhile. The quantity of solution required for treating the 1800 lb. charge is 6 tons. This circulation on the Crosse principle with simultaneous decantation when washing, effects a considerable saving of time over settlement and decantation, considerably increasing the capacity of the conical tank. The washing is maintained for a period of 12 hours, making the total time of treatment 24 hours, at the end of which the concentrate residue assays 4 dwt. per ton, and the solution 0.08 dwt. per ton. This is at present the economic limit to which treatment may be carried. The cyanide consumption at 2.75 lb. of 120% KCN is rather high, due to the refractory nature of the material dealt with, but it has gradually been reduced from double the present consumption, and it is hoped that it will be still further reduced. Possibly there may be a useful field here for one of the various kinds of magnetic separators to eliminate fine iron.

The air for agitation is obtained from a little Ingersoll-Rand compressor; a $\frac{3}{4}$-in. branch pipe from it is allowed to enter a receiver fitted with a pressure gauge, just before entering the Crosse tank, thus allowing the consumption of air to be measured and the cost calculated. The consumption is 7 cu. ft. of free air per minute costing 5d. per ton of concentrate treated. The quantity of mercury recovered from the Crosse tank averages, up to the present day, only about 1 oz. per ton, thus showing the effectiveness of the batea as a trap as already mentioned. The total cost of transportation, grinding, and cyaniding is 26s. per ton as follows:

		Per ton.
Tube-milling	Transport and labor	8s. 0d.
	Power	3s. 0d.
	Pebbles	4s. 0d.
	Total	15s. 0d.
Cyaniding	Transport and labor	8s. 0d.
	Cyanide	2s. 3d.
	Lime	0s. 4d.
	Air	0s. 5d.
	Total	11s. 0d.
		26s. 0d. per ton.

The average value of the concentrate produced at the three sections of the Geldenhuis Deep is 16 oz. fine gold per ton, having a value of about £67. Taking the average residue at 4 dwt., and cost of treatment at 26s., the profit per ton amounts to £64 18s. The economic advantage of treating the concentrate on the mines where it is produced instead of selling it to customs works is apparent even when the basis of payment is as high as 94% of the gold content at 84s. per fine oz., less £6 per ton for treatment charges. Taking the concentrate at 16 oz. per ton as above, the profit on selling would be £56 13s. 4d., allowing 10s. per ton for bagging and transportation, the mines profit being thus reduced by £8 4s. 8d. The concentrate plant installed here toward the end of last year at a cost of £576, including royalty on the Crosse tank, has already handsomely paid for itself, gold to the value of over £2000 having been recovered up to the end of last May.

The U. S. Geological Survey has issued a report, covering the year 1910, giving the production of gold, silver, copper, lead, and zinc in the States of the eastern slope of the Appalachian range. Sixty-one gold placer mines produced 1524.54 oz. of fine gold, and quartz mines 6977.57 oz. or 78% of the total. The silver produced, some 91,595 oz., was a by-product only, being saved wholly in the refining of gold and copper. Copper production, nearly all from the Ducktown district of Tennessee, was 17,923,412 lb. The zinc output was 140,875,886 lb., of which 97% came from New Jersey. The valuation of the total mineral production is given by the report as $10,127,304.

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*Abstract from *Jour.* Chem., Met. & Min. Soc. of S. A.

[1] *Jour.* Chem., Met. & Min. Soc. of S. A., Nov. 1909.

Gold, Silver, Copper, and Lead Production of California

By Charles G. Yale

The mine output of gold, silver, copper, and lead in California in 1910 had a value of $27,020,405, according to figures compiled and just made public by the Mineral Resources division of the United States Geological Survey. The production of gold was $19,715,440; that of silver 1,840,085 oz., valued at $993,646; that of copper 48,700,756 lb., valued at $6,184,996; and that of lead 2,870,977 lb., valued at $126,323. These figures show a decrease in the output of gold, silver, and copper as compared with the figures for 1909, but a large increase in lead. The 1909 figures are as follows: gold, $20,237,870; silver, 2,098,253 oz., valued at $1,091,092; copper, 57,288,281 lb., valued at $7,447,476; lead, 1,502,597 lb., valued at $64,612.

There were 1079 mines producing gold, silver, copper, or lead in California in 1910, of which 564 were gold placer mines. Of the deep mines 485 were gold mines, 9 silver mines, 10 were silver-lead mines, and 11 were copper mines. Of the placer producers 168 were hydraulic mines, 72 were dredges operated by 41 companies, 139 were drift mines in ancient river gravels, and 185 were sluicing mines. Measured by the number of producers, as well as by the tonnage of metal output, deep mining decreased somewhat in California in 1910. Among the placers sluicing decreased also, but dredge and drift mining increased.

In 1910 there were 2,697,885 short tons of ore from deep mines sold or treated in California, with an average total recoverable value of $6.71 per ton, against 3,041,688 tons in 1909, with an average recoverable value of $6.41. Of the total recovered value in ores in 1910, milling ores yielded $10,005,190 in gold and silver; and smelting ores, $1,669,008 in gold and silver, $6,184,996 in copper, and $126,323 in lead. Placers produced $8,888,795 in gold, of which $635,498 was from hydraulic mines, $516,929 from drift mines, $7,550,254 from dredges, and $186,114 from sluicing mines, the yield from dredges alone being over 38% of the total gold output from all sources in California in 1910. Gold dredging has been of constantly increasing importance in California since 1899, when the yield from this source was $206,302. In 1910 it was $7,550,254. The total gold output by dredges in California to the end of 1910 was $40,318,775. The three great dredging fields are those of Yuba, Sacramento, and Butte counties, of which the Yuba county field showed an increased output of $730,557 in 1910, while the production from Butte county decreased $501,038, and that of Sacramento county decreased $164,542 for the year under review.

The following table gives the mine production of California by counties in 1910. Of the total gold placers furnished, $2,468,505 from Butte county, of which $2,389,235 was from dredges; $1,394,537 from Sacramento county, of which $1,369,594 was from dredges; and $3,199,952 from Yuba county, of which $3,172,476 was from dredges. Dredges also produced $191,900 in Calaveras county, $213,980 in Merced and Stanislaus counties combined, and $109,182 in Siskiyou county. Hydraulic placers produced $179,105 in gold from Siskiyou county and $328,154 from Trinity county. Drift mines produced $147,599 in placer gold in Nevada county and $151,743 in Placer county. Surface or sluice placers produced $29,700 in Plumas county, $22,339 in Siskiyou county, and $27,476 in Yuba county, and smaller amounts of gold in most of the other producing counties of the State.

The largest increases in gold production by counties in California were $347,461 in Amador, $80,815 in Mono, $122,363 in Sierra, and $734,408 in Yuba. The largest decreases were $499,288 in Butte, $292,806 in Calaveras, $78,885 in Mariposa, $126,752 in Nevada, $272,940 in Sacramento, and $310,077 in Tuolumne. The Mother Lode in Amador, Calaveras, Eldorado, Mariposa, and Tuolumne counties produced 1,170,497 short tons of ore in 1910, with a total recovery in gold and silver valued at $4,435,802, or an average of $3.78 per ton, against 1,338,160 short tons yielding $4,854,355, an average of $3.60 per ton, in 1909, or a slight decrease both in tonnage and recovery.

MINE PRODUCTION OF GOLD, SILVER, COPPER, AND LEAD IN CALIFORNIA IN 1910.
By Charles G. Yale, U. S. Geological Survey.

County.	Ore treated.	Gold. *	Silver. *	Copper.	Lead.	Total Value.
		Value.	Quantity.	Quantity.	Quantity.	
	Tons.		Fine ozs.	Pounds.	Pounds.	
Amador, ...	577,934	$2,846,246	36,883	151,480	....	$2,885,401
Butte, ...	13,576	2,487,791	11,851	....	659	2,494,220
Calaveras, . . .	438,263	1,147,705	155,248	7,302,331	....	2,158,935
Colusa and Lassen,	12,102	82,180	1,800	....	....	83,152
Del Norte, . . .	....	2,388	23	....	....	2,400
El Dorado, . . .	17,333	171,304	1,791	....	....	172,271
Fresno, ...	14,432	3,373	5,717	486,724	....	68,274
Humboldt, ...	10	35,289	278	....	....	35,439
Imperial & San Diego,	44,835	87,341	439	....	....	87,578
Inyo, ...	52,963	408,509	239,982	58,047	2,866,894	671,614
Kern, ...	197,550	619,974	64,891	....	569	655,040
Madera, ...	2,369	10,076	3,426	298,898	....	49,886
Mariposa, ...	42,703	317,580	4,377	....	....	319,944
Merced & Stanislaus,	....	214,187	1,119	....	....	214,791
Modoc, ...	774	5,438	139	....	....	5,513
Mono, ...	24,913	435,724	17,391	....	....	445,115
Monterey, San Luis Obispo, and Santa Cruz, ...	410	1,013	25	....	....	1,026
Nevada, ...	260,368	2,533,483	30,566	....	....	2,549,989
Placer, ...	15,633	257,191	2,143	....	....	258,348
Plumas, ...	41,681	187,207	1,923	....	1,114	188,294
Riverside, ...	557	5,585	52	....	....	5,613
Sacramento, . . .	150	1,396,874	8,530	....	....	1,401,480
San Bernardino, . .	7,102	55,093	18,822	5,992	1,545	66,086
Shasta, ...	696,333	1,533,728	1,201,676	40,397,284	196	7,313,097
Sierra, ...	28,461	312,035	2,463	....	....	313,365
Siskiyou, ...	13,331	437,376	4,299	....	....	439,698
Trinity, ...	7,925	500,851	3,629	....	....	502,811
Tuolumne, ...	197,737	615,626	10,655	....	....	621,380
Yuba, ...	293	3,204,273	9,948	....	....	3,209,645
Total, . . .	2,697,885	$19,715,440	1,840,085	48,700,756	2,870,977	$27,020,405

* Includes placer production.

Aluminum Production in 1910

Not over a generation ago aluminum was little more than a curiosity. It was worth $15 or more per pound, and its total production in the United States was less than a hundred pounds a year. A report on bauxite and aluminum for 1910, by W. C. Phalen, just published by the U. S. Geological Survey, shows a consumption in the United States in that year of 47,734,000 lb., valued at nearly $12,000,000. The price has thus dropped from $1 an ounce to about 23c. per lb. Mr. Phalen states that although aluminum has in recent years become most important, it is at present produced only from bauxite, a comparatively scarce mineral. He mentions a number of recently patented processes which show progress in the cheap extraction of the metal from the common sources of supply. As aluminum in its various forms, both pure and as an alloy, possesses many remarkable qualities, it may be welcomed as a coming metal of great utility. Should it become as abundant and cheap a metal as may reasonably be expected, the industry holds boundless possibilities. An alloy called duralumin contains 90 to 95% of aluminum, which at present prices would make it rather expensive, but it is claimed to have qualities as good as bessemer steel, although it is only about one-third as heavy as iron or brass. It possesses great hardness, even when annealed. Another alloy of aluminum and copper is said to be a good imitation of gold; it polishes readily and takes a high lustre and is well adapted to ornamental purposes. It is also highly resistant to chemical action and can be readily machined and rolled and drawn into wire. Aluminum may therefore have a wide future use, ranging from structural material to brooches and hatpins.

The growth of the aluminum industry in the United States in 1910 is shown in the following table:

PRODUCTION OF ALUMINUM IN THE UNITED STATES, 1883 TO 1910

Year.	Pounds.
1883	83
1885	283
1890	61,281
1895	920,000
1900	7,150,000
1905 (consumption)	11,347,000
1910 (consumption)	47,734,000

The industry in the United States is of equal importance with that in Europe. France, Switzerland, Germany, and Austria are the most important producing countries in Europe, though Great Britain is also an important producer.

Rocks as Reservoirs

The capacity of rocks to imbibe moisture varies with their physical structure. Most of the water in rocks occurs in pores and interstices, the larger part of the world's well water supply being derived from saturated porous beds, only a small part of it being obtained from caverns or large cavities. Practically all rocks, however compact they may appear to the eye, have interstices and small cavities in which water may be stored. The degree of porosity of rocks varies, being highest in open-textured sands, sandstones, gravels, and chalks, all of which have great capacity for imbibing water, and lowest in close-textured clays, slates, marbles, and granites, which have very small capacity for absorbing and transmitting water. Some rocks, however, such as granite, which in their original condition are almost impervious, become water-bearing through the development of fractures and crevices. The capacity of rocks for transmitting water is different from their capacity for imbibition. In certain fine-grained rocks the pore spaces are so small that they will not readily transmit water. Hence rocks like chalk or brick, which absorb water freely, transmit it slowly, whereas others with no greater total space transmit it readily. Sandstones, for instance, vary greatly in texture and consequently in their capacity for carrying water. (From report of United States Geological Survey.)

Cyanide Poisoning

The Mining Regulations Commission of the Transvaal has recommended the following measures to prevent cyanide poisoning and for treatment of men poisoned.

Preventive Measures.—(1) Provision of an adequate supply of wholesome drinking water about plants and assay offices, the same to be distinctly labeled 'Drinking Water'; (2) the replacement of strong cyanide solution used in the precipitation-boxes by water prévious to the zinc being handled; (3) the effective hooding of the dissolving bath in which the gold precipitate is treated, and the use of some form of mechanical agitator in order to eliminate the necessity of raising the hood.

Treatment.—It is recommended that boxes labeled 'Antidote for Cyanide,' with directions for use affixed to the lids of the boxes, should be kept in prominent and easily accessible parts of the cyanide plants. Each box should contain: A spoon and a metal receptacle to hold about 1 pint; one blue hermetically sealed vial containing 30 c.c. of 33% solution of ferrous sulphate; a white vial containing 30 c.c. of caustic potash, and one package of oxide of magnesium (light). The directions for the use of the antidote should be as follows:

1. Preparation of antidote. Quickly empty the contents of the blue vial, of the white vial, and of the magnesia package into the metal receptacle, and stir well with the spoon. This should be done as rapidly as possible, as the patient's chance of life depends on promptness.

2. Administration of the antidote. If the patient is conscious, make him swallow the mixture at once, and lie down for a few minutes. If the patient is not conscious, place him on his back and pour the mixture down his throat in small quantities, if necessary pinching his nose in order to make him swallow.

3. Incite vomiting. After the antidote has been given, try to make the patient vomit by tickling the back of his throat with a feather or with the finger, or give a tumblerful of warm water and mustard.

It must always be kept in mind that promptness of action is the first essential, as the poison acts quickly.

ELECTRIC FURNACES are furnaces in which the necessary heat or degree of temperature is produced or attained by means of electrical energy. The electric current is used in these furnaces solely for its heating or thermal effect, and either alternating or direct current may be used, but alternating is preferred because of its easier generation and management, capability of being procured from transformers, and absence of electrolytic effects. Electric furnaces render remarkable and highly valuable service to the chemist and metallurgist, for two distinct and unique capabilities; they can generate heat within themselves without the use of combustion and the consequent products of combustion to complicate the working of the furnace, and they can, besides, if desirable, produce temperatures absolutely unapproachable in furnaces using fuel, and thereby enable the carrying out of operations only possible at these extremely high temperatures. The upper limit of electric furnace temperature is simply the volatilizing point of carbon, the temperature at which the material of which the lining of the furnace is made, is boiled away. This is about 3700° C. or 6700° F. The simple statement that this is three times as high as the melting point of cast iron may give some notion of the enormous temperature possible. Besides high temperature, the efficiency of application of electrical heat to the useful purpose is usually high: in many cases 50 to 75% of all the heat developed can be usefully applied, as against 5 to 50% utilized in fuel-fired furnaces. The heating value or thermal equivalent of the electric current is perfectly definitely known; one kilowatt-hour will furnish 860 calories (3400 B.t.u.), which if applied usefully at 100% efficiency would bring to boiling and convert to steam 1.35 kg. (3 lb.) of water, or bring to melting and melt about 3 kg. (7.5 lb.) of cast iron, or 2.5 kg. (5.5 lb.) of steel.

August Production of the Goldfield Consolidated Mines Company

According to the report of J. F. Thorn, general superintendent, the total production of the Goldfield Consolidated during the month of August was 30,580 tons, containing $910,477, or an average of $29.77 per ton, of which 30,508 tons was milled with an average extraction of 94.75%, and 72 tons was shipped, of an average value of $65.21 per ton, the net recovery from all ore being $28.21 per ton. The total net profit to the company was $634,658, or $20.75 per ton. During the month 3744 feet of development work was performed. The total cost of mining, development, transportation, milling, office and general expense was $7.53 per ton, distributed as follows:

Mining:		
Development	$0.87	
Stoping	2.29	
		$3.16
Transportation		0.09
Milling		2.12
Marketing		1.03
General expenses		0.70
Bullion tax		0.36
Marketing ore shipped		0.03
Construction		0.04
Total cost of operation		$7.53
Miscellaneous earnings		0.07
Net cost per ton		$7.46

The 466 intermediate, between the 750 and 600-ft. levels and just south of the 428 stope, in the Clermont, has been extended 40 ft., and produced 265 tons of $20 ore. The 401-ft. raise between the 401 and 428 stopes, produced 54 tons of $150 ore. This raise is now 25 ft. above the back of the 401 stope, and is still in good ore. The 413 intermediate sill-floor has been considerably extended and has produced 1085 tons of ore, worth $45 per ton. The 706 intermediate, below the 1000-ft. level, is now in 4 ft. of $40 ore.

The 305-B cross-cut, about 100 ft. north of the main cross-cut from the shaft in the Red Top, produced 467 tons of $20 ore. Although not of a very high grade, this promises to be an important stope. Cross-cuts into the hanging wall of the 305-I stope exposed 6 ft. of $40 ore, which seems to extend the full length of the stope and should produce a large tonnage.

A new level is being driven at 150 ft. from the collar of the shaft in the Mohawk, to connect with some very good ore that has recently been discovered at about that depth, also to connect with the top of the big 111 stope. The 354 sill produced 380 tons of $15 ore. A new stope (300-X) has been opened up about 300 ft. north of the shaft, and produced 305 tons of $40 ore. The intermediate drift 80 ft. below the third level and south of the 354 stope, has produced 800 tons of $28 ore. The face is still in ore, and the walls are not exposed.

At the Laguna the Hazel shaft, which is 150 ft. deeper and about 400 ft. northeast of the Laguna, is being unwatered and will be connected with the Laguna workings, giving a level 150 ft. deeper than the present working-level.

The company is now engaged in constructing a plant to treat both the accumulated and current residue from the present concentrate-treatment process. Two Edwards duplex roasting furnaces, with 112 by 13-ft. available hearth-area, one Baker cooler, one 5 by 18-ft. tube-mill, together with the necessary bin room and conveying apparatus, will be contained in a steel building to be erected for the purpose. The additional tanks for collecting the roasted product and agitating in cyanide solution will be contained in an extension to the present plant. The gases from the roasters will pass through settling-chambers to a stack, situated high enough above the mill to avoid the effects of the fume. Tests show that 90% of the content of the residue can be recovered, with an annual saving of at least $80,000. The plant will cost approximately $70,000 and will be in operation by January 15, 1912.

American Institute of Mining Engineers

The A. I. M. E. excursion will leave Chicago for the Pacific Coast today, and meetings will be held in Los Angeles next week, followed by sessions in San Francisco the week after. The program so far as arranged is as follows:

EXCURSION TO SAN FRANCISCO

Saturday,	Sept. 30,	Lv. Chicago	8:00 p.m.	via A. T. & S. F. R. R.
Sunday,	Oct. 1,	Arr. Kansas City	8:50 a.m.	
		Lv. Kansas City	9:10 a.m.	
		Arr. La Junta	10:40 p.m.	
		Lv. La Junta	10:55 p.m.	
Tuesday,	Oct. 3,	Arr. Grand Canyon	8:30 a.m.	
Wednesday,	Oct. 4,	Lv. Grand Canyon	7:30 p.m.	
Thursday,	Oct. 5,	Arr. Los Angeles	2:30 p.m.	
		Dinner to visitors and guests, tendered by local committee.		
Friday,	Oct. 6,	A trip to the beaches.		
Saturday,	Oct. 7,	Automobile ride around Los Angeles and to Pasadena.		
Sunday,	Oct. 8,	Lv. Los Angeles	3:00 a.m.	via Sou. Pac. R. R.
		Arr. Santa Barbara	7:00 a.m.	
		Lv. Santa Barbara	11:00 p.m.	
Monday,	Oct. 9,	Arr. Del Monte	8:00 a.m.	
Tuesday,	Oct. 10,	Lv. Del Monte	4:00 a.m.	
		Arr. San Francisco	7:00 a.m.	

ALTERNATIVE

Saturday,	Oct. 7,	Lv. Los Angeles	9:20 p.m.	via Sou. Pac. R. R.
Sunday,	Oct. 8,	Arr. Bakersfield	7:10 a.m.	
Monday,	Oct. 9,	Lv. Bakersfield	9:00 p.m.	
Tuesday,	Oct. 10,	Arr. San Francisco	7:50 a.m.	

SAN FRANCISCO HEADQUARTERS, ST. FRANCIS HOTEL

Tuesday,	Oct. 10,	Afternoon: Opening session.
Wednesday,	Oct. 11,	Morning: Session.
		Afternoon: Leave by special train, Third and Townsend station, Southern Pacific, 2 p.m., for visit to Stanford University, returning to City by 6 p.m.
Thursday,	Oct. 12,	Morning: Session.
		Afternoon: Visit to University of California and other points of local interest.
Friday,	Oct. 13,	Morning: Leave for Folsom and Natoma to visit gold dredges. Luncheon at Natoma. Return to the City in time for dinner.
Saturday,	Oct. 14,	Morning: Military parade, San Francisco.
		Afternoon: Exercises at Golden Gate Park incident to beginning work on the Panama Pacific Exposition. Address by the President, W. H. Taft, the Governor, Hiram Johnson, and others.
		Evening: Street carnival, San Francisco.
Sunday,	Oct. 15,	Morning: Leave by special train from Ferry station for Bohemian Grove. Luncheon at Grove followed by concert. Return to City in time for late dinner.

EXCURSIONS FOLLOWING THE MEETING

Tuesday,	Oct. 17,	Japan excursion. Leave San Francisco, steamer *Manchuria*, 1 p.m.

Members Going East

		Lv. San Francisco (Via S. P. R. R.)	10:40 a.m.
Wednesday,	Oct. 18,	Lv. Ogden (Via U. P. R. R.)	2:30 p.m.
Thursday,	Oct. 19,	Lv. Omaha (Via C. M. & St. P. R. R.)	11:30 p.m.
Friday,	Oct. 20,	Arr. Chicago (Via C. M. & St. P. R. R.)	1:00 p.m.

During the time of the San Francisco meeting, October 10 to 17, the arrangements for the reception and transportation will be in charge of the local committee, and further details will be published later. Final plans will be perfected at the committee meeting today. Evening sessions at San Francisco will be arranged if desired.

Discussion

Readers of the Mining and Scientific Press are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Battery Foundations

The Editor:

Sir—Referring to the discussion during last July in your columns on 'Concrete Mortar Blocks,' J. B. Fleming states, in reference to the battered form of block with anchor bolts set at an angle, installed by him in the mill of the Goldfield Consolidated mine, that to the best of his knowledge this is the first installation of this design of mortar block. I beg to call to his attention that there was published in the *Mining and Scientific Press* of May 11, 1907, a description of this mortar block, designed and installed in the Kuk San Dong mill of the Oriental Consolidated Mining Co. in 1905, by Charles D. Kaeding. I have been informed on excellent authority that the designers of the Goldfield Consolidated mill were aware of this at the time their plant was designed.

Henry B. Kaeding.

Siempre Viva Mines, Nicaragua, September 1.

Duty of Grinding-Pans

The Editor:

Sir—The enquiry of 'Kalgoorlieite' as to the duty of Wheeler pans, has remained long unanswered. He will find exhaustive data on the subject in R. Allen's 'West Australian Metallurgical Practice,' together with screening analyses with various feeds. In brief, the average duty of a 5-ft. pan is about 20 tons per day as a stage-grinder, or about 8 to 10 tons per day as a slimer. The power consumption averages 6 horse-power.

'Kalgoorlieite' is evidently surprised at the diversity of opinion existing in Mexico with regard to the efficiency of the grinding-pan, a diversity that needs some explanation in view of the fact that, at Kalgoorlie, pans are in general use and are considered thoroughly efficient machines. 'Kalgoorlieite' has my sympathy if he has been endeavoring to defend, in Mexico, the practice of pan-grinding, since he will never convince the majority. The main reason for this is that metallurgists in Mexico have nothing to learn with regard to tube-mill practice. The second reason is that pans have never had a fair chance there. The Wheeler pan, as used at Kalgoorlie, is practically unknown in Mexico. In its place is the standard amalgamating and grinding pan. The latter was in general use for intermittent charge-grinding in amalgamating plants before the cyaniding of silver ores was practised. In several cases it was adopted as a re-grinder, preparatory to cyaniding; but failure invariably resulted. Personally, I have done everything in an endeavor to coax even a moderate duty out of this type of pan, but all to no purpose. The general design was hopeless, the grinding surface was insufficient, the 'spider' taking up most of the room; the shoes and dies were much too light, and there was no satisfactory method of compensating for the loss of weight due to wear. The power consumption was in excess of that needed for an efficient pan of the same size, but the maximum output I could get on ordinary quartz ore and with the pan fitted with new shoes and dies and a Wheeler discharge was about 3 tons slimed per 24 hours, from 20-mesh.

The conversion of this type of pan into an efficient machine meant a complete renewal of everything, with the exception of the shell and gears, and, although I thought otherwise at first, I soon came to the conclusion that investment in tube-mills, and the scrapping of the pans, was the best course to pursue. To judge from the number of these machines that one sees on junk piles in northern Mexico, I was not alone in my experience or conclusions, and I gather that this is one of the reasons why grinding-pans are not in favor in Mexico.

A. W. Allen.

London, September 11.

The Economic Value of the Mint and Assay Service to the Mining Industry

The Editor:

Sir—Persistent rumors to the effect that the present administration contemplated surrendering the functions of its assay offices and refineries to private interests were silenced by the Director of the Mint, George E. Roberts, who, during his recent visit to the San Francisco institution, declared that its doors would not close. He informed the press that the reasons for the reduction of its force of employees from nearly 350 to 130 were the discontinuance of the coinage of Philippine silver pesos and United States gold pieces, also the installation of labor-saving machinery and other economies.

In 1902 the Director recommended in his annual report that the Government could save the wages of many employees, the cost of operating, wastage, and abrasion losses by discontinuing the coinage of gold. Over half a billion dollars in gold coin was then stored in the vaults of the Treasury Department, against which gold certificates had been issued. The banking interests had complained to him of their losses due to abrasion, and demanded bars instead of coin for foreign export. The wastefulness of coining eagles to ship to England, where they would only be melted and stamped as British sovereigns, was obvious to Mr. Roberts. Fortunately for a few hundred faithful employees, the good work of the coin-factories continued, as the pace-makers raced for records. In 1904, the banner year, the grand total amounted to $228,202,151 in gold and silver, and ₱12,552,629 for the Philippine Government.

A billion dollars in gold coin had accumulated in the vaults of the treasury in 1910, and this vast hoard of minted metal was deemed by Mr. Roberts in his last report to be a reserve sufficient for all practical purposes. In acordance with his ideas, Congress passed a bill authorizing the issuance of certificates against gold bullion received by the mints of the United States and stamped with its weight, fineness, and value. It was signed by President Taft on March 2, 1911. In August, the electrolytic refinery of the San Francisco mint began producing fine gold in the form of bright, glossy bars, 7 in. long, $3\frac{1}{2}$ in. wide, and $1\frac{1}{2}$ in. thick, weighing about 26 lb., and worth, upon an average, $7000. Upon their computed value certificates will be issued by the Treasury Department. The cessation of the coinage of gold was an undisputed economy, but the shake-up in the mint service which followed caused the spread of rumors, intimating that, in the interest of further retrenchment, the Government would turn over the refining of its bullion to private enterprise. But the Secretary of the Treasury has emphatically denied that the administration has now any intention of permitting this necessary public service to become a monopoly in the hands of the smelting trust.

Back of these smoke-clouds were the fires of the smelters, which long have burned with an eager desire to monopolize the refining of $150,000,000 or more which the mints annually receive. It is only natural that private interests should covet this prize, and that they should spare no effort to secure the 'rake-off' they would win from its refining. At the present time, approximately half of the bullion which the Government ultimately purchases is refined at private smelting and reduction plants, whose management is reaching out for the entire production of the precious metals produced in this country or tributary to it. If it were possible for certain influential financial organizations to induce the Government to abandon its refining-plants in the interest of a theoretical economy, they would probably not hesitate to eliminate Federal competition by resorting to short-cut methods peculiar to lobbyists. How an executive order or a legislative act that would put these institutions out of commission would 'help business." But, as this course is now neither feasible nor expedient, an attempt may yet be made to corner the gold and silver output of the country by cutting rates below the cost of refining. The adoption of Standard Oil tactics to cut throat competition, may only be successful if the mining operators can be cajoled to play into the hands of the precious metal monopoly as did the independent oil producers of unhappy memory. Any temporary losses which the trust might sustain while throttling competition would soon be recouped when it could purchase bullion upon its own terms and at its own assay value. Therefore, the private refiners regard the present scope of the mint service as a Socialistic intrusion upon their own field.

If the only function of the Government were merely to coin metal according to the demand, its usefulness would be much more limited. Its officials would only be concerned in receiving bullion of sufficient fineness to permit it being alloyed with copper and stamped with the face of Liberty. And now that the coinage of gold is suspended indefinitely while bars of fine metal are being manufactured instead, the interested smelters would fain be public-spirited enough to relieve the Government of the expense of refining its treasure. Such a situation would be ideal from the standpoint of the private companies, if the Treasury would purchase their fine bars at par, asking no such foolish questions as, "Where did you get it, gentlemen?"

For many years our Government has taken a paternal and fostering interest in the welfare of the mining and metallurgical industry. Its policy has ever been to protect the producers of the precious metals from the extortions of rapacious bullion-buyers. For this very reason the Government has established from time to time, assay offices at convenient centres where depositors, great and small, could depend on equal consideration and purely disinterested service. As the Government does not engage in the business of purchasing bullion for profit, the spirit and practice of this department is the refinement of the principle of the 'square deal.'

Just as the postage rates are fixed at their present low prices, so are the mint charges for melting, refining, and assaying (at the minor offices). Every endeavor is made to keep these costs at the lowest possible level. The Government has installed electrolytic refineries at Philadelphia, Denver, San Francisco, and New York during the past few years. These plants permit operating on much larger amounts of bullion than could be treated by the old-fashioned acid-parting processes. An additional advantage which the Government enjoys is its freedom from interest charges on the gold and silver undergoing refining operations. The private institutions, on the other hand, have to reckon on interest as a serious factor, which, in the end, is transferred to the producer's shoulders. In order to get business, the private purchaser must make some showing that will convince his customer that it is to his interest to patronize the private refiner. Frequently a higher assay report than the Government's certificate is the proper bait. This comes high, but they have to use it to land their prize. Of course, the producer has to pay for this artificial fly so skilfully cast. Usually the difference is made up by a heavier melting loss, or a 'revision upward' next time. The Government always credits the depositor with the metallic grains recovered from the slag, which often affords him quite an unusual advantage. No possible incentive for manipulating melting losses for profit can exist in the Federal service, where every effort is made to reduce such wastage to a minimum.

Whether the mint or the private refineries pay the best prices for various grades of bullion has long been an open question. Throughout the mineral districts one may hear many conflicting reports. Refractory gold and silver ores, mattes, concentrates, cyanide precipitates, and other metallurgical products in crude and bulky condition, must obviously be shipped to the smelters and reduction plants. From these sources are derived the bulk of the bullion which ultimately comes to the mint in the form of refined bars. The Government gives private enterprise a clear field in which to operate, as thus far it does not engage in industrial smelting operations. It even encourages this legitimate business by exempting bullion over 992 fineness.

The case is different with bullion in the form of crude gold or silver bars, dust, amalgam, jewelry, and plate. The mints have established brisk and healthy competition for metal in these conditions. A melting charge of $1 is imposed upon each 1000 oz. of bullion, or fraction thereof. Tariffs varying from ½c. an ounce on alloys of one precious metal with copper, to 1c. an ounce on bullion containing from 500 to 950 parts gold are collected to pay the cost of refining. During the fiscal year ended June 30, 1910, the mints and assay offices received a total of approximately $128,600,000 in gold and silver from all sources, foreign and domestic. The charges collected for parting amounted to but $242,249. The average cost to the depositor was less than one-fifth of a cent on the dollar. To what limit this infinitesimal figure might have been swelled if the producers of the Nation's wealth had been turned over to the tender mercy of a monopoly, it is difficult to conjecture. In some districts miners are stampeded to desert the Government by following the example of some big company, which may occasionally profit by a sliding scale of smelting charges, or the actual receipt of rebates. For example, in a region which produces $5,000,000 annually in gold and silver from a hundred mines and prospects, an influential company may obtain a wholesale rate on its output of a million dollars. Any child who has mastered the principle of discount will realize that the small producers ultimately pay for such rebates. If the remaining $4,000,000 can be brought to the smelter by the advertising effect of such an example, it is safe to bet that the small fry will be dealt with according to their apparent degree of business sagacity. In many instances good and discriminating judgment is displayed by mining men who send their bars recovered from free-milling ores and cyanide precipitate to the mint, while their more base and refractory products are shipped to the smelter. It is in the latter capacity that private enterprise performs its most useful service.

In many respects the mint and assay service is analogous in its usefulness to the postal department. It assays and refines bullion at a minimum cost, and provides a varied circulating medium according to the demands of the financial interests. In like manner does the postoffice extend its service to include savings banks, and perhaps, in the near future, the parcels-post. All of these duties intrude upon the industrial domain of private enterprise, but the trend of modern thought is along the more progressive lines of public service. The San Francisco mint is an institution that has proved a valuable asset to local business interests. Since 1854, a fabulous sum has been put in circulation by this agency, which otherwise would have been diverted elsewhere. An average of half a million dollars annually has been expended for supplies and wages, which have stimulated the ordinary channels of trade, while many millions have been invested by depositors in real estate and the industrial enterprises of this city.

In the light of recent political and economic developments, it seems hardly advisable for certain private refining interests to attempt to oppose the Government. Popular sentiment throughout the mining West would prompt progressive leaders to take radical action of a retaliatory nature. The question of the giving of rebates on refining rates might lead to some sensational disclosures. Those timid folk who still feel that the Government would come out second best in a tussle with a certain trust, may be cheered with the knowledge of a big stick in the hands of the chiefs of the Treasury Department. That beneficent bludgeon has the power of arbitrarily imposing a parting charge on bullion of less than 999 fine sufficiently high to take all the profits out of the refining of the same. This right of the Government may never be invoked, but should an emergency justify recourse to it this big stick of the Treasury could humble in a moment the most arrogant monopoly that ever raised its Hydra head.

HAROLD FRENCH.

San Francisco, September 16.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

AN ACID-PROOF INK which can be used with a drawing pen on zinc is made of 1 dram verdigris, 1 dram sal-ammoniac powder, and 72 drams lampblack, mixed with 10 drams water.

AN EXCELLENT cement for cloth or leather is made by melting together and mixing well the following ingredients in the proportion indicated: 16 gutta-percha and 4 india rubber, cut small; 2 pitch; 1 shellac; 2 linseed oil.

TO THOROUGHLY penetrate timber, designed for mines or other purposes, with creosote, the bark should be carefully and absolutely removed. A thin sheet of bark fibre will completely prevent the entrance of the creosote.

TO FIND the thickness of lead pipe required when the head of water is given, multiply the head in feet by size of pipe wanted, expressed decimally and divide by 750. The quotient will give thickness required in hundredths of an inch.

TO CLEAN scale from gray iron castings, pickle by immersing in water containing 1% of sulphuric acid, and let stand from two to three hours. Rinse in cold water and scour with sharp sand and a fibre brush, or with a coarse rag and the sand.

BISMUTH is not commonly found occurring in the native state, but sometimes the brittle silver-white mineral with a reddish tinge is found disseminated through the gangue in branching lines, or in grains and lumps. The most famous locality for native bismuth is Schneeberg, in Saxony.

JADE, or nephrite, was formerly supposed to be a cure for kidney diseases, both its names having that meaning. It is highly esteemed in China and India, where it is carved into ornaments and other objects of art. The bright green variety, called *fei-ts'ui*, and the grayish white are most highly esteemed.

A VERY hard putty is made by mixing a handful of burned lime with 120 grams of linseed oil, boiling it to the usual consistence of putty and allowing the plastic mass to spread out in a thin layer and dry in a place where it is not reached by the sun's rays. When required for use it is made plastic by holding over a lamp; on cooling it regains its previous hardness.

IN PREPARING bluestone for steel a few drops of muriatic acid will make the solution adhere to oily metal, and it can be used immediately without waiting for it to dry. Coat the piece to be coppered and wipe off the remaining moisture. To coat brass or bronze with this solution dampen a bit of waste, and dip it in cast-iron dust, then apply it to the pieces to be coated. This gives a fine coppered surface and any lines will show very plainly.

TEMPERING of copper is popularly supposed to be 'one of the lost arts,' but as a matter of fact is one that was never possessed to any higher degree than at present. It is safe to say that copper has never been tempered at any time by anyone, as it does not possess the necessary properties. Copper can be hardened in a number of ways; the easiest being to plunge the finished article into molten antimony or arsenic; the resulting alloy formed on the surface is exceedingly hard and brittle. Recent research in Mexico has shown that the tools there supposed to be made of hard copper were made by smelting mixed ores of copper, nickel, and cobalt; the resulting alloy, something like monel metal, was naturally hard. None of these old tools are of a quality equal to those which can now be made.

GOLD is sometimes very fine and is difficult to save by hydraulic methods. Many years ago a clean-up of an undercurrent of the Spring Valley Co. at Cherokee in Butte county, California, yielded $2600; this gold had been saved from material which had run through 2½ miles of sluices and over 19 undercurrents before being caught in the twentieth. Even then Chinese were at work upon the tailing.

CUPELS are ordinarily made of sieved bone-ash purchased from supply houses. The quality of this can usually be depended upon, but sometimes it may be too fine or too coarse, giving cupels that are likely to crack, in the first case, or too porous in the second. This may be remedied by mixing fine and coarse together, or by decreasing the pressure when working with fine material and increasing it for coarse. For ordinary work it is not necessary to mix any binder with the bone-ash, though any mucilaginous substance will make a stronger cupel. When such binders are used the cupel should be left in the muffle long enough to burn them off completely before adding the lead button, so the escaping gases will not interfere with the cupellation.

STEAM-SHOVEL records are of perennial interest, and those made on the Panama Canal are watched closely by engineers. The monthly record is now held by No. 257, which is a Marion, Model 91, working on railroad relocation work at Gatun. It worked in rock, with high bank, short cuts, and handled huge rocks that had to be loaded on 10-yard cars. There were many delays for backing and drilling, and in considering Panama records the eight-hour day and numerous holidays must be taken into account. The yardage handled by this shovel from February to July, inclusive, was as below, from car records:

February	60,210	May	72,060
March	69,600	June	65,310
April	61,100	July	60,310

This gives an average of 64,765 cu. yd. per month. From bank measurements the record figures a little less, 62,864 cu. yd., in itself sufficiently remarkable.

LINSEED OIL is generally regarded as the standard oil for mixing paint, but, owing to its high cost many other substitutes are used; in certain cases, indeed, other oils give better results. The essential characteristics of a paint oil are that it should mix well with the solid constituents of the paint, giving a mixture that works freely under the brush, and after being applied dries quickly to the proper degree. If it does not dry thoroughly it will be sticky and collect dust; if it dries too hard it will be inelastic and likely to crack. Only the drying oils can be used in paint, that is, oils which when exposed to the air become converted into hard inelastic substance. This is due to oxidation, which may be hastened by the use of japan and driers. Japan, a name now used for a variety of substances, meant originally a varnish which hastened the drying of the oil with which it was mixed. Driers are oxidizing substances, commonly oxides of manganese, and are commonly used by boiling with a small quantity of the oil, then adding to the total mass. A marked effect is thus produced by a small quantity, just as a little sour milk added to a large quantity will quickly sour the whole. Tung oil, made in China from the nuts of the tung tree, is highly regarded as a paint material, and fish oil, which is much cheaper than either of these, is much used for outside work, but must be thoroughly mixed with the proper dryer in order to secure proper hardening. The various animal oils do not dry quickly and should be used with caution when mixed with other oil. Bean oil, made from the soy bean of Manchuria, has recently attracted much attention, but its properties as a paint oil are not yet thoroughly tested. Whenever a painting job of any size is to be undertaken a careful study of the conditions to be met will often enable the work to be done at a much lower cost, and with much better results than if it is simply turned over to the local painter.

Special Correspondence

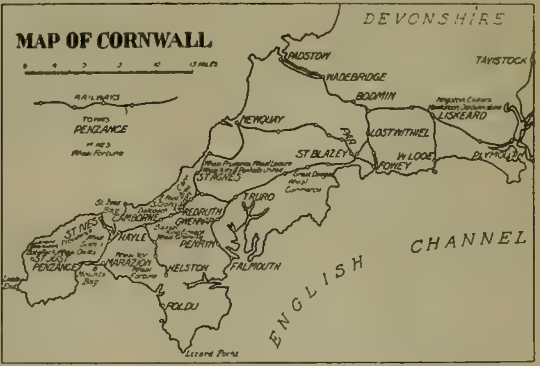
LONDON

East Rand Proprietary's Metallurgical Troubles — Miscalculations at Prestea Block A — Edward S. King's Reforms at Carn Brea & Tincroft

The London share market this week received a rude shock by the publication of a statement by the East Rand Proprietary to the effect that owing to unaccountable losses of gold in the extraction plant the profits would be less than estimated and the dividend reduced. A mistake in the methods of metallurgy on the Rand was unthinkable, and all sorts of wild guesses were made by shareholders and others. The announcement was not at all clear. It stated that for some time past there had been a serious shortage of gold from the cyanide works, as compared with the quantity called for by the assay calculations. By careful check it was found that sufficient gold had gone into the plant to provide the expected yield, and the managers clung to the hope that it would be found somewhere eventually. As time passed and the phenomenon continued, W. A. Caldecott, of the Consolidated Gold Fields, was asked to examine into the matter. In the latest report issued by the company it was announced that the yield for August was 51,093 oz. obtained from 197,333 tons, as compared with 60,000 oz. in July. Part of the decrease is explained by the absorption of gold in the reconditioning of the cyanide plant. If an improvement is not made shortly the profits will be seriously curtailed, and to a much greater extent than was expected when it was announced that the dividend for 1911 would only be 30 instead of 40%. The actual cause of this contretemps is not divulged by the managers, and some critics allege that the fault is in the mine and not in the mill. Such pessimists have some reason for this view, because on several occasions before ugly circumstantial reports had been in circulation, and had forced the board to make re-estimates of the reserve. Those intimate with metallurgical practice on the Rand are, however, inclined to think that it is the cyanide extraction that is at fault, and they point to the fact that this plant has been overworked. The whole of the stamps and tube-mills have been at work, though the full complement of cyanide vats has not yet been erected. It is their opinion, therefore, that gold has been re-deposited and lost. Whether the exact cause will ever be published is doubtful. For the benefit of American readers I ought to say that the East Rand Proprietary is a gigantic consolidation, effected in 1908, of properties belonging to the Farrar group. The producing mines at the time were the Driefontein, Angelo, Comet, and Cason. The capital is £2,500,000, and the capacity 200,000 tons per month. A few months ago Sir George Farrar announced that over 10,000,000 tons of ore averaging $6\frac{2}{3}$ dwt. per ton was ready for stoping; and judging by the area of the property the eventual life should be 30 to 40 years. It is legitimate to estimate the probable life in this way, for the work in the Cinderella, on the dip, is proving immense bodies of ore.

I wrote a few weeks ago about the Prestea Block A mine in West Africa, and announced that some of the stamps had resumed work, after the operation had been centred for a year or more on development. Now comes a remarkable announcement to the effect that the full battery of 110 stamps cannot be employed for over a year, because the capacity of the shafts is not equal to the demands of the mill. It had been estimated that by May of this year the output would be 30,000 tons per month, and it is a shock to find that somebody has made miscalculation. The directors state that only 15,000 tons can be raised per month, and that the higher figure cannot be reached until August of next year, when one of the new inclined shafts will be completed and equipped. Shareholders are quite mystified at this state of things, and wonder whether the former engineer in charge, or the new one, is at fault. The company was formed in 1903 to acquire from the Prestea Mines, Ltd., and the Appantoo Mines, Ltd., portions of the Essaman and Intermediate concessions, in the Prestea district near the Ancobra river, Gold Coast Colony. An additional block has since been acquired from the Appantoo Mines, Ltd., a total of 170 Rand claims.

In a recent letter I referred to the present position of the Carn Brea & Tincroft company, operating tin mines in Cornwall, and recorded that Edward S. King, late of Kalgoorlie, had been appointed manager, mentioning that this was one of the most important events in connection with Cornish mining that had happened for some years. A fortnight ago I outlined the results of the half year's work ended June 30. Mr. King faced the shareholders last week for the first time. Though an up-to-date and live manager, he is not an orator, and as he had not prepared a written speech, as most mining men find it safest to do, his impromptu remarks could hardly be described as fluent. But what he lacked in style of utterance was attoned for by the excellent common sense displayed. He had to criticize severely the old *laissez faire* method of mine management common in Cornwall, but was so pleasant about it that those who might have taken umbrage joined in his enthusiasm. I will quote the main points of his speech. He first described recent developments at the North and South Tincroft and was able to say that the ore reserves were sufficient to last for two and a half years. It is seldom or never that a Cornish manager will make an estimate of his reserves, and in fact Mr. King was only forestalled by a few weeks by Mr. Paull, of South Crofty, in a modern pronouncement on this subject. He then went on to say that this amount of work done per man was very small compared with that done in other parts of the world, and laid the blame on the unfair method hitherto in vogue of cutting down prices given to competent men when renewing contracts, and of increasing the price of men whose results were supposed not to give them a fair living. ("This system has made lazy men of we.") Another point upon which he laid stress was the absence hitherto of any adequate assay of the ore, concentrate, and tailing, and he condemned the old vanning-shovel assay to the limbo of forgetfulness. As regards the Cornish stamps, he found that their duty was only 13 cwt. per day per head, and that they were of the ancient type that had no anvil. He immediately placed granite blocks below and mounted iron 'bottoms' upon them, and the duty rose to 1 ton per day. Another serious question to be tackled was the scattered power-houses; at present there are five pumping shafts and eight hoisting shafts, the power for which is all independently generated. Such a system is hopeless in a property raising only 80,000 tons per annum. But perhaps his most scathing criticism was reserved for the Cornish system of keeping, or rather not keeping, accounts. Nobody can tell the cost of any individual item, such as development, power, roasting, or concentrating. The accounts are not analyzed and costs segregated. This is a point on which Mr. King properly insists, so that he can put his finger on the weak points. Mr. King is enthusiastic and is confident of eventual success even with the old rattle-traps of plant at his command. But he has a hard row to hoe, and the rehabilitation of this company will be more to his credit than he thinks. It is opportune to say that Mr. King is the first



outsider of high rank that has been appointed to the management of a Cornish mine and given a free hand. The other firms who have introduced London capital into Cornwall of recent years have appointed resident Cornishmen as managers. It is true that in one or two cases mining engineers of distinction have reopened old mines or have attempted to do so, but they have either been short of funds or have not been able to give personal attention to the work, so that their case is not quite the same.

KALGOORLIE, WESTERN AUSTRALIA

Ivanhoe East Lode Found in Great Boulder Territory.—Purchase of Transvaal Mine.—Miners' Phthisis Question.—Annual Report of Mines Department.—Production for July.

During the month a fine development was recorded by the Great Boulder company, in that the diamond-drill cut the Ivanhoe East Lode on the west boundary at a depth of 1480 ft., 1170 ft. north of the main shaft. The lode is 22 ft. wide, worth $40 per ton, and 6 ft. of it is in the Ivanhoe and 16 ft. in Boulder ground. The drill also cut the lode 5 ft. to the east of the west boundary at a depth of 1480 ft., 1250 ft. north of the main shaft. Here it is 15 ft. wide, assaying $46 per ton. This lode has been worked by the Boulder company through the Hamilton shaft on the north, where it was from 5 to 14 ft. wide, worth $14 per ton. A cross-cut is being driven toward the lode where cut. This development is important for both mines, and shows that an active exploratory campaign is being carried out.

The Oroya Exploration company has decided to close the option on the Transvaal mine near Southern Cross for $48,000 cash and an interest in any new company formed. The Oroya has been many months opening up the mine, and experimenting with the treatment of the ore, which is heavily mineralized with arsenical pyrite, and also some graphite. The solution of this problem will be awaited with interest by many, as its complex nature is known. It is rumored that oil flotation may be tried.

The annual report of the Mines Department, just issued, contains little that is fresh. Tin (black) to the amount of 471 tons worth $214,000 was produced; a decrease on the previous year; 34,369 tons of copper ore valued at $808,000; 262,166 tons of coal was raised, the output per man being 503 tons. There were 34 State mills at work, and 24 cyanide plants, also several slime-plants, and 2 tin-dressing plants. To date the mills have treated 784,407 tons of gold ore, yielding $17,800,000; and 45,492 tons of tin ore, yielding $320,000.

Yield of Principal Mines During July

Name.	Tonnage.	Value.	Profit.
Associated	10,506	$80,200	$12,000
Associated Northern Blocks	1,631	27,500	......
Chaffers	2,740	19,500	4,500†
Golden Horse-Shoe	24,067	162,500	760
Golden Ridge	2,912	32,200	14,000
Great Boulder Perseverance	20,630	151,000	39,400
Great Boulder Proprietary	18,557	240,100	124,500
Great Fingall	10,729	95,500	23,800
Hainault	5,153	34,100	900
Ivanhoe	20,706	201,000	90,000
Kalgurli	10,985	116,000	57,400
Lake View Consols	7,830*	9,600	3,500
Lake View & Star	13,417	82,500	8,700†
Oroya Black Range	4,630	47,400	13,500
Oroya Links	8,150	51,400	4,300
Sons of Gwalia	14,025	122,500	46,500
Sons of Gwalia South	2,331	17,700	5,000
South Kalgurli	9,566	57,800	7,000

The Government has appointed a commission of five on the miners' phthisis question. They are: (1) to investigate and consider the causes of pulmonary fibrosis and tuberculosis among miners; (2) to investigate and devise means whereby such causes may be removed or their defects minimized; (3) to recommend the form which legislation should take; (4) to consider and report upon the results likely to follow from such legislation as would effect, (a) the economic working of the mining industry; and (b) the conditions of living and means of livelihood of workmen engaged in mining; (5) to consider and make recommendations upon the steps to be taken to provide employment for men who may be compelled to give up mining work on account of pulmonary diseases, or provide other means for their maintenance, when partly or wholly incapacitated. The present commission is the result of Dr. Crumpston's recent report on the prevalence of fibrosis, etc., in miners and surface workers on the mines. It is quite likely that the commission may suggest legislation along the lines followed in New Zealand and South Africa in creating a fund for the maintenance of affected workers, by a Government subsidy and a certain sum contributed from the mines.

GLOBE, ARIZONA

Production at the Miami.—Mill Records.—Progress on the Inspiration and Live Oak.—Shipments to Smelters.

The Miami Copper Co. is mining and milling 1700 tons per day, of which 200 tons is from the dump, 600 tons from development, and 900 tons from mining operations. Three and one-half sections of the mill are in continuous operation and the other 2½ sections are being rushed to completion. In the half of the fourth section now in operation an 8-ft. Hardinge pebble mill is being used for the fine grinding instead of the Chilean mills used in the other sections. If experiments prove satisfactory the other 2½ sections will be equipped with Hardinge mills. The Burch rolls, which were formerly credited with a high repair cost, are now said to be working satisfactorily. The salient feature of a lateral movement to one roll has been retained, but the mechanical application of the motion has been changed and the speed reduced without lowering the capacity. The mill is reported to be making a 75% recovery and to be producing 75 tons per day of concentrate averaging 42% copper. The average monthly production of refined copper is 1,800,000 lb. The concentrate is shipped to Cananea, whence the blister copper is sent to the refinery at Raritan, New Jersey. Five hundred and ninety men are employed, 300 underground and 290 on the surface, of whom 90 are in or about the mill. The Nordberg machinery in the power-house is running smoothly and a 75-hp. electric hoist is about to be installed at No. 2 shaft to replace the steam-hoist now in commission. This shaft is used only for men and timber, the ore being extracted through No. 4 shaft.

At the Inspiration, development is at a standstill, all underground work and all churn-drilling having been discontinued for the present. A damsite for a pumping station has been selected at Wheatfields, twelve miles from the mine on Pinal creek. Thirty men are working on a road at that place and a corps of engineers is making a survey for a pipe-line from the site of the proposed pumping station to the mine. Preliminary surveys for a millsite are in progress near the mine, and the engineers of the Arizona Eastern railroad are surveying for the extension of their track up Bloody Tanks wash and Live Oak gulch to a point near the Inspiration ground. At the Live Oak, the cross-cut being driven at the orebody from No. 1 shaft is about 550 ft. from the shaft. Shaft No. 2 penetrated the orebody at a depth of 705 ft. and is now at about 706-ft. depth and progressing rapidly. Five Star churn-drills are in continuous operation near the western end of the property. The ore is unusually deep at this end, from 600 to 1000 ft. of capping having been penetrated before the ore was reached. Twenty tons per day of silicate copper ore is being shipped to the smelter at El Paso from the dumps at the old workings. It is the intention of the management to ship 1000 tons of this ore. There is evidence that indicates that negotiations are pending for a consolidation of

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*From old dumps. †Loss, due to capital expenditure in development and plant.

Live Oak with the Inspiration, but neither a confirmation nor a denial can be obtained. Such a merger would have many economical advantages.

The Keystone is operating a Star churn-drill on hole No. 36 about 500 ft. west of the shaft. The hole has passed through the granite porphyry and is now in the schist. Aside from this, there is no work going on at present, all underground development having been discontinued some time ago. Nothing can be learned as to the future intentions of the management.

SALT LAKE CITY, UTAH

Recent Developments at Park City. Progress at Cottonwood. Consolidations at Alta. Tintic News. Work at Bingham.

With few exceptions the mines of Park City have not shown much until depth was attained. The recent exception is the Barre-Coxe, which was organized only a few weeks ago. Its shaft has already cut two orebodies before reaching a depth of 50 ft. The shaft was sunk on a fissure, and ore has been found making into the bedded planes characteristic of a portion of the Park City district, where some of the greatest orebodies have been found. Two cars of ore have been taken out, assaying 30 to 42% lead, 20 to 38 oz. silver, and $1 to $2 gold. The management is preparing to drive an adit to intersect the fissure at greater depth, and explore the territory more economically than is possible with a shaft. The Silver King Coalition has practically completed the work of equipping the mine electrically, and will increase its output. For over a year the production has been about half normal, while the work of equipping the mine underground was in progress, but the management now says that during the next few months the shipments will be as large as ever. Several miles of 20 and 30-lb. rail have been laid, drifts have been straightened out and enlarged, the mine has been lighted with electricity, and other changes have been made toward the end of more economical and efficient operation. The Daly-Judge is making good progress with its development at depth since the drainage problem has been solved. If the stockholders of the Ontario and Daly companies ratify the proposed consolidation, it is expected that a more aggressive development campaign will follow at these properties. A number of the other Park City properties, old and young, are making encouraging progress, and the immediate future of the camp looks brighter than it has in several years. In the adjacent Cottonwood districts, the Utah Mines Coalition appears to have substantial claims to recognition as a mine, rather than a prospect. Last winter the property had a severe blow through a snowslide which did great damage to its surface improvements and caused loss of life. Within a short time after that, however, the operations began to show highly encouraging results, and now for several months the management has been blocking out orebodies and making shipments. Shipments are going on regularly, and arrangements are being made to continue them all winter. The Cardiff is another steady shipper, which has proved itself within the year. About 125 tons of high-grade ore per month is going from this property. Some of it is said to contain as high as 68.5% lead, 100 oz. silver, and 10% copper. The property has been explored to such an extent that the management has felt justified in driving a 2500-ft. adit, which is now in over 100 ft., to cut the veins at depth. A depth of 2000 ft. will be obtained in some portions of the ground. Drainage, as well as development of ore at depth are objects sought. Several other properties are reporting developments of more or less importance. On the Alta side several companies are preparing to consolidate to enable them to cope with water and pursue work to better advantage in other ways. Down in Beaver county, a new dividend-payer has appeared. This is the Moscow, which paid $8500 September 15. The Moscow is an old property in the Star district, but the present development campaign has been going on less than three years. Shipments have been made at intervals during this time, but the best ore began coming out during the summer. Six cars were marketed in August, averaging over $1400 per car. During the year the company has paid off $30,000 indebtedness and spent $6000 for water facilities, besides paying mining expenses, and it now has ore in sight to continue regular shipments for some time. The situation in the old Tintic district is somewhat mixed. The Chief Consolidated appears to be a comer among the newer properties. It is shipping regularly a good grade of ore, and is looked on as likely to continue to yield good reports. On the other hand, Colorado has cut its dividend from $60,000 to $30,000 for the quarter because the ore reserve is lessening and the company is conserving its cash for development work. The Opex, having failed to find the ore for which it was looking, has closed down. Uncle Sam has declared another dividend of $25,000, bringing the total to $495,000, or within $5000 of the capitalization, and the physical condition is said to be excellent.

The situation with the copper producers at Bingham has been pretty fully reported. The Utah Copper has completed its railroad and is pushing stripping operations at a tremendous rate and improving the mill so that it can increase its production heavily in the near future should it desire to do so. At present it is employing about 2200 men at the mine and is shipping something like 13,000 tons of ore per day. The Ohio Copper, still struggling with the general financing problem, has closed a contract with E. A. Wall to enlarge its mill capacity from 1700 tons per day to 3000 tons, materially reducing costs. Yampa is making a little money for the first time in its history. Utah Consolidated is pushing development vigorously in the hope of regaining some of its lost prestige. The Utah Metal Mining adit, which is to be 11,800 ft. long and is to connect several of the Bingham mines at depth with the International Smelting & Refining Co. plant at Tooele, is nearly half completed, and work is now going ahead from both ends. It should be finished inside of a year. Some of the smaller companies operating in Bingham are having trouble to get the necessary funds for development, but the camp as a whole is prospering.

NEW YORK

Depression of Share Markets.—The Copper Situation.—Reorganization of Arizona Commercial.—Channing on the Finlay Report.—General Development Enters Lake Superior Field.—Nevada Utah.—Porcupine News.

The monotony of chronicling the constant decline of the market is as nerve-racking as trying to keep step with a bounding upward market, which uses each advance gained only as a stepping stone to reach still higher planes. Since August 1 the decline has been steady and uninterrupted, culminating this week in an attack on both the common and preferred shares of the United States Steel Corporation, adding to the already gloomy atmosphere a spirit of foreboding of what ensuing tomorrows are to bring. Political factors are deemed of first importance. The dissolution of the Steel Corporation and the International Harvester Co., either voluntarily or involuntarily, are confidently expected, and Wall Street, outraged in all its traditions, crimped in income by lack of business, apparently forsaken by the leaders so often acclaimed as saviors, exasperated, must stand and watch the issues which have provided no small share of the activity of past years, wiped off the board as outlaws. Wall Street has no philosophy for the present crisis, and to it the very firmament is falling. Steel was Morgan's triumph and it is to be declared without the pale. The Goths and Vandals are defiling the innermost shrines of Wall Street's temples. The degradation is complete. This week saw two 'million share days', the first of the current year, and they brought no comfort. All attempts at new enterprises in any public way are for the time completely abandoned. The situation abroad is equally depressing. There are not a few voices that can be heard to argue that it would be much better for the situation to come to a violent break in any quarter and so relieve the present intense strain, rather than prolong it.

In the copper situation the trend of affairs abroad is the dominating factor. The export demand has saved the copper market during the last year, and it must continue to draw heavily upon our production unless we are again to see a surplus rapidly accumulating. The industrial inflation in Germany constitutes an admittedly weak span in the world structure of commercial credit just now, and desperate efforts are being made to get back to earth once more without loss or harm. The development of devices in use in making copper has been so rapid and so remarkable, the enlarged scale upon which copper mining is now conducted is so gigantic, that it is small wonder that the industry is in something of a state of confusion. The world's production is increasing so rapidly that consumers are unable to take any aggressive position in the buying of copper, and while the volume of accumulated stocks is watched as a barometer, there is a great deal more keen analysis made of the situation than a mere review of the monthly published figures. The year 1907 was something of a date line in copper. Since the panic prices of that year the metal has been struggling for a normal basis, and during that time production has increased some 855,000,000 lb. as compared with the three years preceding. It is the knowledge of these conditions that causes manufacturers to ignore, as they have during the last three months, a smaller surplus. The needed correction is not curtailment of output, but conservation of ore reserves. The pine barrens of the Southern States ought to be an object lesson for copper producers. Once, and that but a short time since, considered inexhaustible, now they are nearly gone and the turpentine camp has taken the place of the sawmill. By way of example of the development of huge output, Utah Copper broke all records for the month of August with 9,010,669 lb of copper being 1,455,262 lb. greater than the previous high record month of May 1910. Nevada Consolidated, on the other hand, suffered somewhat for lack of water, and production was cut down to 5,249,514 lb., a little below the output for any month so far this year except February.

It is characteristic of periods of liquidation that attempted reorganizations meet with many snags and obstacles. The merger of the Arizona Commercial and the Superior & Boston, a reorganization of the former at the same time, was hailed as a completed move a week or more ago, only to be set aside now for an independent reorganization, with Charles S. Smith, vice-president of the Old Dominion, as the new head for the Arizona Commercial, which is to be made into a new company of 300,000 shares, par value $5; the bondholders to exchange their $1,000,000 in bonds for $700,000 (140,000 shares) in stock; the present shareholders to exchange present holdings (120,000 shares) for the same amount of new stock, but to pay in $3 per share, all of which will leave the new Arizona Commercial with 40,000 shares of stock as a treasury reserve.

The discussion of the Finlay report on the mines of the Lake Superior region continues to hold attention in Boston. It is conceded that the most important part of the Finlay report lies in what is said concerning the exhaustion of the Calumet & Hecla and his comment that no mines have so far been developed to replace this chief source of production. Inasmuch as J. Parke Channing was the principal engineer in the making of the original appraisal of the Lake properties, his comments on Mr. Finlay's conclusions are of particular interest. In a recent interview, Mr. Channing said: "The Finlay report took into consideration nothing more or less than the immediate valuation of the mines examined for the purpose of taxation. There is no district in America where more possibilities exist for the finding of new lodes and new mines than at Lake Superior. There is no doubt whatever that the older mines like Quincy, Calumet & Hecla, and Hecla proper, and Tamarack have seen their best days as producers, but on the contrary there are new mines like the Copper Range, Ahmeek, Superior, Hancock, and others, all virgin and new producers, and developed to date at only shallow levels. Then in the vicinity of the Lake mine and the Indiana, great possibilities exist of finding copper deposits. As a whole, therefore, the Lake Superior section bids fair to maintain for many years to come approximately the same output as in the past, the newer properties taking the place of the older. There is a great area thirty miles long that must be considered as mineral territory only partly explored today."

It is altogether natural that the trend of opinion in Boston should be against the porphyry coppers. Boston is reluctant to admit the domination of the red metal industry by the steam-shovel coppers. The low costs reached by properties such as Utah Copper and Nevada Consolidated and confidently anticipated in the cases of Chino, Ray Consolidated, Miami, Inspiration, and others of this class have in the eyes of a part of the public robbed the deep-level vein mines of their attractive possibilities. Along this line a leading Boston copper man argues that "year in and year out the cost of production by the vein mines will compare favorably with the porphyries, particularly if anything like a uniform method of accounting is used. A porphyry mine is an entirely different proposition from a vein mine when it comes to this item. Most of the porphyries start with practically all their ore developed, and the tendency is to include in costs all expenses of mining, concentrating, etc. On the other hand, the vein mines develop as they go along, which expenses are charged to copper cost. In the case of the porphyries development expense has been capitalized and unless proper depreciation charges are made the cost of the porphyry production is seemingly much lower than conservative accounting would indicate; the porphyries are not going to revolutionize the copper business either as to price, output, or cost of production."

Mr. Channing's work in the Lake regions is evidently to result in something more than mere discussion of the conclusions arrived at in examinations. It is now stated that the General Development Co., the Lewisohn organization, which controls the Miami, the New Keystone, and other important copper properties, is negotiating for a group of properties adjoining the Isle Royale and south of the Quincy and the Hancock mines. The lands in question aggregate some 1300 acres and consist of the south side of Naumkeag, the Dakotah, and the Montezuma, and some lands of the St. Mary's Mineral Land Co. The land is thought to carry the southern extension of the Pewabic and the Hancock lodes. At the moment the negotiations are waiting the return of Mr. Channing who is at the Miami, in Arizona, on an inspection trip. The Street is inclined to attach a little significance to the entrance of W. E. Corey into copper mining circles and his trip through the Southwest and into Mexico, coming just at the time when the troubles of the Steel Trust seem to have culminated in a historical market smash. It has been rumored that Mr. Corey went heavily short of steel before his retirement was announced. It is quite evident that Mr. Corey is not now concerned with the troubles of the Steel Corporation and his serious intentions as to copper as a future field for his activities are indicated by his trip; on which he travels in company with John D. Ryan of the Amalgamated, R. L. Agassiz, vice-president of the Calumet & Hecla, and William D. Thornton, president of the Greene-Cananea. After a thorough inspection of the Greene-Cananea, the party will visit several of the principal mining centres of Mexico.

Nevada Utah's troubles seem to be without end. The last recent attempt to effect a merger of the properties of the Pioche camp has wound up in a tangle of litigation involving E. R. Woolley, the Pioche Amalgamated Mines Smelting Coporation, the Pioche Consolidated, the Nevada Utah, L. Vogelstein & Co. of New York, and the National Bank of the Republic, of Salt Lake City.

The announcement made some weeks ago that the Nipissing Mines Co. is to undertake important exploration at depth, to sink a shaft to the 1000-ft. level to settle the much mooted question of the Cobalt formation is now flatly contradicted, and neither drill nor shaft is to be sent down nor any sinking done save as mine conditions warrant. Nipissing's extreme depth is about 300 ft. A hydraulic plant to be used in removing overburden was erected last spring, but delays have intervened until it will not be put into commission until next spring. It is anticipated that this hydraulic work will greatly facilitate prospecting.

General Mining News

ALASKA

Juneau

The Alaska United G. M. Co produced in the month ended August 15, free gold, base bullion, and sulphides valued at $48,186 from the Ready Bullion claim, and to the value of $47,040 from the 700 Foot claim. From the former 18,568 tons of ore was crushed and 430 tons of sulphides saved. From the latter 19,532 tons of ore was crushed and 379 tons of sulphides saved. The realizable value of the total production was $47,704 for the Ready Bullion claim, and $46,590 for the 700 Foot claim. On the former 259 ft. of development work has been done, and on the latter 322 ft. The 20 stamps added to the mill on the latter property have been in operation during the month.

Prince of Wales Island

Samuel Lichenstadter, president of the Mt. Andrew Iron & Copper Co., died of heart failure at Ketchikan, Alaska, September 20. He had been at the mine, which is located on Prince of Wales Island, for some weeks prior to his death and was apparently in the best of health.

ARIZONA

Cochise County

(Special Correspondence.)—The Copper Queen Con. M. Co. has taken options on eight mining claims and five millsites in the Old Hat district. The price named is $50,000, of which $1800 has been paid. In one year $16,800 is to be paid, and the balance of $31,400 in two years. The properties are the Copper Trident, Grant, Copper Era, General R. E. Lee, Copper Head, Marble Peak, Tunnel Site, and Wedge mining claims, and the Centennial, Beautiful Snow, Giant, Lawton, and Lunton millsites. The Copper Queen company is to have full possession of all property excepting the residence of R. N. Leatherwood. An amendment also has been filed to the option from William Reid on the General Grant claim, extending the time of the first payment of $5000 to August 15, 1912.

POWER PLANT OF THE COPPER QUEEN.

Douglas, September 25.

Gila County

The directors of the Live Oak Dev. Co., at a meeting in Boston recently, elected the following officers: Henry B. Hovland, president; J. D. Clark, vice-president; Harvey Smith, secretary; J. B. Hardon, assistant secretary; D. L. Fairchild, of Duluth, treasurer.

Security holders of the Arizona Commercial Copper Co., at a meeting in Boston, decided to attempt reorganization of the property as an independent enterprise. A committee of six, representing both classes of securities, appointed by the meeting's chairman, S. R. Pearman, is to draw up a plan for the reorganization of the company. Consolidation with the Superior & Boston has been proposed.

At a meeting of the stockholders of the Warrior Dev. Co. in Globe, September 12, a new board of directors was elected as follows: S. R. Kaufman, Marquette, Mich.; J. C. Rotterhaus, D. L. Fairchild, E. C. Congdon, Harvey P. Smith, and H. B. Hovland, all of Duluth, Minn.; and M. E. McCarthy, of Globe. It is not known whether the option on the Black Warrior mine, owned by the Warrior Copper Co., will be exercised.

The Inspiration mine, according to late reports, has ore reserves, averaging 2% copper, of 26,569,400 tons developed, and 81,300 tons partly developed. Future effort, it is stated, will tend toward preparing the ore reserves for mining and treatment rather than toward developing additional tonnage. Under the direction of C. H. Repath, engineers are making plans for the new 5000-ton mill.

Pinal County

The Ray Con. Copper Co. is about to ship its ore to El Paso, where the reverberatory-furnaces of the A. S. & R. Co. are practically completed, according to late reports. Since July the ore has been shipped to Aguascalientes.

CALIFORNIA

Butte County

(Special Correspondence.)—Some $20 gold ore has been opened in the Clipper Mills mine. The vein is developed by means of an adit for 100 ft. If the vein continues along such favorable indications, the owners will buy machinery to work the property on an extensive scale.

Sierra County

(Special Correspondence.)—A gasoline engine generator set for electric hoisting and pumping is now being erected at the Monte Cristo gravel mine near Downieville. This mine is showing up well.

The construction of a water-driven compressor has been completed at the Kate Hardy mine near Forest and driving in the lower adit has been started. With a total of only 525 ft. of prospect adit along the foot-wall, this mine has an actual mint record of $28,000 in specimen gold ore extracted. Very little stoping has been done, and that only in a narrow layer adjacent to the foot-wall. The balance of the vein, 20 ft. wide, has not been explored. Samples taken along the outcrop indicate an ore-shoot 300 ft. in length assaying $12 per ton exclusive of high-grade ore.

The electric equipment for the Omega gravel mine near Forest has been installed, and work is being carried ahead on an extensive scale. The main adit is being pushed ahead up the centre of the channel, at the same time cross-cutting to define the latter, which is about 200 ft. wide. This company controls one mile of channel. The gravel will average $1.75 to $2.75 per car exclusive of rich 'bunches.'

Surveys and estimates are being made for the installation of electric power at the North Fork mine near Forest.

The rich ore still persists at the Red Star mine near Alleghany. About $80,000 has been taken out during the past month. Ore in the vicinity of this shoot mills $150 per ton. On the same vein at the Tightner mine in the lower adit, specimen rock has also been found. The latter discovery now establishes two definite shoots of high-grade ore. The 10-stamp mill on this property is about completed.

Alleghany, September 23.

Tuolumne County

(Special Correspondence.)—Steps are being taken for the resumption of operations at the Draper, near Soulsbyville. Unwatering the mine is now in progress and should be accomplished in another two or three weeks. R. A. Nicholls is again superintendent.

The eight men operating the Soulsby under lease are said to be well satisfied with results thus far, though up to the present time the mill has been run only at irregular intervals.

A company has taken under bond the Uncle Sam mine, at Arastraville, and will begin operations in the near future. The property was unwatered for examination and consequently but little remains to be done before actual work can be commenced.

The mill at the Sunnyside, south of Tuolumne, will be in operation within a few days. The ore will be taken from a shoot 5 to 7 ft. wide which averages $7 per ton.

The Jim Lyons mine, in the Confidence district, has been bonded to A. H. Russell, of San Francisco. According to report the price to be paid for the property is $75,000. It is still the belief of some that the mine is the one from which Jim Lyons, a notorious character of the early days, took out a great amount of gold. The ore is of a very high grade, assaying from a few dollars to several hundred dollars per ton. The owners endeavored to sink a deep shaft on the property, but found this impossible without the proper machinery to handle the heavy flow of water encountered.

Tuolumne, September 24.

COLORADO

Gilpin County

(Special Correspondence.)—A vein of ore 6 in. wide that assays $100 per ton in gold and silver, has been uncovered on the 210-ft. level of the Maine mine. The same vein is showing on the 310-ft. level. L. H. Leber is manager. A carload shipment from the London mine in the Twelve Mile district made last week brought $32 per ton net. Large orebodies are showing throughout the various workings. A hoist is being erected over the Corydon mine. The property is owned by Henry M. Teller, ex-senator, and was a good producer a number of years ago. A gold 'retort' weighing 57.15 oz., which sold for $17 per ounce, was deposited with the Rocky Mountain bank. The gold was secured from ore from the U. P. R. mine. A shipment of ten carloads of ore from the Topeka mine made a few days ago brought 16.75 oz. gold, 16.60 oz. silver, and 7.15% copper, a total valuation of $334.61 per ton. The ore was taken from the 1400-ft. level.

CENTRAL CITY.

Central City, September 20.

Lake County

It is reported that a large combination dominated by the Central Colorado Power Co. is to undertake to unwater by 'coöperative pumping' the mineral area known as the 'downtown' district of Leadville. It is believed that the managers and owners of the properties involved will assist in the project. The plan includes the placing of a large pumping-plant in the shaft of the Penrose mine, of which the principal owner is J. F. McDonald. A. F. Bohn, postmaster of Leadville, is one of the leaders in the project.

Teller County

The Dante No. 1 soon will have a 100-ton cyanide mill, according to an announcement by A. E. Kelso, who is associated with some Colorado Springs men. The equipment for the plant was purchased at Denver.

Newspaper reports state that the recent discovery on the Colorado Boss property by J. R. Lewis is now believed one of the largest ore-shoots found in the camp this year. The lowest assay of any grab sample is said to be $108. The mine is on the south slope of Gold hill.

IDAHO

Idaho County

W. W. Gifford, of the Hydraulic Placer company, operating on the Salmon river, 15 miles east of its confluence with the Snake river, said on returning from the diggings that gold washing will begin early in October. The pipeline is completed and the two big giants are ready for use and only 200 ft. of flume remains to be installed. The apparatus is designed to wash 1000 yards of gravel daily.

Shoshone County

The Hecla Mining Co. brought its total disbursements to $2,290,000 by the payment of its ninety-ninth dividend of $50,000, at the rate of 5c. per share on September 21. Of this, $180,000 was paid this year. The mine, which is situated at Burke, has ore reserves to maintain the present rate of production for two years, it is asserted.

The cross-cut adit being driven by the National Copper M. Co. to develop its property above Mullan, is in 2400 ft., or a little more than half the distance planned.

The C. & R. Mining Co., working a property of the same name adjoining the Hercules mine in the Coeur d'Alene district, has erected a compressor and gasoline engine to expedite the driving of a lower adit, now in 200 ft. The adit, when completed to the vein, will be 900 ft. in length. It will tap the vein at a depth of 340 ft. under the No. 2 adit.

The Amazon-Manhattan group of eight patented claims on the west side of Carbon creek in the Sunset district of the Coeur d'Alene, nine miles north of Wallace, has been secured by William T. Tracey of Galesburg, Ill., who has engaged Patrick Burke, until recently manager of the Jack Waite mine, to develop the property. About $300,000 is involved in the deal. The property, which has been owned the past nine years by the estate of Barry N. Hillard and his heirs, Horace M. Davenport, Charles M. Asp, and Ben Stanley Revett, the last of Colorado, has two distinct veins, both having good ore from the grass-roots. They are about 100 ft. apart on the surface, and dip toward each other. The Amazon has the largest orebody, while the Manhattan has a higher grade of ore.

MICHIGAN

Houghton County

Drill-hole No. 15 of the Mayflower M. Co. has passed through two promising copper-bearing formations. It is down over 1350 ft. Old Colony No. 9 drill-hole has been discontinued at a depth of over 800 ft. What is thought to be possibly an extension of the St. Louis vein was discovered, but contained no copper in commercial quantities.

The Mohawk M. Co., in August, made a new record for output—1,134,684 lb. of refined copper. The recovery per ton of ore was 15.53 lb. of refined copper, the lowest recovery since last March when it was 13.88 lb. The production in the first eight months of 1911 was 7,927,971 lb., against a production of 7,358,814 lb. of refined copper in the first eight months of 1910.

MISSOURI

Jasper County

Thomas Douglas & Co., having found that the name Golden Rule conflicts with that of another mine, have changed the name of their property, which now will be operated by the Aberdeen Mining Co. The mine is known as the old Lincoln, and is situated near Smithfield.

A new concentrating mill has been completed on the Clara Bell property, which is operated by L. F. Kinney.

MONTANA

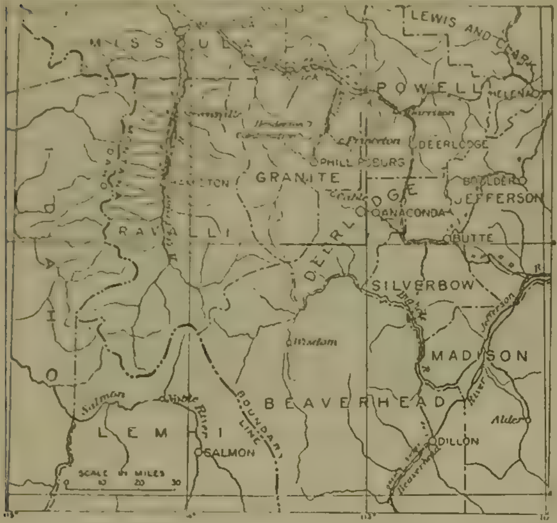
Fergus County

The Kendall M. Co., operating at Kendall, paid its eighty-second dividend of $10,000, at the rate of 2c. per share, on September 23. The total amount paid this year is $90,000. The company is incorporated for $500,000. Its dividends to date amount to $2,01[illegible],000. Messrs. Finch and Campbell, of Spokane, who are the largest shareholders in the Hecla, own the controlling interest of the Kendall.

LINCOLN COUNTY

Some samples of the ore from the recent copper discovery made on Parmenter creek were brought in recently by Frank Bryant, and it is stated that there is almost a mountain of the ore. The rock is freely sprinkled with peacock copper and comes from a 200-ft. dike, which carries veins varying from a foot to 20 ft. in width. A. Lacharity, E. W. Doe, and James Hurley are interested with Bryant in the property.

(Special Correspondence.)—E. H. Wilson, who has charge of operations at the Snowshoe mine for the Pacific Coast Smelting Refining Mining Co., has been appointed by Governor E. L. Norris as a delegate to the American Mining Congress, to be held in Chicago from October 24 to 28. **Mr.** Wilson was also appointed as a delegate from **California** by Governor Johnson. He attends the congress every year and is a member of the executive committee of the organization. Montana has two other delegates, from Helena and Butte.



MONTANA.

Libby, September 24.

MISSOULA COUNTY

An unnamed New York mining man is reported to have secured an option on the Texas claim, near Deborgia, from David Cromie, A. L. Thurston, and George Cox. The mine is east of the Rough Rider M. & M. Co. and north of the True Fissure. Mr. Thurston will have charge of the development work.

SILVERBOW COUNTY

(Special Correspondence.)—The High Ore mine will start up early in the coming month under the compressed-air system of hoisting ore. For more than a month workmen have been engaged in making the necessary changes to the engine. It has not yet been definitely determined which mine will be closed down next to allow the necessary changes to be made, but the changes on all the engines of the Anaconda company will go right along.

North Butte is producing copper laid down in New York at about 9c. per pound, and those who are in a position to know declare that it is earning much more than its dividend on its output of a little over 2,000,000 lb. per month. Not over a year ago the North Butte was probably not earning its dividend, but with the high-grade ore now being mined and hoisted to the surface, and the high silver value being obtained, there can be no question as to the company being in a position to earn its dividends. From all that can be learned, the mine is showing up remarkably rich at depth, and some of the richest ore ever brought out of a property in this district is assured in the near future. A 10-ft. vein was found while shaft-sinking was proceeding, and the ore is said to run 12% copper and 28 oz. in silver per ton. As soon as the stations are cut on the 2600 and 2800-ft. levels, these orebodies will be opened up.

Butte, September 25.

The North Butte M. Co. has declared a quarterly dividend of 30c. per share, payable October 21 to stockholders of record October 7. With this dividend the stockholders will have received since the first payment in September 1905, $9,538,000.

NEVADA

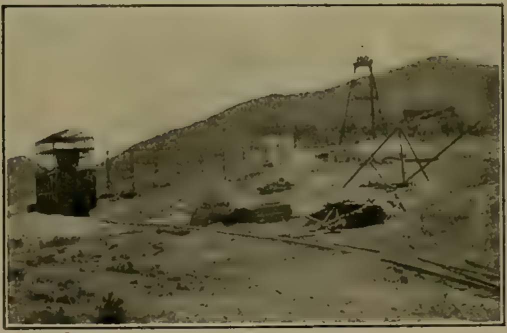
CHURCHILL COUNTY

The full 20 stamps of the new Nevada Hills M. Co., at Fairview, were dropping on September 19. The first ten started September 10. The water storage-tanks are practically filled, and plenty of water for milling purposes is assured, it is stated. The mill will gradually increase its present tonnage of 110 tons per day. The new shaft is down nearly 500 ft., and a station cut at the 450-ft. level. Driving is being done from the 570-ft. level of the old shaft. The new mill will eliminate the high freight and smelting charges incident to sending the ore to Hazen, as was done in the past. W. H. Webber has resigned as general manager for the Nevada Hills, according to report, and E. A. Julien, formerly of Goldfield, has been appointed to the position. Fred Siebert is consulting engineer.

HUMBOLDT COUNTY

Press despatches state that a vein of ore averaging more than $6000 per ton, chiefly in gold, with a little silver, has been found in the Friedman winze of the Seven Troughs Coalition M. Co.'s property.

An important discovery of manganese tungstate was made recently in the Adelaide portion of the Gold Run district by Robert Major. It is thought that other ore supposed to contain only zinc may also have tungsten.



BELMONT SHAFT.

(Special Correspondence.)—The Rye Patch Mining & Leasing Co., operating the Rye Patch mine, is awaiting the delivery of a stamp-mill. Air-drills also have been ordered. The company is shipping a car of ore per week to the Salt Lake City smelter, according to report. C. B. Conlin is general manager for the company, which has offices at Rye Patch.

The Star Peak mill has been bonded to Bela Kadish, of Baker, Ore., for $20,000. The property consists of six claims, on which about 1000 ft. of development work has been done. A 5-stamp mill and a tramway are on the property.

Rye Patch, September 23.

NYE COUNTY

The mill at Shoshone is to be taken to the Blue Jacket property, and applications for leases on property near the new site on Round mountain are said to be numerous. The contract for dismantling the mill has been let.

The Tonopah M. Co. of Nevada has declared a regular quarterly dividend of 25c. and an extra dividend of 15c. per share, payable October 21 to stockholders of record September 29. This will make a total of $1,600,000 paid in dividends this year, and a total of $8,050,000, or 805%, to date. The payment will leave in the treasury more than $1,000,000, and it is asserted that the present net earnings of the mine will permit the present rate of dividend and yet leave a surplus for the reserve fund.

Last week the Tonopah M. Co. shipped 3250 tons, the Belmont company 2350 tons, the Montana 849 tons, the Tonopah Extension 980 tons, and the Midway 50 tons of ore. The total, 7479 tons, is valued at $186,975.

A new vein has been found at the 1200-ft. level of the Belmont on a cross-cut driven north from the shaft. The vein runs east and west and dips northerly, according to press reports.

STOREY COUNTY

In the preliminary work for reclaiming the deeper levels in the north-end mines the winze formerly used jointly by the Mexican and Ophir has been found in apparently good condition to the floor of the 2900-ft. level. New pumps will be placed at the head of the winze, and water will be pumped to the 2450-ft. level of the C. & C. shaft, where a pump-station will be cut. From there it will be raised to the old Comstock adit. Pumps also will be placed at the 2650-ft. station of the C. & C. shaft.

WHITE PINE COUNTY

The Nevada Con. Copper Co. in August produced 5,249,514 lb. of copper, against 5,258,582 lb. in July. The company is reported to be well within its dividend-earning requirements.

OHIO

Ohio in 1910 produced 34,209,668 short tons of coal, with a spot value of $35,932,288. The increase in production is the largest ever made in one year. In 1909 Ohio produced 27,939,641 short tons, valued at $27,789,010. The increase was 22.44% in quantity and 29.3% in value. In 1910 more than half of the miners were on strike for a period equivalent to 25% of the average number of days worked.

OREGON

JACKSON COUNTY

Newspaper reports state that Adolph Meier, representing the Boston-Montana Silver & Copper Co., has been investigating the Rogue River district to select a site for a concentrator. The plant is to cost between $500,000 and $750,000, and would be built to handle the output of the Rogue River valley and southern Oregon mines. F. E. Steffey, of the Boston-Montana company, is expected in Medford in the near future.

SOUTH DAKOTA

LAWRENCE COUNTY

The Homestake M. Co. paid its regular monthly dividend of 50c. on September 25.

UTAH

SALT LAKE COUNTY

The west end of the 11,800-ft. tunnel of the Utah Metal M. Co. is in 5600 ft. and averaging 19 ft. per day. The east end, recently commenced, has been driven 100 ft. It is estimated that a year will be required to complete the remaining 6000 feet.

The Utah Copper Co. in August produced 9,010,669 lb. of copper against 7,555,407 lb. in July. The production for the quarter ended March 31 was 12,296,709 lb., and for that ended June 30, 24,469,812. The output for the third quarter will be unusually large, according to report.

SUMMIT COUNTY

At a meeting of the Uintah Treasure Hill Coalition M. Co., at which 853,000 of 1,000,000 shares were represented, it was unanimously decided to petition the court for dissolution of the corporation and distribution of assets. Each holder will receive about 10.7c. per share, as there is $106,000 on hand, received from the sale about nine months ago of the company's property to the Silver King Coalition M. Company.

WASHINGTON

FERRY COUNTY

The Ben Hur Leasing Co., with C. M. Kingston, general manager, and John Benson as superintendent, began sinking the Ben Hur shaft from the 300-ft. level September 18 and is sinking two compartments 5 ft. per day. Three sets of timber were put in during the week. The original plan of raising from the 400-ft. level while sinking from above was abandoned on account of there not being sufficient boiler power to run the compressor and two hoists.

The Hope company has sunk the new shaft on the cross-vein 63 ft. It has passed through several stringers and gives evidence of the vein being much wider below than was supposed from the width of the cropping. While the vein quartz is very hard and solid from the cropping to a depth of about 30 ft., below that depth it is much oxidized and brecciated, and the stringers are separated by andesite breccia. The ore near the bottom of the shaft has altered very little in sinking the last 30 ft. On the 300-ft. level the east drift on the hanging vein is in 75 ft. On the cross-vein the drift is in over 50 ft. on ore assaying from $15 to $50 per ton.

The San Poil Con. company resumed work September 5 with nine men. On the No. 1 level a stope has been started on a new shoot 4 ft. in width. The ore assays from $29 to $64 per ton. On the No. 2 level a raise has been started on the same shoot. There the ore assays from $16 to $27 per ton. In the North San Poil ground, at about 350 ft. north of the No. 1 raise, a new stope, 30 ft. long and 4 to 5 ft. wide, is up 20 ft., the ore assaying about $26 per ton. The company will ship to the B. C. Copper Co., at Greenwood, B. C. Since resuming work three carloads have been shipped, and three more cars are being loaded to go out September 26.

In the Lone Pine workings the Republic Mines Corporation is stoping ore northeast from the winze on the 400-ft. level. The stope is about 5 ft. in width. The ore, more uniform in value than above, assays about $20 per ton. In the east raise ore which assays from $20 to $30 per ton is being stoped.

At the Surprise mine, on the 300-ft. level, at a point about 70 ft. south of the turnsheet, a stope about 25 ft. long and 8 ft. wide is up 20 ft. in ore that assays about $70 per ton. From this stope a cross-cut has intersected the vein 25 ft. in ore averaging about $25 per ton. North of the turnsheet, on the same level, the drift is being slowly extended, on acount of the air being bad, with no present means of ventilation. It is now in the porphyry dike, which has apparently widened at this depth to 35 or 40 ft. From the 200-ft. level a raise is being driven toward the Wallek stope, at the bottom of which is a bunch of ore of good shipping grade, 25 to 30 ft. in length and 8 ft. wide. A line of 8-in. air-pipe is to be hung up in the south drift for ventilation. From the 600-ft. level, through the Quilp mine, a car of ore is being shipped per day, the assays from which have been running the past week from $17 to $130, with an estimated average of $65 to $70 per ton.

At the Knob Hill mine new work has been started on the 400-ft. level, in driving northward toward the extension of the Pearl-Surprise vein through the Mud Lake claim, which belongs to the Knob Hill company. The distance to be driven is about 600 ft. In the raise from the 400 to the 200-ft. level a stope has been started 100 ft. above the former, on ore 9 ft. in width which assays about $35 per ton. Southwest from the first mentioned, another raise has been started on a cross-vein, on which the company will begin stoping ore in about ten days. On the No. 2 level high-grade ore, averaging about $100 per ton, is being stoped about 3 ft. in width. The mine is looking well throughout, and the development work is kept well ahead of the production of six carloads of ore per week. At present 22 men are employed on two shifts.

Republic, September 23.

Okanogan County

C. H. Neil, ex-judge of the Superior Court of Ferry county, has bonded the Caaba mine, on Mt. Ellemeham, on the Similkameen river, near Nighthawk, and connected with the early history of the county. The consideration has not been made public.

Nighthawk, September 23.

CANADA

British Columbia

The net profit of the Granby Con. M. S. & P. Co. for the year ended June 30 was $216,525, according to figures submitted in connection with listing $150,000 treasury stock on the New York Stock Exchange. The net profit for the previous year was $564,947. The company for the year recently ended produced 17,855,130 lb. of copper at an average cost of 11.09c. per pound, and sold it at an average price of 12.311c. The cost of production for the previous year was 10.3c. per pound. The silver yield was 343,504 oz., and the gold 41,744 oz. The silver sold at an average price of 53.564c., and the gold at $20 per ounce. The company has a total surplus of $2,532,414. The $150,000 issue of stock, states G. M. Luther, president of the company, is to enable the company to make final payment on the entire issue of stock of the Hidden Creek Copper Co., on which an option was first obtained last October. The Hidden Creek property is on Goose bay, Cassier district, British Columbia, and consists of 412 acres crown-granted mineral rights, the Maple Leaf and Bunker mineral claims, not yet granted, 600 acres of land, and a recorded water right. About $300,000 had been spent on development at the time of sale. Cores in the lowest workings assay about 3% copper. Work has been started on a 400-ft. wharf, a 6000-ton ore-bunker at the dock, and a 4000-ton bunker at the mine. An electric plant is being constructed and other improvements are under way.

GRANBY SMELTER.

Spokane directors of the Rambler-Cariboo M. Co. have received advices from the manager of the property near McGuigan that the face of the 1200-ft. level continues in about 5 ft. of solid galena. This showing now has lasted for more than 30 ft. Since the 1200-ft. level entered the second lens of ore it has been advanced 180 ft., and for the entire distance the pay-streak has averaged more than 3 ft. in width of ore that assays 250 oz. of silver and more than 60% in lead per ton. The first shoot discovered on the 1200-ft. level was 60 ft. long and of an average width of 3 ft. of clean galena.

S. N. Ross, of Salmo, while in Spokane, reported that the Canadian Consolidated M. & S. Co. is planning to develop the H. B. property at depth by means of adits and diamond-drilling. The property has been bonded for $500,000. The Queen mine is operating a 20-stamp mill which has been in continuous service for nine years.

Ontario

A test-pit on the No. 16 vein of the Lucky Cross property has opened up one of the richest ore-shoots so far found in the Swastika district. This vein has been uncovered for about 350 ft., and for a distance of over 100 ft. free gold can be seen throughout the quartz, according to late reports. A test pit sunk to the depth of 8 ft. some weeks ago showed 2 ft. of quartz which gave an average assay from wall to wall of $112 per ton. The new showing in the second test pit is decidedly richer than anything heretofore found on the property.

La Rose Con. and Nipissing mines both declared their fourth quarterly dividends for the year on September 18, the dividends to be payable October 20. The La Rose dividend, of 2%, will involve a disbursement of $150,000, and brings the total of dividends paid since October 1905, when the first was paid, to 35 per cent.

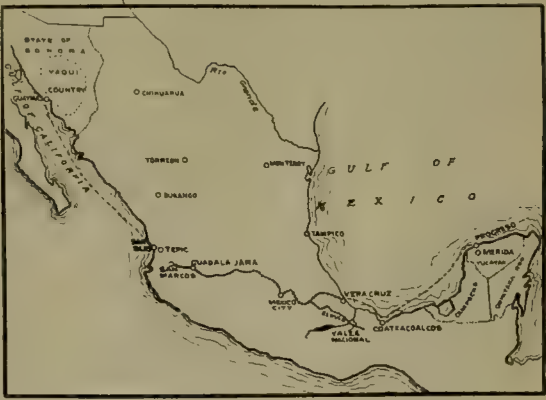
The Nipissing regular 5% dividend and customary bonus of 2½% will result in a disbursement of $450,000. The company in all, with the present declared dividend, will have paid stockholders 121½% on their investment.

The report of the Beaver Con. Mines, Ltd., for the quarter ended August 31, shows that the company has done 1102 ft. of development work, an increase of more than 400 ft. over the work of the preceding quarter. Two cars of high-grade and eight cars of low-grade ore, aggregating 648,194 lb., and valued at $133,000, were shipped. Payments are due from the smelters on about $135,000 worth of ore, part of which was shipped during the previous quarter. The figures, it is asserted, indicate an increase during the quarter of $68,718 in liquid assets. The company has a cash balance on hand of $59,960.

MEXICO

Chihuahua

Newspaper reports state that plans are being made for the construction of an aerial tramway from the San Cristobal mine, in the Parral district, to the Veta Colorada mill. B. V. Gordon is manager of the San Cristobal mine.



MEXICO.

Additions to the mill of the Tajo property in the Parral district are planned. H. H. Utely is manager.

Durango

The Restaurador mine in Guanacevi, formerly owned by Ayton & Co., has been sold to an English syndicate. The property has a large mill. Development was stopped a year ago pending the completion of the deal.

Hidalgo

The San Rafael y Anexas company is planning to erect a cyanide plant on the Los Remedios properties, Pachuca district.

Sonora

Exceptionally rich ore has been found recently in several properties of the Rey de Oro district, about 50 miles east of Magdalena, and about 15 miles south of the Santa Rosalia mine. On the Patsie denouncement, owned by O. B. Glover, ore assaying $1000 per ton, according to press reports, has been discovered at a depth of 150 feet.

The reduction plant of the Cerro Gordo mine, Cumpas, has had a test run, but some small changes will be made before regular production will be commenced.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

F. L. SIZER was in Nevada last week.

ERROL MACBOYLE has returned from Alaska.

JOHN FINLAY, of Los Angeles, is in San Francisco.

GELASIO CAETANI is expected from Colorado Monday.

W. M. KNOX is drilling placer ground near Vladivostok.

JOHN B. FARISH is at the St. Francis hotel, San Francisco.

FREDERICK BRADSHAW has been in San Francisco for a few days.

GEORGE H. GARREY has returned to San Francisco from the South.

W. H. STORMS is examining mines in Nevada county, California.

W. C. RALSTON has returned from a visit to Tonopah and Virginia City.

S. H. BALL has returned to New York from a six weeks trip through Mexico.

W. P. O'MEARA, of Salt Lake City, is at the St. Francis hotel, San Francisco.

SUMNER S. SMITH has gone from the Matanuska coal-fields to Ketchikan, Alaska.

F. W. BRADLEY has been at Kellogg, Idaho, and is expected at San Francisco Monday.

T. LANE CARTER has gone from Mexico to inspect some mining properties in northern Arizona.

C. W. PURINGTON and NORMAN C. STINES have been at Harbarovsk on their way to Nicolaievsk.

R. P. WHEELOCK has been appointed superintendent for the Enterprise M. R. & I. Co., Kingman, Arizona.

J. A. HOLMES has returned from Alaska. He was at Kellogg, Idaho, this week and has gone to Chicago.

E. C. ENGELHARDT has accepted a position with the American Smelting & Refining Co., at Garfield, Utah.

E. S. RUST has been appointed manager of the Seattle branch of the Yuba Construction Co., with offices at 1224 Alaska building.

W. H. GRAHAM has returned to San Francisco from Libby, Montana, where he has been for a month. He expects to return there in about two weeks.

JOHN D. RYAN, WILLIAM E. COREY, R. L. AGASSIZ, W. D. THORNTON, P. L. FOSTER, and L. D. RICKETTS, visited Miami, Inspiration, and Live Oak last week.

C. B. CONLIN, formerly superintendent of the Commodore gravel mine in Sierra county, California, is in charge of the Rye Patch M. & L. Co., at Rye Patch, Nevada.

P. R. PARKER, formerly manager of the Seattle branch of the Yuba Construction Co., has been appointed superintendent of the company's plant at Marysville, California.

RENE E. HAZARD will leave New York early in October for Medellin, Colombia. He is taking with him a large amount of machinery for the Sambenigo Mines & Estates Co., for which he is manager.

The local committee in charge of arrangements for the San Francisco meeting of the A. I. M. E. will meet at the Commercial Club today at noon.

Obituary

R. F. MORTON, who died at his home in Berkeley, California, September 27, was a civil engineer who had lived many years in California and been concerned in the making of many local maps. Mr. Morton was a particularly excellent draughtsman, and numerous examples of his work have appeared in the *Mining and Scientific Press*. His large map of the oilfields of California, involving months of careful compilation, is especially well known.

Market Reports

LOCAL METAL PRICES.

San Francisco, September 28.

Antimony	12—12½c	Quicksilver (flask)	47½
Electrolytic Copper	14—15½c	Tin	47—48½c
Pig Lead	4.75—5.70c	Spelter	7½—8½c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50—9.75; large $7.50—8.50

METAL PRICES.

(By wire from New York.)

Average daily prices in cents per pound.

	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Sept. 21	12.13	4.48	5.86	52½
" 22	12.13	4.48	5.86	52½
" 23	12.08	4.48	5.86	52½
" 24	Sunday.	No market.		
" 25	12.08	4.48	5.86	52½
" 26	12.08	4.48	5.86	52½
" 27	12.08	4.48	5.86	52⅝

ANGLO-AMERICAN SHARES.

(Cabled from London.)

	Sept. 21. £ s. d.	Sept. 28. £ s. d.
Camp Bird	1 7 4½	1 8 3
El Oro	1 3 0	1 3 0
Esperanza	1 12 9	1 14 0
Dolores	1 5 0	1 5 0
Oroville Dredging	0 5 7½	0 5 7½
Mexico Mines	6 17 6	6 16 3
Tomboy	0 17 6	0 17 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing Prices. Sept. 28.		Closing Prices. Sept. 28.
Amalgamated Copper	$ 48¾	La Rose	$ 4
A. S. & R. Co	60¾	Mason Valley	7
Braden Copper	4⅛	Miami Copper	16¾
B. C. Copper Co	3⅝	Mines Co. of America	4¼
Butte Coalition	14½	Nevada Con	15½
Chino	17¼	Nevada Utah	½
Davis Daly	⅞	Nipissing	8
Doble	1¼	Ohio Copper	1⅜
Dolores	4½	Ray Central	1⅛
First National	1	Ray Con	12¾
Foley O'Brien	¼	South Utah	⅝
Giroux	3¾	Superior & Pittsburg	13
Goldfield Con	5⅞	Tenn. Copper	32
Greene-Cananea	5⅞	Trinity	3¼
Guanajuato Con	½	Tuolumne Copper	3⅛
Hollinger	11⅝	United Copper	1
Inspiration	5¾	Utah Copper	39
Kerr Lake	3⅜	Yukon Gold	3⅛

COPPER SHARES—BOSTON.

(By courtesy of J. C. Wilson, Mills Building.)

	Closing prices. Sept. 28.		Closing Prices Sept. 28.
Adventure	1¼	Mohawk	$ 39½
Allouez	21	North Butte	22½
Calumet & Arizona	48	Old Dominion	36
Calumet & Hecla	475	Osceola	84
Centennial	8	Parrot	8
Copper Range	50	Shannon	7½
Daly West	5	Superior & Boston	2½
Franklin	6¼	Tamarack	20½
Granby	27½	Trinity	3⅜
Greene Cananea, ctf.	5⅞	Utah Con	11
Isle-Royale	12	Victoria	1½
La Salle	3¼	Winona	5
Mass Copper	5	Wolverine	88

NEVADA STOCKS.

(By courtesy of San Francisco Stock Exchange.)

San Francisco, September 28.

Atlanta	$ .16	Mayflower	$ .04
Belcher	.40	Mexican	3.05
Belmont	7.00	Midway	.26
B. & B.	.15	Montana-Tonopah	.80
Booth	.08	Nevada Hills	2.77
Choller	.12	Ophir	1.57
Combination Fraction	.08	Pittsburg Silver Peak	.87
Con. Virgina	.69	Round Mountain	.63
Florence	1.25	Sandstorm Kendall	.04
Goldfield Con.	5.82	Savage	.20
Gould & Curry	.05	Tonopah Extension	1.05
Jim Butler	.24	Tonopah of Nevada	6.25
Jumbo Extension	.25	Union	.92
MacNamara	.21	West End	.60

Company Reports

THE BROKEN HILL PROPRIETARY CO. LTD.

The report of this company, operating mines at Broken Hill, Victoria, and works at Broken Hill and Port Pirie, South Australia, for the half year ended May 31, 1911, shows that during the period 52,441 tons of ore was treated at the old mill, producing 10,638 tons of lead concentrate (57.43% lead, 27.08 oz. silver) and 7980 tons of slime (13.20% lead; 16.47 oz. silver). The new mill treated 159,609 tons of old tailing, producing 5090 tons of concentrate (51.56% lead, 26.65 oz. silver) and 10,737 tons of slime (11.65% lead; 16.67 oz. silver). The residue from both mills (178,125 tons) was sent to the zinc concentration plant, which produced 44,110 tons of zinc concentrate (44.88% zinc; 6.95% lead; 12.86 oz. silver). The smelter treated 85,832 tons of material, yielding 43,563 tons of bullion. The refinery produced 2,018,887 oz. silver; 1410 oz. gold, 38,749 tons of soft lead, and 293 tons of antimonial lead; 665 tons of spelter and 100 tons of blue powder was produced. A fifth furnace will be blown in soon, and the Dwight-Lloyd smelting plant is now in course of erection. The receipts from the sales of metals, plus increase of metals on hand since last report, amount to £728,841. Operating costs for the period were £561,027, leaving a gross profit for the six months of £167,814. Dividend No. 155, of £48,000, was paid. The subscribed capital of 960,000 shares at 8s. amounts to £384,000. Of the £260,000 reserve and insurance fund £239,837 has been used in the company's business, and the accumulated profits, £669,054, are being used in the conduct of business. A contract has been made with the British Broken Hill Proprietary Co. to treat its lead concentrate, about 2000 tons per month, at the Port Pirie smelter. The zinc concentrating plant has given most satisfactory results.

ANACONDA COPPER MINING COMPANY

This company has an authorized capitalization of 6,000,000 shares of a par value of $25 each, 4,220,000 shares having been issued. During 1910 the capital stock of the company was increased from 1,200,000 shares to 6,000,000, in order to purchase the properties of the Boston & Montana Consolidated Copper & Silver Mining Co., the Red Metal Mining Co., the Washoe Copper Co., the Butte & Boston Consolidated Mining Co., Big Blackfoot Lumber Co., Parrot Silver & Copper Co., Alice Gold & Silver Mining Co., and the stock of the Diamond Coal & Coke Co. The purchase was effected by the exchange of $3,020,000 shares of the Anaconda company, and April 1, 1910, the operations of the different companies was unified, and the mines are now operated as departments of the Anaconda Copper M. Co. In June the properties of the Original Consolidated Mining Co., the Clark Montana Realty Co., and the Colusa-Parrot Mining & Smelting Co., belonging to the Amalgamated Copper Co., were purchased for 112,500 shares of Anaconda stock. The properties are now operated by the Anaconda company, with the exception of certain claims in which the ores are chiefly zinc, which were not included in the transfer. The Colusa-Parrot smelter has been closed and the concentrator leased to W. A. Clark. The mining operations of the company are now carried on under (1) the Anaconda department; (2) the Boston & Montana department; (3) the Butte & Boston department; (4) the Parrot department. During the year there was received from the sale of copper, gold, and silver $30,943,508; the amount of these metals on hand at the end of the year is valued at $14,736,503; other sources of income bring the total to $46,391,126. Mining expenses, including development, amounted to $12,628,535; reduction expenses at Anaconda and Great Falls, $7,203,880; transportation, refining, and selling expenses, $3,001,377. The profit for the year was $5,720,903, and during the year dividends 38, 39, 40, and 41, amounting to $6,930,000, were paid. The assets of the company are given as $118,720,218, of which $93,078,071, is represented by lands and equipment, $3,444,343 by deferred accounts, and $22,197,804 by current assets, chiefly metals on hand. The report contains summaries of the work of the different departments of the company. During the second half of the year the economies resulting from consolidation began to be shown.

ALASKA MEXICAN GOLD MINING COMPANY

The Alaska Mexican mine is on Douglas Island, Alaska, between the 700 Foot Claim and the Ready Bullion mine of the Alaska United. It is one of the Treadwell family of companies, for which F. W. Bradley is consulting engineer, Robert A. Kinzie superintendent, and E. P. Kennedy assistant superintendent. The report for the year 1910 shows both the mine and the company to be in excellent condition. Since 1893 this mine has produced 3,132,954 tons of ore with an average yield of $2.74 per ton and a total of $8,592,487. Of the latter, $4,879,178 was from the sale of bullion and $3,713,309 was won in the form of concentrate. The operating profit for the period was $3,087,891, equivalent to $0.98 per ton, the operating costs have been $1.76, and the dividends paid have amounted to $2,742,381. In considering these figures it is well to remember that this company follows the policy of paying for plant and improvements out of income, so that the operating cost includes these items. For the year 1910 the figures were: tons crushed, 218,960; yield per ton, $3.50; operating profit per ton, $1.74; dividends paid, $342,000. It is interesting to note that the operating cost for the year, $1.76, was exactly the same as the average since the mine opened, and that the dividends paid amounted to almost 44% of the gross income. The ore reserve at the end of the year amounted to 1,093,029 tons of an average assay value of $3.41. This for a low-grade mine is an enviable record. An interesting detail in the report is a table showing quicksilver losses. These amounted to 295 oz. lost in retorts and 16,483 lost in the mill. The whole loss was 28.49%. This, while larger than usually considered to occur, is probably not greater than the actual loss in many mines. The chrome steel used for shoes crushed 2.78 tons per pound of steel.

AMERICAN SMELTERS SECURITIES CO.

The sixth annual report of this company, for the year ended May 31, 1911, shows that the earnings from operation of the smelting and refining plants for the year were $6,110,477, and from mines $1,850,800. Income from investments amounted to $77,174 and miscellaneous earnings $234,544. On ordinary repairs and replacements $944,409 was spent; $42,261 for corporation and excise taxes; $365,400 for administrative expense; interest, $662,176; discount on bonds, $16,667; depreciation, $650,000. The balance available for dividends was $5,092,083; from this preferred A of $1,020,000, and preferred B of $1,500,000 was paid, leaving a balance to be carried to profit and loss account of $2,072,083. Miscellaneous profit and loss adjustments amounted to $381,962 and depreciation in the value of investment stocks to $2,754,895, leaving a balance at the end of the year of $1,623,423, or a decrease of $64,774, compared with last year. The capital stock of the company consists of issue A of preferred, amounting to $17,000,000, and B preferred, $30,000,000, the common stock amounting to $30,000,000, and $15,000,000 of 6% debenture bonds have been issued. Current liabilities amount to $2,348,115, reserve funds $90,893, and profit and loss account $1,623,423. The property is valued at $76,261,106; investments, $2,399,800; working assets, $1,191,198; current assets, $7,465,007; account collectible, $3,432,248; loans and cash on hand, $4,605,729. The expenditure of $594,724 for new construction and permanent improvements during the year was placed to property account, and $650,000 charged off for depreciation. During the year $15,000,000 in 6% gold debenture bonds was issued, payable February 1, 1926, and sold to the American Smelting & Refining Co. on the terms given in the report of that company. These bonds were issued for the purpose of funding the indebtedness of the American Smelters Securities Co., paying the deferred liability on account of the purchase of the capital stock of the Baltimore Copper Smelting & Rolling Co., and for other corporate purposes.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS.

Location of Mining Claim — Marking Boundaries and Discovery

The location of a mining claim is invalid where the boundaries of such claim are not marked on the surface. Evidence of seams of minerals on a claim located without any showing as to what the minerals are is insufficient to establish a discovery of valuable minerals within the lines marking the claim that constitutes an essential element to a valid location of a mining claim.

Harper *v.* Hill, (California) 113 Pacific, 162, January, 1911.

Injury to Miner—Ignorance of Rules

In an action by a miner for injuries caused by a car jumping the track, the court instructed the jury that although the mine-owner had a rule requiring the miners to stand back when a trip of cars are passing on the main line, yet if the injured person did not know the rule, he would not be bound thereby, and would not be precluded from recovery by negligence on the part of the mine-owner.

Consumers' Lignite Co. *v.* Cameron, (Texas) 134 Southwestern, 283. February, 1911.

Death of Miner—Controverted Question of Negligence

In an action for the death of a miner by the fall of a portion of the roof, the controversy arose as to whether props supporting the roof were removed by the order of the mine foreman or by the miner without authority from the foreman. The question as to whether the props were taken out in accordance with the express direction of the mine foreman was for the jury, and the court properly instructed the jury that unless they found by fair preponderance of the evidence that the foreman was negligent, the plaintiff could not recover, and if they found for the plaintiff it must be because the foreman was negligent either in failing to give proper instructions as to how the work should be done, or in giving faulty instructions.

United States Gypsum Co. *v.* Sliwienska, 183 Federal, 688. December, 1910.

Duty of Mine-Owner to Furnish Safe Place for Work in a Mine

The statute of Washington requires a coal-mine owner to keep sufficient timber at any mine where it may be required for props, in order that the workmen may properly secure the workings and prevent them from caving in. It requires the owner to send into the mine all necessary props when required and to deliver them at the entrance of the working place. The statute also provides for inspection, underground maps, ventilation, measurement of air, openings and exits, signals, hoisting pumps, safety lamps, proper tools, and care of the men engaged. In an action for injury to an employee based on this statute, it was decided by the Supreme Court of Washington that the statute did not apply where it was shown that at the time of injury the injured employee and others were engaged in driving a rock tunnel to explore the territory and discover a ledge, and where no coal had been discovered or worked up to the time of the accident: that such tunnel was not a coal mine, but it might become a part of one, depending upon future developments, and it would be extending the statute beyond the limit of legislative intention to hold that a rock tunnel was a coal mine and subject to the operations of the statute. But this construction of the statute does not relieve the employer of his common-law duty to use that care which the cirsumstances and character of the work require for the protection of workmen in constructing the tunnel.

Hemmingson *v.* Carbon Hill Coal Co., (Washington) 112 Pacific, 1111. February, 1911.

Book Reviews

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

PRACTICAL GEOLOGY AND MINERALOGY. By W. D. Hamman. The Mining Man's Library, Vol. I. Pp. 224. Ill., no index. Pub. by Way's Pocket Smelter Co., South Pasadena, California, 1911. Price $2. For sale by the *Mining and Scientific Press.*

There is a recognized need for more scientific books written in simple language and designed to meet the everyday wants of the common man. Unusual difficulties, however, must be faced the moment the attempt is made to meet this want. The lack of preparation on the part of the reader makes the task of the author almost impossible of accomplishment. A statement that, made with the unconscious mental qualifications that exist in the minds of a scientific man, is eminently sound, is entirely misleading to a man whose preliminary training has not prepared him to make similar qualifications. On the other hand, it is the common experience of teachers that if a fact is stated to beginners in any but positive form, it makes no impression.

It is at once apparent that in scope he has covered fairly well the field chosen. The salient facts of geology, mineralogy, petrology, and mineral deposits are treated. The statements are plain and easily understood. Evident care has been used to secure exactness. In general the author is as judicial in his discussion of controverted problems as this purpose will permit. A reader feels instinctively that any mistakes of facts or of emphasis are honest mistakes, that the author has no pet theory to bolster. None the less there are numerous mistakes of fact, and, in my opinion, some of emphasis. There are places where the discussion is somewhat out of focus and the author has not always been in touch with the latest and best information—as, for example, in discussing the cause of the Glacial Period. As mistakes in statement of fact may be cited that on p. 35, that quartzite first made its appearance in the Cambrian; that on p. 54 that marble has its origin in fusion of limestone; on p. 63 that gneiss differs only from granite in being stratified; and others. Even these cases are mainly erroneous in being bald statements without qualification. Quartzites were long thought to appear first in the Cambrian, possibly fused limestone would result in formation of marble, though certainly most marble has not so originated, and 'stratified' is not the word a geologist would choose to describe gneissic structure, because of the genetic significance that the word connotes. There is an unconscious humor in referring to a certain famous doctrine as the "nebulous" hypothesis, and the figure on page 40 has been carelessly labeled. It is, of course, a map of North America in the Tertiary period and not a map of the period, the latter being a time term. The statement that placer nuggets have been traced to fusion will be questioned, and the belief that the definition of feldspar on p. 68 "will enable anyone to distinguish" that common mineral, seems hopelessly optimistic. The illustrations are faulty. Oyster shells are hardly the most appropriate illustration that could be chosen for the Silurian; the calcareous crystals on p. 52 look suspiciously like quartz, and the oven for making plaster, shown in Fig. 16, may have been used at some previous time, but certainly does not illustrate modern practice. On the whole the author has done much better than is common in writing such books. The work will prove helpful, and no doubt errors will be eliminated in future editions. We could wish that some effort had been made, by suggestions and frequent reference, to lead its readers into wider fields of reading. They would probably not read many of the books cited, but it might correct their tendency to go away with the satisfied feeling of having mastered the whole subject; a feeling that Mr. Hamman has no apparent intention of giving them, but which they none the less probably get. Other books of the same series are promised by the publishers, and they will be wished success in their experiment by all interested in spreading information among miners and prospectors.

H. F. B.

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EDITORIAL

CALIFORNIA welcomes the American Institute of Mining Engineers to the city by the Golden Gate.

OUR Salt Lake City contemporary, *Mines and Methods*, has trained its guns upon us, but as this was to be expected, we remain undisturbed.

NOME has been suffering from early storms this fall, but no considerable damage has been done, beyond the loss of a few lighters and the coal wharf at Fort Davis.

TRUSTS are meeting 'heavy going' these days, the most recent acquisition to the list of delinquents being the 'Lumber Trust', against which suit has been filed at Denver.

AUGUST production of oil in California amounted to 7,208,984 bbl., or a daily average of 232,546 bbl., the gain in average daily production of 8744 bbl. over July being largely due to the increased production of the Midway field.

AN INTERNATIONAL organization as the solution of the problem of forming a merger of copper producers at a time when monopolies are being ordered to dissolve, is suggested by our New York correspondent. But the immunity thus secured would probably be short-lived; an international commerce commission at The Hague is equally feasible.

NAVIGATION on the coast of Alaska is beset with difficulties; narrow passages, strong and erratic currents, fogs, and too few aids to navigation in the form of lighthouses, channel marks, and accurate charts. Added emphasis is given by the beaching of the *Edith* on Level island in Sumner strait not far from Wrangel, the latest of a series of such disasters. Someone is at fault; a series of wrecks should not be necessary to bring the responsibility home.

PLATINUM continues to increase in price, having sold at $47.50 per ounce in New York on Tuesday. Dispatches from Russia say there is much excitement on the Ekaterinburg market, the 83% quality continuing to advance in price while iridium is in strong demand with none to offer. Chemists to whom platinum is a necessity are correspondingly depressed. Painstaking search fails to disclose new deposits of the platinum group of metals, and apparently the necessity of devising substitutes must soon be faced.

AMERICAN trade has become of much importance in the Near East, as is evidenced by the appearance of the *Levant Trade Review*, a quarterly published by the American Chamber of Commerce for Turkey, recently organized to promote Ottoman-American trade and industries. The first number contains much of interest, and we extend to both the organization and its journal our hearty wishes for their success. The growth and importance of trade with the Far East leads to the hope that a similar organization may be formed to promote trade relations between Asia and the Pacific Coast region. The recent visit of the members of the Associated Chambers of Commerce of the principal Pacific Coast cities to China, which is to be followed next year by a visit of Chinese merchants to the United States, was an excellent step in the right direction; more should follow.

RAILROADS are accustomed to picture themselves as ground between the upper millstone of rate regulation by the Interstate Commerce Commission, and the lower of increased operating costs, chiefly due to the demands of labor, but when annual reports appear the harrowing panorama is temporarily obscured. The Atchison, Topeka & Santa Fé system, one of the loudest in its wails, after making, and properly so, heavy expenditures for maintenance and improvement, still exhibits an increase of over a million dollars in the excess of profits over fixed charges. The Illinois Central records the year ended June 30 as the most prosperous in its history, showing an increase of 5.34 per cent in gross earnings over the preceding year, yielding an operating profit of 10.20 per cent, or 3.20 per cent in excess of its dividend requirements. On this showing, most of the shippers will also wish to be oppressed, if similar results will follow.

COPPER production has undergone sweeping changes of recent years, and the readjustment to changed conditions has given rise to many tremors and has been attended with not a little friction and heat. But, like geotectonic adjustment, such changes seem resistless, even though their advent may be undesirable to many; neither blinking the facts, nor distortion of them serves as effective preventive. On the following pages the chief features of the technology of the methods employed in the mining and milling of large low-grade copper deposits are briefly reviewed, and Mr. C. B. Lakenan, general manager for the Nevada Consolidated, contributes to our discussion column further data of much interest. These new methods merit extensive critical discussion, but of a character different from that which they have heretofore evoked. We hope that many engineers will join in the serious discussion of the problems involved, and from such a discussion results of value will be obtained.

WINTER is closing in on the Far North. The last steamer has backed away from the wharf at Dawson and started down the Yukon. From now only the White Pass route will be open and the last boat up the river is scheduled to leave October 10. At Nome 'last' boats are loading, and at Fairbanks and Chitina stages are being prepared for the winter run. The fall exodus is in full swing, and everyone whose business permits is starting 'outside.' Thousands, however, will stay behind, and he knows but little of Alaska and the Yukon who thinks of winter as a period of hibernation. Ice and snow make the trails good, and thousands of pounds of freight are now waiting for the freeze-up which permits transportation to the scattered mines and prospects that are to become mines. Fewer people will be in the country, but underground work will be pushed vigorously, and great piles of frozen dirt will grow apace awaiting the breath of spring to unlock the gold.

REJECTION of closer relations with the United States by Canada, accompanied by intimations that our commercial, legal, financial, social, and ethical standards are by no means what they should be, as voiced by Rudyard Kipling, might well cause chagrin, but some balm for the wound may be found in a recent pamphlet by Mr. J. W. Moncada, ex-Minister of the Interior for Nicaragua, who sees in the United States the guide, friend, and protector of the Latin-American republics. Governments, which in the twentieth century are by the people, are therefore delightfully human, one phase of which is inconsistency. Canada, which long sought for reciprocity, has rejected it when offered; the Latin-American republics, which sometimes employed the Monroe Doctrine as a shield for schoolboy naughtiness, but apparently regarded it as a menace to entire independence, on the whole, may well come to recognize in the United States a help to true progress. The United States is not likely to wish to acquire more territory—anyone who will promise to give the Philippine Islands a good home and be kind to them should apply to Washington, D. C.—and closer trade relations with the adjacent portions of North and South America can result only in mutual advantage.

EUROPEAN countries have exhibited much friction in their international relations recently, and public attention has been so engrossed with the Moroccan situation that the declaration of war upon Turkey by Italy came as a surprise. Tripoli is but a couple of hours by steamer from Sicily, and in the course of time a large Italian population have engaged in trade and industrial development along the adjacent African coast. Under Turkish rule a situation has arisen in Tripoli which has some resemblance to that in Cuba in 1898. The war is likely to be even more brief than the Spanish-American war, Germany having already proposed what is practically a sale of Tripoli to Italy, and the really important effects of the outbreak are likely to be upon the Government of Turkey, which has scarcely a firm seat in the saddle as yet, and upon European relations generally, more especially in regard to Morocco. Meanwhile an element of humor is injected into the situation by the comments of the daily journals, some of which seem to think Tripoli a city in Morocco, while a well known daily gravely suggests that, like Great Britain in South Africa and Russia in Manchuria, Italy is likely to find a war conducted at a great distance from a base of supplies long and arduous!

Welcome to the Institute

The American Institute of Mining Engineers, which is in session at Los Angeles today, and which will hold meetings at San Francisco next week, is the largest and most representative organization of mining engineers in the world. With a distinguished history extending back to 1871, and a membership of over 4000, representing nearly all the countries on the globe, the Institute includes practically all the great engineers who have contributed to the progress of American mining and the spread of American practice abroad. It is a catholic body and extends membership not only to practising engineers, geologists, and metallurgists, but the students who are to become the engineers of the next generation, and to lawyers, business men, and others whose affiliations are with mining. The wisdom of this generous welcome to associates has been at times a matter of discussion and criticism. For ourselves, we have held that the Associate membership is a source of strength to the Institute rather than of weakness. If the line has been drawn a bit carelessly at times, the amendments to the constitution now under discussion and presented in full on another page, will right the matter. While there are many members who possibly have done little to further the interest of either the Institute or of mining, it is extremly rare to find an American mining engineer of real ability and achievement, who is not a member of the Institute. In California alone there are more than 300 members. Around San Francisco Bay there are 120. What is true of California and San Francisco is equally true of every other great mining State and centre in America. Everywhere the Institute is at home, because everywhere there are enough local members to assure a good meeting. Reinforcing the California members this week a large delegation has come from the East, with smaller ones from North and South.

It is the pleasant duty of the local members to meet and entertain the visitors. A dozen years have passed since they last had that privilege, and, while the California of 1911 is a very different California from that of 1899, the same hearty welcome awaits the visitors.

In 1898, the year preceding the last meeting of the Institute in California, the total mineral production of the State amounted to $27,289,079. Of this amount more than half, $15,906,478, came from the gold mines, and, indeed, mining in California was then dominantly gold mining. The four mineral products following next in order of value were petroleum, $2,396,420; copper, $2,475,168; quicksilver, $1,188,626; borax, $1,153,000. In 1909, the last year for which complete figures are available, California mines produced $79,945,078. The difference in the distribution of the production is as significant as is the growth of the total. Gold, though amounting to $20,703,600, is no longer first. It had even in 1909 been surpassed by petroleum with a total value of $30,675,267. Third in the list was copper, with an output valued at $6,963,932. Quicksilver had dropped to $658,688, a reflection not only of decreasing grade of ore, but of increasing consumption of cyanide. Borax amounted to $1,534,365, a moderate increase on the production of 1898. A whole group, however, of materials only produced in insignificant amounts in 1898 have come to the front in the interim. A great cement industry has been established, and an output worth $5,899,784 tells the same tale of industrial expansion as does a production of clay goods to the amount of $4,437,165, and of stone to a total of $3,444,900. Later figures where available but emphasize the contrast. California is no longer the State of the Argonauts, but an industrial commonwealth in which fuel and structural materials are of first importance.

Gold mining, the historic indvstry of California, is still its leading metal-mining industry, and there could be no more mistaken notion than that the day of mining has passed in this State. Gold mining has increased mightily, but other industries have grown faster. California is still the first American State in point of gold production, and in 1910, according to the figures of the Mint, yielded $21,146,150. The sources of the production in 1898 and 1910 stand in interesting contrast. Then the five leading counties in gold and silver production were: Nevada, $2,037,104; Amador, $1,808,105; Tuolumne, $1,750,535; Shasta, $1,031,948; Kern, $1,023,933. In 1910 they were for gold alone: Yuba, $3,204,273; Amador, $2,646,246; Nevada, $2,533,843; Butte, $2,487,791; Shasta, $1,533,728. The changes in the industry are even better shown by figures compiled by Mr. Charles G. Yale for the interesting souvenir volume published by the California Miners' Association in 1899, and for his official report to the United States Geological Survey for 1910. In 1898, $12,488,321 worth of gold came from quartz mines, $1,028,547 from drift mines, $962,192 from hydraulic mines, and $1,841,473 from placer mines. In 1910 the figures were: quartz mines, $10,005,190; drift mines, $516,929; hydraulic mines, $635,498; sluicing, $186,114; dredges, $7,550,254. The most important and significant change has been the growth of dredging from a position where it was not separately listed, the yield in 1898 being $18,847, to a position but little below that of the quartz mines. In the souvenir volume already mentioned, Mr. R. H. Postlethwaite gave a graphic picture of the dredging industry that was then just beginning. Three small dredges were then in operation at Oroville with buckets of 3¼ cubic foot capacity. Now there are 68, ranging in size up to giants with buckets of 15 cubic foot capacity. Next week the engineers will be taken to Folsom where, as guests of the Natomas Consolidated of California, they will see some of the largest and most modern boats. On another page of this issue Mr. Newton Cleaveland, who is in charge of the work for the Natomas company, gives interesting details regarding one of the boats that will be visited. The great mines of the Mother Lode and in Nevada county have held their own, but by their side has grown up another mining industry of first rank.

In 1898 the petroleum production of California was 2,429,088 barrels. In 1910 it was 73,000,000 barrels, and the value direct and indirect is beyond calculation. When the engineers visited the State last, the Los Angeles, Summerfield, Kern River, and Coalinga fields had all been opened, but the great production had not begun. It is worth noting that these old fields are still producing oil, though the engineers will see a practically new industry both on the Coast and in the Valley. Cheap fuel, the long lacking requisite of industry on the Coast, is now available.

The same contrast may be observed between copper mining in 1899 and 1911. Then the Mountain Copper Company, Limited, was practically the only producer in the State. It made 21,422,000 pounds of copper in 1898, working on ore containing 8.42 per cent and wasting all the sulphur. Now this company has as an active companion in Shasta county the Mammoth Copper Company, and, temporarily idle, the Balaklala Consolidated Copper Company and the Bully Hill Copper Mining & Smelting Company. In the foothills of the Sierras the Penn Mining Company is producing. Ores assaying less than 2½ per cent copper were smelted in California this year and the Mountain Copper Company no longer wastes its sulphur. A plant on San Francisco Bay converts it into acid, which in turn is used for making fertilizer, and a great phosphate industry is being established in the West. The day of careless waste and open-handed generosity has gone from the sunny land first conquered by the Padres. Industrialism is now triumphant and every man must give accurate account of the materials that are placed in his hands. Men, however, have changed less than their environment. The sturdy spirit of enterprise that marked the pioneers of California rules their descendants. The changes noted have but broadened the field for success. Our visitors will find a State that faces the ocean of opportunity and a people with the spirit to achieve.

Rights of the Reader

In the September issue of *The Mining Magazine* Mr. T. J. Hoover refers to the inadvisability of publishing articles of any permanent value in journals of limited circulation. While we cannot agree with him in his designation of the *Western Chemist and Metallurgist* as a 'backwoods' magazine, yet the main point is well taken. Every engineer is now familiar with the phase rule, first published by Willard Gibbs in the proceedings of a small Connecticut society, whence it was only disinterred after the lapse of many years, by a German investigator and brought to its rightful recognition as one of the most notable achievements by American men of science. Graduate students at our universities not infrequently undergo the unpleasant experience of devoting several years to an investigation, only to find, when the work is well advanced, that all the essential features have already been published in some little known periodical. The loss in such a case to a young man of limited means is often serious, and a just regard for the rights of others, as well as a proper appreciation of the attention which a notable article should attract should prompt its publication in a medium which is easily available. A reasonable number of journals devoted to each phase of current thought are necessary in order that progress may be viewed from enough angles to obtain the proper perspective, but reckless multiplication should be decried as a hindrance rather than an aid to progress.

Recent Problems in Copper Production

AN EDITORIAL REVIEW

It is not too much to say that development during the last decade has completely revolutionized the copper situation. How sweeping the changes have been may be seen from a comparison of the tables below.

FIFTEEN MOST IMPORTANT COPPER PRODUCERS, 1901

(As given in *Mineral Industry* for 1902)

		Pounds.
1.	Anaconda, Montana	101,850,000
2.	Calumet & Hecla, Michigan	82,520,000
3.	Butte & Boston, Boston & Montana, Montana	58,029,000
4.	Copper Queen, Arizona	39,781,000
5.	United Verde, Arizona	34,520,000
6.	Montana Ore Purchasing Co., Montana	29,899,000
7.	Quincy, Michigan	20,540,000
8.	Arizona Copper Co., Arizona	20,535,000
9.	Tamarack, Michigan	18,001,000
10.	Butte Reduction Works, Montana	17,970,000
11.	Detroit, Arizona	17,535,000
12.	Osceola, Michigan	13,723,000
13.	Parrot, Montana	10,168,000
14.	Old Dominion, Arizona	10,094,000
15.	Colorado S. & M. Co., Montana	7,465,000

FIFTEEN MOST IMPORTANT COPPER PRODUCERS, 1911

(Estimated)

		Pounds.
1.	Anaconda, Montana	250,000,000
2.	Phelps, Dodge & Co.	133,000,000
3.	Utah Copper	94,000,000
4.	Calumet & Hecla	74,500,000
5.	Nevada Consolidated	63,000,000
6.	Calumet & Arizona	50,000,000
7.	Greene-Cananea	47,000,000
8.	Copper Range	32,500,000
9.	North Butte	28,000,000
10.	Quincy	21,500,000
11.	Granby	21,500,000
12.	Ray Consolidated	20,000,000
13.	Miami	15,000,000
14.	Shannon	15,000,000
15.	Tennessee	13,000,000

Ten years ago the important factors in the situation were the comparatively rich sulphide ores of Montana and the Southwest, the native copper ores of Lake Superior, and pyritic ores in various places. Some years since the latter were objects of great interest and attention, and were expected to have great influence on copper production. Later experience has gone to show that this importance was perhaps overemphasized. Large masses of pyritic ores are not everywhere available and with those known to exist it is not at all easy to maintain the sulphur content at the high level necessary for carrying on pyritic smelting, and when this Ultima Thule is attained the smelter manager is likely to find himself in the toils of neighboring agriculturists, as the problem of avoiding damage suits when smelting with over 30% of sulphur on the charge is by no means a simple one. The advent of the so-called 'porphyry coppers' has been the most significant event of recent years, and the important place which they have already taken is evidenced by numbers 3, 5, 12, and 13 in the table given above. To describe them somewhat epigrammatically, material not previously classed as ore is mined upon a larger scale and at a lower cost than before, by novel methods, and the resulting ore is milled with a greater recovery than previously deemed possible, with the final result that deposits which until recently had no value are now a source of great profit. So much ill-considered and misdirected criticism has been leveled at these enterprises that it seems desirable to review briefly the problems met in their exploitation. The following has been prepared after a brief study of the operations of the two most notable enterprises of this kind, the Utah Copper Co. and the Nevada Consolidated Copper Co. To the officers of these companies we are indebted for the facilities afforded in the study of their operations. Further details of much interest, contributed by C. B. Lakenan, manager for the latter company, appear on p. 458.

In dealing with these recent problems of copper production, we have to do not with new species alone, but new genera. It is not remarkable, therefore, that some have found themselves unable to believe in the results actually attained. A rough but not inapt comparison is to say that these new methods of work bear to the older methods much the same relation that a street railway system bears to stages and omnibuses. In other words, it is the relation between a large volume of work carried on at a uniform rate with a low unit cost, and a smaller volume of work to which a larger degree of individual attention and effort is given at a higher unit cost. Where work is carried on at the rate of ten thousand or fifty thousand tons per day it permits the use of methods which eliminate the factor of individual attention which makes high unit costs. The 'porphyry coppers' are large masses of igneous rock which carry small amounts of copper ore, fairly uniformly disseminated throughout the mass. Size and uniformity of content are, then, the essential factors. The problems are to determine the size and uniformity of content of the deposit, to mine it as cheaply as possible with a daily production of many thousands of tons, to mill the product with a high percentage of saving and at a low cost, and then to smelt the concentrate as cheaply as possible. These will be discussed in more detail, taking them up in their logical order.

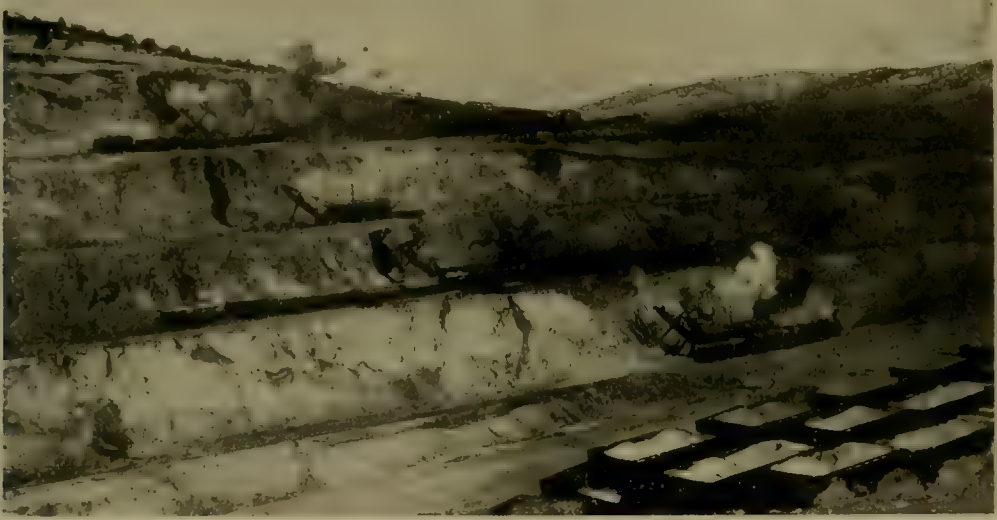
EXPLORATION

To determine the extent and content of ore deposits of this character the churn-drill affords the quickest, cheapest, and most satisfactory method, by far. The general features of churn-drilling have frequently been discussed in these columns and it would not be profitable to review them here. One or two points may be mentioned, however. A regular system of blocking out the ground is adhered to, as it should be. There will frequently be a tendency to lose the holes which are being put down in richer parts of the deposit. It would naturally be expected that these would contain more 'slips' and bad ground, and great difficulty may be experienced, therefore, in reaching to the full depth of the ore. But when such depths as can be reached have disclosed a sufficient quantity of ore of high enough grade to justify the inception of the enterprise, these areas may safely be left for later attempts at drilling, as experience has shown that additional reserves are always welcome, tending to greater economy by allowing an increase in the scale of working with a resulting lower unit cost. In the development of new enterprises of this character it may prove a question of much importance as to how long the beginning of actual construction work may be delayed waiting for the completion of exploratory work. This problem may solve itself at times, when the construction of mill and smelter in successive units automatically keeps step with the enlargement of ore reserve by drilling. In the case of the properties previously mentioned, the management has been extremely conservative in this regard, and those in charge of subsequent projects may well follow their example.

MINING

Practically only two types of mining methods are applicable to such deposits: (1) stripping and removal by steam-shovels when the deposit lies near the surface, and (2) some form of caving method when deeper seated. The latter methods have been developed in dealing with the iron ores of Lake Superior; their use in this connection has been so fully discussed elsewhere and their application to copper ores is so recent that no further discussion of them will be attempted here. Steam-shovel mining was also developed in handling the Lake Superior iron ores and has been applied with notable success in stripping and mining the 'porphyry coppers,' where with overburdens of one hundred feet or less in thickness and with three or more tons of ore uncovered per ton of capping handled, this method of mining is capable of yielding large daily tonnages at a low unit cost. While the two cases are not strictly comparable it will be of considerable interest to give some records of output at these mines and upon the Panama Canal. During June 1911 the No. 7 shovel of the Nevada Consolidated Copper Co. handled 74,000 cu. yd. of stripping. The No. 6 shovel handled during the same period 121,000 tons of ore (averaging 6% moisture) and 11,000 cu. yd. of stripping at an average cost of 15c. per dry ton of ore, and 34c. per cubic yard of stripping. The record upon the canal is held by shovel No. 257, a Marion, working in rock in a borrow pit on Gatun ridge, on the railroad relocation. This shovel during the six months of February to August 1911 averaged 62,864 cu. yd. per month, while the 40 shovels at work on the Central division during July averaged little more than one-half of this (1,314.8 cu. yd. per shovel per day), though showing an increase in daily output of 6.77% over that attained in 1910. The figures given are obtained by cross-section measurement in both cases. These shovels are of two sizes, 5-yard and 'class 70'; the Nevada Consolidated shovels are 5-yard, 95-ton Bucyrus shovels using 3½-yard dippers where the digging is hard, and those of the Utah Copper are Marion, Bucyrus, and Atlantic 5-yard shovels which have been fitted with 3½-yard dippers, as it is found that better service is obtained by decreasing delays by the lessened repairs. How much these amount to is evidenced by the fact that a shovel is actually engaged in the useful work of loading cars only about 40% of its time, the remaining 60% being occupied in trimming the face, moving back and up on account of blasting, advancing the tracks as work progresses, making minor repairs, and waiting for cars. The last is decreased by having an ample supply of cars and locomotives to move them. But it is not usually possible to cause the cars to follow a circular path, and the time required to run a loaded train out of the pit and run in the train of empties which has been waiting is frequently equal to or greater than the time required for loading. When other delays can be concentrated into this period the wait does not greatly matter, but it is obvious that the delays are likely to show an annoying tendency to get out of step and to make the stopping of the shovel necessary during the precious moments when the train is waiting to be loaded. Detailed costs of the steam-shovel work have not been made public by the mining companies, but we give below the statement of the average costs in the Central division of the Panama Canal for the three months of April, May, and June, 1911, as given in the *Canal Record*. These costs are based upon 4,186,518 cu. yd. handled during the period, or approximately twice the yardage handled by the Utah Copper Co. in the same time. It can scarcely be necessary to add that costs are not strictly comparable in the two cases, but the figures will serve to show the important factors in the work.

	Cents per cu. yd.
Drilling	5.42
Loading	5.04
Blasting	6.76
Tracks	8.14
Transportation	7.47
Dumps	4.42
Pumps	0.56
Maintenance and equipment	9.78
Plant, arbitrary	10.00
Division expense	1.17
Administration and general expenses	4.78
Total	63.48



STEAM-SHOVEL WORK, NEVADA CONSOLIDATED.

As noted above, the stripping cost at the Nevada Consolidated is given as 34c. per yard, but this undoubtedly does not include the last three items of the statement above, and it is impossible to rigidly compare costs in the absence of a detailed comparison of the conditions of work. At the Utah Copper the stripping cost is 33c. per cu. yd., which includes all items except the last three. It has been argued that it is not necessary to make an arbitrary charge for the amortization of plant, as repairs and renewals are included in maintenance, so that amortization would merely need to provide for the difference between the selling value and the book value of the plant at the cessation of operations. If this sum is actually set aside during the life of the property, preferably during its middle years, this plan has at least the advantage that it lightens the burden upon the first years of working when the working conditions are less favorable than at a later period.

It is impossible in the limited space at our command to take up a detailed analysis of all the features of this work; nor does it seem desirable to do so; yet some points should be briefly alluded to. The contour of the ground has an important influence on this work. It is necessary to carry on the work in successive benches, separated by slopes of a height and steepness varying according to the sum of the conditioning circumstances. In our issue of March 4, E. E. Barker discussed in detail this question of permissible slopes, concluding that under the conditions obtaining in the Copper Flat pit of the Nevada Consolidated the most desirable slope for economical operation is 1.75 to 1. The Utah Copper, having steeper natural slopes and greater differences of elevation counts, on using 1 to 1 slopes, and the high bank now carried on the edge of the big pit has a height of 250 ft. and a 50° slope, upsetting previous ideas as to the maximum permissible slopes. It is obvious that where the natural topography is steep it will be necessary to carry a large number of slopes, with a correspondingly great increase in the amount of trackage required, and of steep grades in order to reach the necessary elevations. On the other hand, some degree of compensation is found in the greater number of working faces afforded, thus allowing an earlier completion of the stripping of the orebody, and the more ample dumping ground for waste available upon a steep surface. As seen from the foregoing figures, the maintenance of tracks is a question of much importance; where these are greatly curved in the effort to 'make grade' the cost of the increased wear and the added delays due to derailments and other mishaps are a not unimportant factor. Drilling and blasting are carried on by separate crews, and the separation of capping from ore is effected by drilling through the capping until the ore is met, the capping is then blasted off, and the ore later drilled and blasted. The ore surface is a warped one, and in passing from capping into ore a working face will at some period be partly in one and partly in the other. This offers no difficulty where the transition occurs horizontally, as the ore may be loaded into one set of cars and the overburden into another, but where the dividing line occurs part way up the slope it is impossible to prevent the overburden from sliding down and becoming mixed with the ore as the latter is being removed. This is not a serious matter, however, as no ore is lost thereby, and even if 10% of barren waste should become mixed with the ore its total effect would be to decrease the grade of ore from 1.50 to 1.37% copper, for example. At Utah Copper not over 4 or 5% of waste containing copper is mixed with ore while mining ore next to capping, and after the capping is completely removed the ore will be mined clean. On the whole work this is of but slight importance, but in every case there will be a period during which the slopes are passing out of overburden into ore when this will assume an exaggerated temporary importance. In an ideal mine it would be easy to plan the work so as to minimize all the factors which militate against economy in steam-shovel mining, but in any actual case disturbing factors cannot be avoided. For example, it may be necessary to work at a disadvantage in order to obtain an immediate regular supply of ore for the mill and smelter, where greater economy in mining could be obtained by postponing the removal of ore until stripping was farther advanced. For this reason the ore supply at the Utah Copper has at present to be supplemented by ore broken underground at a cost approximately four times that of open-cut work. A portion of this extra cost will eventually be returned by the saving in drilling and blasting charges when the filled slopes are afterward mined by steam-shovel. This increased cost of mining of a portion of the ore may legitimately be regarded as a charge against the mill for keeping it in steady operation; in other words the cost of shutting down or operating the mill at part capacity is borne by the mine. It will readily be perceived that to an even greater extent than in ordinary mining the early operations are conducted at a disadvantage. Though the great capital expenditure for stripping is distributed over the life of the mine it necessarily, as a 'factor of safety,' imposes a heavier burden upon the early life of the mine when operating costs are higher than in the later work and the securing of the economies of full-scale operations are difficult.

The transportation of ores from the mines to the mills is an important factor in the cost of production, but it is so purely a matter of railroad operation that no discussion of it will be attempted here.

MILLING

It can scarcely be necessary to say that the problems of milling ore at the rate of ten thousand tons or more per day differ markedly from those arising in a small mill. In the former case large expenditures of capital for the purpose of reducing unit costs slightly, or for making a little higher saving, are advisable, and it may further be pointed out that the amounts of capital expenditure thus justified are much larger than might be expected without careful consideration. In milling, for example, an ore containing but 31 lb. of copper per ton, it will be obvious that a considerable saving will be necessary merely to defray the expenses of handling the ore. Suppose it is necessary to save 15 lb. per ton of the copper in order to defray operating costs. If the total saving is 18 lb. a certain profit will be made; if this saving can be increased 15%, or to 21 lb. per ton, an increase of 100% in the operating profit will be the result. Since, for example, the net operating revenue of the Utah Copper Co. during 1910 was nearly $4,000,000, the importance of this factor is easily grasped. For this reason careful study of the problems involved and intelligent modification of methods employed are not only possible, but necessary. It is not too much to say that milling practice at these large mills exemplifies the most advanced work yet done in the art of ore dressing. This is evidenced by the fact that a much higher recovery is made than previously deemed possible upon ores of this character, at an unexpectedly low operating cost. As the result of careful study the recovery has gradually been increased until, at the Arthur plant of the Utah Copper Co., it has reached at times as high as 77% and averages well above 70%, a substantial improvement on the first work done by this mill. As previously pointed out, this represents an enormous increase in operating profit, and would have justified a much larger expenditure of capital than was required to secure it.

The problem of milling these ores, though complicated in detail, is simple in its general features. To crush the ore as quickly and as cheaply as possible to a size which will permit the separation of ore and gangue, to make this separation as complete as possible with the fewest operations and machines and with the least possible production of slime, are the requirements for success. It is impracticable to attempt a separation of gangue and valuable mineral on material coarser than 10 mesh, on account of the fine state of division of the copper minerals. The coarse lumps are therefore crushed in gyratories and the whole mass reduced to 10 mesh by rolls, following the generally accepted practice. The coarse concentrate is then removed on roughing tables of the Wilfley type. The tailing is classified and the coarser portion of it is re-ground in Chilean mills to pass 40 mesh. The use of rolls for this re-crushing has been advocated upon the theory that they would make a smaller proportion of slime, but careful experiment has gone to show that the Chilean mills are more satisfactory for re-crushing material of this degree of fineness. The re-ground product is carefully classified, and like the former product, distributed to tables and vanners which are operated at a high capacity. This high capacity is made possible by careful classification and the classifiers must be regarded as machines of much importance in the mill work. Various types of classifiers have been employed, but the Richards-Janney has, so far, given the most satisfactory combination of capacity and refinement of product.

An important problem in milling is the loss of copper in material finer than 200 mesh. This is always more than half of the total loss, and would seem to be a strategic point of attack to secure an increase in saving. Unfortunately milling methods have, until recently, ignored this class of material, which is commonly designated as 'slime' and regarded as an impossible subject for treatment. Where its quantity and value are small this is a justifiable attitude, but where it represents the loss of millions of pounds of copper per year a closer scrutiny becomes necessary. Two lines of attack suggest themselves; to crush and separate the valuable mineral with the production of as little slime as possible, and to secure a better saving from the slime. The former method of attack has probably been pushed nearly to its limit in the mills of the Utah Copper Co., where practice in this regard exhibits a high degree of perfection. It is obvious that minerals cannot be separated in a coarse state which are present in a fine state of dissemination, nor can any ordinary ore be reduced to a fineness of 40 mesh by any known method of crushing without the production of large amounts of −200 mesh material.

Making a good recovery from material finer than 200 mesh is a disheartening task. That it is not an impossible one seems to be indicated by a screening analysis of the tailing from these mills, which shows that the tailing between 100 and 200 mesh has the lowest copper content of any. There seems no reason to believe that at 200 mesh an arbitrary line is overstepped, beyond which good recovery is impossible. But this may be looked at in another way; if the material approximately 200 mesh in fineness is low in its copper content, while all the material finer than 200 mesh shows a fairly high average, it follows that the finest material must have a proportionately high content of copper, or as it is ordinarily expressed, the copper minerals have 'slimed' in crushing. There is much difference of opinion over the proper definition of slime, but it may be defined for the present purpose as material which does not settle quickly. As the machinery used for making the separation of valuable minerals from gangue utilizes their relative settling ratio in some form or other, it is powerless to deal with material which will not settle.

MAGNA MILL, UTAH COPPER COMPANY.

Why will not fine material settle in water? The rate of settlement of solids in water depends chiefly on: (a) the relative density of the solids to the water; (b) the sizes and shapes of the particles; (c) the velocity of flow of the water; (d) the nature of the solids; (e) the ratio of solid to water; (f) the presence of electrolytes. The mass of the given particle is acted on by gravity, tending to make it fall in the water, while opposed by the various resistances indicated above. It is not clear at first why the size of the particle should affect its rate of settlement, but when taken in conjunction with the other factors the effect is clear. In dealing with a mineral particle consideration must also be given to what may be called its 'extraterritoriality,' an area immediately adjacent to the particle which exhibits phenomena as though it were actually a part of the particle. In other words, when a mineral particle falls through water the line of separation is not between the mineral and the water, but between the water which adheres to the mineral and the water through which this water-mineral aggregate is falling. This concept immediately introduces a highly complicated series of relations which are as yet imperfectly understood. Suppose there is a series of perfect spheres of equal size made of different minerals, will each sphere control an equal 'extraterritorial' area, or will they be unequal? And, in dealing with spheres of different sizes of the same material, will the ratio between mineral area and extraterritorial area be equal for all sizes? It is not known, but the weight of present evidence inclines to the belief that they are unequal in both cases. Accepting this view, it may result that with small equal sized particles of valuable mineral and gangue, the difference in extraterritorial area may so alter their relative settling ratios as to make a separation by any method based on settlement impossible. A further important point is the character of the solid. During fine grinding some of the minerals present are converted into colloidal hydrates and silicates, as pointed out by R. E. Ashley in the *Mining and Scientific Press* of June 12, 1909. It seems probable that these colloids attach themselves to the sulphide particles, much as oil does, the resulting aggregate having a structure similar to that of egg divested of its shell, the sulphide particles corresponding to the yolk and the colloids to the white. It is readily seen that this action would so increase the effective area of the sulphide particles as to militate strongly against their recovery by ordinary ore-dressing methods. Possibly the addition of milk of lime during crushing would be of service in preventing the formation of colloids. The effect of the presence of electrolytes has been studied in cyanidation, but little is known of its influence on ordinary ore dressing. Enough has perhaps been said to indicate that the problems involved in the milling of these copper ores yet requires much study and experiment. The operating staff is naturally jubilant over the securing of much better results than ever previously obtained; the management properly keeps its attention fixed upon the saving still to be made. Indeed, with tailing losses amounting to nearly three million dollars per year, this is a matter worthy of all the thought and experiment now being devoted to it. On the other hand, the old story of the superintendent who upon being asked why his recovery was not higher replied, "copper is the cheapest thing I've got," is not without its point. The line where an increased saving can be gained only at a cost which renders it profitless is a skirmish line which the technical staff of the operating companies is advancing as fast as practicable.

SMELTING

Smelting, refining, and selling the copper is of great importance, both because of the complexity of the operations involved and because it is the most expensive step in the series of operations. This is shown in the following table, deduced from the figures published in the annual reports of the Utah Copper Co. and the Nevada Consolidated.

	Cost of production in cents per pound. I.	 II.
Mining and development	1.01	1.83
Milling	1.92	2.08
Transportation	0.86	1.33
Smelting, refining, and selling	3.58	2.83
	7.37	8.07
Concentration ratio in milling	10 into 1	25 into 1

The relatively greater smelting costs in case I are due to the large tonnage smelted, the ratio of concentration in milling in the first case being approximately 10 into 1, and in the second 25 into 1. This, of course, is an individual problem, and the hasty generalization that the cost of production in case I might be decreased by increasing the ratio of concentration cannot be so quickly arrived at. The percentage of valuable mineral saved is now about the same in both cases; by increasing the concentration in case I the percentage of saving would be decreased. Furthermore, it is necessary to keep the requirements of the smelter in mind, whether to obtain the minimum rate from a custom smelter or to furnish a suitable product to the privately owned smelter.

Improvements in smelting methods have developed almost independently of methods of mining and milling, except so far as the problem of handling enormous tonnages of fine concentrate has circumscribed progress. The improvements in reverberatory practice have now practically settled the discussion as to the relative merits of blast-furnace and reverberatory carried on in the columns of the *Mining and Scientific Press* during 1906. It is now recognized that each has its proper field, and the handling of fine is clearly the field of the reverberatory furnace. The various methods for sintering or aggregating fine have been practically abandoned in the copper-smelting field, except as aids in the handling of flue-dust in some cases. How great recent progress in smelting has been may be graphically and not inaccurately indicated by saying that where formerly the effort in reverberatory smelting and in converting was to keep the furnaces and converters hot enough to keep the process in satisfactory operation, now the effort is to prevent them from becoming so hot that they are destroyed. In the case of the reverberatory this has been brought about by improvements in the method of firing and in furnace construction. The draught has been increased to nearly two inches of water, the furnace built so as to exclude unnecessary air, and the fires so placed and managed as to keep the greatly increased hearth area uniformly hot from end to end. This elevation of working heat-level would quickly result in the destruction of the furnace were it not for the frequent and copious feeding of charge at the hearth end, which rapidly smelts and is drawn off as matte and slag. The situation is not unlike that of a man who daily pays large sums into his bank, giving checks for nearly equal amounts, so that his actual balance, which in this case corresponds to the margin of safety between rapid smelting and destruction of the furnace, is actually small. The increased working temperature allows the raising of the roof, which formerly was kept close to the hearth in the effort to keep the heat down where it would do useful work, with the result that it was frequently burned out. The silica brick have been increased to 15 and 20 in. in length with good results.

Only two fuels are employed in reverberatory practice, coal and oil. Coal-dust firing, which was tried at the Highland Boy smelter at Salt Lake and at Cananea, has been discontinued, as was the use of regenerative gas-firing in Montana. In these cases it was found that these methods did not offer sufficient advantage under the then existing conditions to make it worth while to continue their use, but this should not be taken to indicate that the employment of coal-dust or gas-firing is contra-indicated in every subsequent case. Nor should it be hastily assumed that the great advantages of regenerative gas-firing in open-hearth steel practice can be easily reaped in reverberatory smelting; in the former case practically the only solid additions are steel scrap, in the latter the great quantity of solid fine works havoc in the regenerators. But this does not indicate that steel men and copper smelters cannot study each others' operations with profit.

Innovations are always regarded with enthusiastic approval, and the great advantages attending the use of oil as a fuel in reverberatory smelting are perhaps likely to be overestimated. The question of oil versus coal is actually a cold-blooded matter of dollars and cents. It is usual to reckon three to three and a half barrels of oil as equal to one ton of coal, which agrees well with results in practice; whichever of these is the cheaper, allowing for differences in cost of construction and maintenance, will be the fuel to employ. This will obviously be largely a matter of geography and friendly relations with transportation systems. Oil-firing offers the advantage that an auxiliary burner can easily be introduced into any part of the furnace in order to tide over a temporary emergency, but while great improvements have been made in the type of burners employed the damage to the roof has not yet been reduced to the point attainable in coal-firing. In both types of firing the heat utilized in the furnace is only about one-third that actually generated, the other two-thirds escaping to the waste-heat boilers, which should be of a type that permits easy cleaning. Probably little more than one-half of this is there utilized, so the combined efficiency of furnace and waste-heat boilers is something like 60 to 70%. But it must not be forgotten that there is no cheaper way to produce chimney draft than to utilize some of the heat of combustion for that purpose.

In converting, the most striking feature of recent progress is the wide application of the basic converter, which in copper metallurgy has long held the place occupied by the tariff in politics as a perennial topic of discussion. Recent articles have given in detail the construction of the Pierce-Smith basic converter and it is not our purpose to go beyond general features here. Basic converting is being successfully carried or in the ordinary type of converter, the general characteristic of the operation being that a large converter is employed, lined with magnesia brick, plastered with a magnesite-sodium silicate mixture, and so arranged that punching the tuyeres will not cause a destruction of the lining in that region. With these preliminaries everything is ready to add matte and silicious ore and go ahead. The silicious material is added in lump form; its addition in a finely divided state, though alluring, has proved difficult mechanically. A not unnatural question at this point is why, after the use of a basic lining has offered so much difficulty for so many years, it is now possible to employ it without difficulty. Various answers might be made to this; that it is now possible to prevent the destruction of the lining at the tuyeres, that a satisfactory inner lining to protect the expensive magnesia brick shell lining has been devised, and so on, but our personal opinion as to the real underlying reason is that now the converting operation is carried on with a sufficiently large active mass to give the necessary heat reserve—what may be designated as the working capital of heat—with a less temperature range. The losses are minimized by faster and more regular working and the heat is kept down by silicious additions. It was first thought necessary to pre-heat the lump ore added to the furnace, but this has been found not to be the case, and dry lump ore is now regularly used in converter practice. In the case of a custom smelter this is obviously a convenient method of smelting silicious ore.

It is not our purpose to go into the details of present smelting practice, and this discussion may well be brought to a close by pointing out that a smelter is a living organism and its life history, like that of all living organisms, consists of a series of adjustments to continually changing environment. Possibly the supersensitiveness of smeltermen to criticism, expressed or implied, in part arises from the too frequent ignoring of this truism and the setting forth of the excellencies of practice at a given place as though, like a patent medicine, they were universally applicable, and the pointing out of defects in practice without adding the qualification that the methods used represent the best that can be applied under the conditions.

* * *

LIGNITE is distinguished from sub-bituminous coal, according to E. E. Smith, in Bulletin 474 of the United States Geological Survey, by its color, texture, and amount of moisture. It is brown in color, or has a distinctly brownish cast. The texture is usually more or less distinctly woody, although some lignite, notably that of Texas, is amorphous. The amount of moisture ranges from 25 to nearly 45 per cent.

Valuation of Public Coal Lands

In response to a letter written by F. W. Mondell, representative from Wyoming and Chairman of the House Committee on Public Lands, the Secretary of the Interior has prepared the following statement regarding the present policy of the Government in valuing the coal lands before sale. Because of its particular interest throughout the West, it is published below in full:

Honorable W. F. Mondell,
House of Representatives

Sir: A reply to your letter of June 24, 1911, protesting against the present policy of valuation of public coal lands, has been delayed by my absence from the city, and by a desire to incorporate the latest data from official records. In your letter you state that the prices now being fixed on public coal lands are prohibitive, that they have paralyzed the coal industry of the West, that they have resulted in increasing the cost of coal to the consumer from 50c. to $1 per ton, and that they create a monopoly in the hands of the Government, and of those who acquired coal lands prior to the adoption of the classification policy. You also state that the prices in all the working fields run from $150 to $500 an acre, that millions of acres are rated at values above $180 an acre, that lignites are valued at hundreds of dollars an acre, and that the prices in the better fields are far in excess of those charged in commercial practice in the same fields or for the better-grade coals in the Eastern fields.

These statements are apparently based on a series of misapprehensions; first, as to the basis on which valuations are made by the Department; second, as to the prices which are actually placed on coal lands; and third, as to the effect which the classifications have had upon the sale of public coal lands.

There are estimated to be west of the 100th meridian 620 billion tons of anthracite and bituminous coal, 650 billion tons of sub-bituminous, and 720 billion tons of lignite. The valuation which the Department under the present scheme of classification places on any given tract of coal land is based primarily upon the tonnage and quality of coal which underlies that tract, so that the purchaser, instead of paying a flat rate per acre, pays by the ton for the coal which he buys, at values graded according to the character of the coal. Thus prices of lands underlain by anthracite and high-grade bituminous coals are computed at a maximum of 3c. per ton, whereas sub-bituminous coals of only moderate fuel value are rated at one-half cent per ton. An exception to the tonnage basis is made in the case of lignites and the lowest grades of sub-bituminous coals. Those are valued at the prices fixed by law as the minimum prices of coal land. No lignites are given values of hundreds of dollars an acre, nor any value greater than the minimum of $20 if within 15 miles of a railroad, or $10 if at a greater distance.

The tonnage values placed on coals are considered by no means unreasonable. The tonnage value for coal sold in the ground should be, in general, from one-fifth to one-half the royalty value of the same coal if paid for as mined, since the fee buyer has large risks and interest charges which a lessee has not. The price fixed under present regulations for a single bed of high-grade bituminous coal represents about one-fifth the computed royalty value of that bed, while values of additional beds, if more than one is present, are computed at much smaller fractions. For lower-grade coals the ratio of the Government sale price to the royalty values charged for the same coals in the same general region is still lower, being in some cases only one-fortieth and even less. The State of Colorado charges a royalty of 10c. per ton for coal mined from State lands, regardless of quality. Wyoming fixes royalties for all grades of coal mined from State lands at from 3 to 6c. per ton, depending upon the quantity produced. Private leases in Wyoming are reported at 10c., and for small local mines at royalties much higher. Fifteen cents is the royalty in the Miles City and Roundup districts of Montana, and the terms in the Trinidad and Boulder County fields of Colorado run from 8 to 27½c. The Government's price is in no case higher than 3c. per ton, and the great majority of the Western fields are being classified at from ½c. to 2c. per ton. No land is classified as coal land which is not underlain by a bed of a thickness and quality which has been commercially demonstrated to be workable in the United States. This system of valuation results in prices of which only a comparatively small part are $150 or more. Great areas are valued at the minimum, and other great areas at comparatively low figures. There cannot be millions of acres of classified lands rated above the figure you quote ($180) as "the highest price paid" by coal purchasers, since only 16 million acres of coal land have been priced to date. Values running into hundreds of dollars will be found only in the anthracite, bituminous, and very high-grade sub-bituminous fields, and in these only where the tonnage of coal is large.

In many if not most cases the prices fixed are less than the actual market price of private lands of the same character in the same fields. For example, coal lands in private ownership in the Rock Springs field, Wyoming, are reported to have been sold at from $180 to $430 an acre. The Government's prices in this field are from $20 to $465, the $465 price being for land with a greater tonnage than that covered by the land for which the $430 sale is reported. In the Colorado Springs district of Colorado sales of private land are reported at from $100 to $500. The classified prices in this district range from $20 to $50. It is true that some of the prices fixed by the Government are higher, acre for acre, than the prices asked for some of the highest grade coals of the Eastern fields, but the *greater tonnage per acre* in the Western fields makes the *value per ton* asked by the Government considerably less than that asked for even the low-priced Eastern lands. It must be remembered, moreover, that some of the Eastern fields are more remote from development or are subject to greater competition than many of the Western fields. The prices fixed in the most accessible and most active Western fields should not be compared with the lowest Eastern values, but with Eastern fields of the same accessibility. Lands in certain of the Pennsylvania fields are selling at $2000 per acre, whereas the highest price fixed by the Government on any of its lands is $608 per acre. The difference in quality between the coking bituminous coal of Pennsylvania and the non-coking bituminous coal of Colorado is more than compensated for by the fact that the Pennsylvania land in private ownership is sold on the basis of one bed of coal, and that less than 10 feet in thickness, whereas Government prices for the Colorado land refer to tracts underlain by four beds aggregating 23 ft. in thickness. The values for privately-owned lands in the Connellsville, Pennsylvania, district run as high as $300 per acre-foot. The highest Government price is $30 per acre-foot. It is plainly impossible that the net result of the classification policy has been to increase the cost of coal to the consumer from 50c. to $1 per ton, since the maximum Government price is only 3c. per ton.

Whether or not the prices fixed are prohibitive can best be judged from a study of the records of coal-land sales in the General Land Office. The following table shows that in the four fiscal years since the adoption of the classification policy the sales of public coal land have increased 12½% in acreage and 36% in value, as compared with the four fiscal years preceding July 1, 1907, and on inspection it will be noted in the table that during the first year of the four in which the reclassification has been in effect, the sales exceeded by 100% the average of the four years immediately preceding, but 1907 was the culmination of a period of industrial activity and boom conditions. In the fall of 1907 and during 1908 there was a sharp reaction from the somewhat inflated conditions of 1906 and 1907, and while there has been some recovery from the slump of 1907-8, the industrial situation is still far from satisfactory. During the last three years the production of coal has been in excess of the consumptive demand, and returns have not been remunerative to the producers. There has therefore been little to encourage the purchase of coal lands, and this condition easily explains the decreases in sales from 1907-8 to 1910-11. Moreover, largely because of uncertainty in the public mind during the past year regarding the stability of the Government's policy relative to public coal lands, and the feeling engendered by statements appearing from time to time in the public press, or referred to in public addresses, to the effect that the prices of Government coal lands should be lowered, prospective purchasers of such lands have been inclined to hold off. This hesitancy has naturally affected chiefly prospective purchases which were based on tentative speculation. On the other hand, legitimate locators who are proposing to proceed with actual development have been willing, after the lands in question have had prices placed upon them by the Government, to pay the prices assigned, since those prices are known to be based on very conservative tonnage estimates.

SALES OF COAL LANDS AT ALL PRICES

(Exclusive of Alaska)

Fiscal Year.	Entries.	Acres.	Receipts.
1903-1904	190	28,827.42	$ 395,309.90
1904-1905	158	20,456.35	277,402.40
1905-1906	244	42,143.39	538,683.70
1906-1907	157	20,387.02	303,255.60
Four years prior to July 1, 1907	749	111,814.18	$1,514,551.60
1907-1908	299	58,047.10	647,584.55
1908-1909	182	26,590.68	502,743.65
1909-1910	189	26,074.16	657,175.80
1910-1911	83	15,284.89	251,323.03
Four years since July 1, 1907	753	125,996.83	$2,058,827.03

TOTAL COAL LAND SALES AT VARIOUS PRICES SINCE JULY 1, 1907

Price per Acre.	Entries.	Acres.	Receipts.
$ 10.00	328	46,022.21	$ 461,099.33
15.00	15	2,310.55	34,658.25
17.50	1	40.00	700.00
20.00	258	52,833.03	773,028.80
25.00	37	11,171.68	131,671.70
30.00	23	3,159.81	94,794.30
35.00	2	239.78	8,392.30
40.00	8	800.06	32,002.40
45.00	...	240.00	10,800.00
49.00	1	40.00	1,960.00
50.00	69	8,218.63	409,023.00
65.00	...	200.00	13,000.00
75.00	2	161.23	12,092.25
90.00	1	121.69	10,952.10
92.00	1	40.00	3,680.00
100.00	1	38.48	3,848.00
120.00	1	40.00	4,800.00
135.00	1	80.00	10,800.00
140.00	1	120.00	16,800.00
170.00	1	39.89	6,781.30
180.00	1	40.00	7,200.00
270.00	1	39.79	10,743.30
Total	753	125,996.83	$2,058,827.03

Many of the lands sold since July 1, 1907, have doubtless been unclassified lands sold at the minimum price, but the table above shows that by no means all of the sales have been at minimum, and that the increase in sales for the four years is much more than equaled by the sales at classified prices greater than the minimum. In other words, the acreage sold at the minimum since classification began has actually been less than in the same period preceding, although the total acreage has increased, showing beyond question that the classification prices have not been prohibitive.

Although revenue for the Government is not the principal object to be attained in the classification of coal lands, it is worthy of note in the table just given that the sales at classified prices represent a clear gain to the public treasury of at least $407,134.50, and probably considerably more. This increase in revenue goes into the Reclamation Fund and is returned to the people of the West through the construction of reclamation projects.

Since the figures given above show that the prices fixed by the Department do not lessen the rate of sale of public coal lands, it follows that the classification policy neither injures the coal industry of the West nor creates a monopoly of coal lands in the hands of those whose title antedates the beginning of the classifications. The present healthy condition of the Western coal trade, in a region where the title to a large area of coal land still rests in the Government, as compared with conditions in the East, where the trade is unaffected by the public coal-land policy, is shown by the fact that the coal production of the Rocky Mountain States was 14.7% greater in 1910 than in 1909, although for the whole United States the increase in production for the same period was only 8.85%. The prices now fixed are designed, not to create monopoly in the hands of present owners of coal land, but to prevent monopoly by making it unprofitable to purchase large areas for indefinite holding without development. This, in fact, is the constant aim of the Department in the prices which it puts upon public coal lands—to make them low enough so as to encourage purchases for immediate development, yet sufficiently high so as to discourage purchases for long-time holdings for speculation or for monopolization. Prices prohibiting development would be inimical to the present interests of the people of the West; prices permitting purchase with a view to monopolization would be inimical to their future interests. The sole object, therefore, is to so value the lands as to permit development and to prohibit speculation.

In view of all the facts, however, I am convinced that the prices now being placed on the public coal lands are neither unreasonable nor exorbitant, and that the increase in the sale of coal lands for the four-year fiscal period subsequent to July 1, 1907, in comparison with the preceding four-year period, together with the present condition of the Western coal industry, demonstrate conclusively that the present classification policy is not open to the criticism you make.

It may well be that a liberal but wisely protected leasing law would be found to promote development more vigorously than any system of outright purchase. Such has been the case in Australia and New Zealand; and Canada has adopted the leasing system in its Yukon territory. It relieves the coal operator from the large capital expenditure of which you complain, and absolutely requires development as a condition of the lease.

Very respectfully,
WALTER L. FISHER,
Secretary.

Kansas City, Missouri,
September 27, 1911.

ACCOUNTS so far published show that the geology of the Porcupine district is essentially similar to that of Opasatica, and the gold occurs in similar quartz-ankerite veins. Tellurides have not yet been discovered at Porcupine, but it has been reported that some apparently unpromising veins have yielded good assays, which may be due to the presence of tellurides. In other veins the free gold at the surface has been found to continue in slightly increasing quantity down to depths of 200 ft. If this represents the zone of oxidation, then an enriched zone may be expected not far beneath.

Nevada Metal Production in 1910

The total value of the mine output of gold, silver, copper, lead, and zinc in Nevada in 1910, according to V. C. Heikes, of the United States Geological Survey, was $34,152,148, as against $30,072,932 in 1909, showing an increase of $4,079,216, or over 13.5 per cent.

The total production of gold in 1910 was 913,265.05 oz., valued at $18,878,864, a gain of $2,638,901, or 16%, over the 1909 production. Of the gold output 7851.70 oz. came from placers (mainly in Nye county), 880,180.93 oz. from silicious ores, 21,230.87 oz. from copper ores, and 3998.55 oz. from lead, zinc, copper-lead, and lead-zinc ores. Silicious ores yielded over 96% of the entire gold production. From bullion in gold and silver mills was recovered 728,139.67 oz., concentrate produced 76,696.62 oz., and crude ore shipped to smelters contained 100,574.06 ounces.

The largest production of gold was from Esmeralda county—$11,994,338 in 1910, against $10,341,397 in 1909. Of this production the Goldfield district yielded $11,137,150, an increase of $1,753,889, or 15.7%, over 1909. Nye county produced $3,661,967 gold in 1910, against $2,945,942 in 1909. The Tonopah mines yielded $2,303,702 gold, an increase of $903,341, or 64.5%, over 1909. The Comstock mines produced $502,843 gold, against $556,621 in 1909.

The silver production of Nevada in 1910 was 12,479,871 oz., valued at $6,739,130, against 10,981,061 oz., valued at $5,710,152, in 1909. Of the 1910 output 11,763,012 oz., or 94%, came from silicious ores, 583,282 oz. from lead ores, and 107,365 oz. from copper ores. Bullion at gold and silver mills produced 6,518,976 oz., concentrate 2,577,203 oz., and crude ore sent to smelters contained 3,380,037 oz. Nye county produced 10,550,303 oz. of silver in 1910, as against 8,246,496 oz. in 1909. Of this output the Tonopah district yielded 10,422,869 oz., or 83.5% of the entire silver production of Nevada in 1910. Storey county (Comstock) produced 320,716 oz., against 501,625 oz. in 1909.

Copper production increased in Nevada from 57,964,477 lb., valued at $7,536,942, in 1909, to 64,359,398 lb., valued at $8,173,643, in 1910. This increase was practically due to the mines at Ely, in the Robinson district, White Pine county, which yielded 63,914,197 lb., or 99.3% of the entire State production. Concentrate production 62,432,779 lb., and crude ore sent to smelters produced 1,926,619 pounds.

The production of lead in Nevada in 1910 was 4,871,130 lb., valued at $214,329, against 9,840,791 lb., valued at $423,154, in 1909, a decrease of about 50%. The mines of Clark county, the largest producer, yielded 1,309,684 lb., an increase of 863,777 lb. over the 1909 production. The mines of Eureka county produced only 672,801 lb., against 4,346,535 lb. in 1909, a decrease of 3,673,734 lb. Crude ore shipped to smelters contained all but 190,932 lb. of the total lead output of Nevada in 1910.

The zinc production of Nevada was 2,707,071 lb., valued at $146,182, in 1910, against 3,013,352 lb., valued at $162,721, in 1909. The entire 1910 production was derived from Clark county from ores shipped to smelters.

There were 608 mines producing gold, silver, copper, lead, or zinc in Nevada in 1910, compared with 417 in 1909. The total quantity of ore sold or treated in Nevada in 1910 was 3,655,775 short tons, an increase of 673,168 tons.

MINE PRODUCTION OF GOLD, SILVER, COPPER, LEAD, AND ZINC IN NEVADA IN 1910, BY COUNTIES

[By Victor C. Heikes, U. S. Geological Survey.]

Counties.	Ore treated, Tons.	Gold.*	Silver,* Fine ounces.	Copper, Pounds.	Lead, Pounds.	Zinc, Pounds.	Total value.
Churchill	1,164	$43,062	162,541	2,417	31,602	....	$132,531
Clark	33,640	219,191	30,650	216,773	1,309,684	2,707,071	467,080
Douglas and Ormsby	24	570	22	....	....	....	582
Elko	4,460	43,467	18,658	9,768	201,631	....	63,655
Esmeralda	523,982	11,994,338	198,703	122,593	153,310	....	12,123,953
Eureka	11,977	81,489	36,047	721	672,801	....	130,649
Humboldt	6,648	1,458,486	280,632	7,182	107,063	....	1,615,650
Lander	12,484	41,513	79,132	11,383	81,068	....	89,257
Lincoln	4,310	34,876	54,571	7,653	935,255	....	106,467
Lyon	11,117	118,030	10,531	....	....	....	123,716
Mineral	18,743	183,722	522,987	47,375	711,517	....	503,459
Nye	524,576	3,661,967	10,550,303	2,038	15,019	....	9,360,050
Storey	108,592	502,843	320,716	573	1,871	....	676,185
Washoe	3,672	37,745	15,156	644	63,720	....	48,814
White Pine	2,390,386	457,565	199,222	63,930,278	586,589	....	8,710,100
Total	3,655,775	$18,878,864	12,479,871	64,359,398	4,871,130	2,707,071	$34,152,148

*Includes placer production.

Gearing Construction

Metallic gearing, especially steel, is noisy in operation, the noise becoming particularly troublesome in the case of high-speed gear trains. Iron or brass gearing also has not sufficient elasticity to successfully withstand the shocks or back lash caused by the torque variations incident to the operation of machine tools such as punches, shears, and planers. In order to overcome these drawbacks, various kinds of non-metallic substances, such as rawhide and paper, have been used for one or more members of a gear train, but the results have been only partly successful. As a rule, pinions made of such substances were not sufficiently resistant to moisture and exposure to heat, and rawhide is liable to injury by rats and mice when kept in stock.

In cloth pinions these defects are obviated because of the nature of the material and the method of construction employed. The blanks from which the pinions are cut consist of a filler of cotton or similar material confined, at a pressure of several tons to the square inch, between steel shrouds, or side plates, the whole being held together by means of rivets, or, in case of very small pinions, by threaded sleeves. After the teeth are cut, the cloth filler is impregnated with oil. Cloth pinions are impervious to moisture, unaffected by changes in atmospheric conditions, and absolutely vermin-proof.

The teeth are cut to the 14.5° involute system according to Brown & Sharpe's standard. Diametral pitch is the standard of measurement, and companion gears should be cut to similar form. The teeth are stronger than those of any other type of non-metallic pinion, and are sufficiently elastic to allow the meshing teeth to bear evenly across the full width of face, thereby enabling the combination to absorb shocks capable of fracturing cast iron or brass. The pinions are self-lubricating, operate noiselessly, and have long life. Cloth pinions made by the General Electric Co. and operated under severe conditions for periods ranging from a few months to two years, have not shown any appreciable signs of wear.

Giant Gold Dredges at Natoma, California

By Newton Cleaveland

During the year 1911 the Natomas Consolidated of California has begun operating two new modern gold dredges of the California endless-chain type, having digging buckets of 15 cu. ft. capacity. These are known as Natoma 8 and Natoma 9. The machines dig to a depth of 55 ft. below the water-line. They have a maximum theoretical capacity of about 650 cu. yd. per hour, and have, under favorable conditions, handled 500 cu. yd. per hour of running time in continuous operation in formation extremely difficult to handle. They are the latest and most improved gold dredges in operation today, not only being the largest in capacity, but also having the most complete equipment. Something of their size may be inferred from the following list of materials used in the construction of each.

TUMBLER, NATOMA 8.

BOW VIEW DURING CONSTRUCTION.

	Weight, Pounds.
Lumber in hull and housing (732,000 bd. ft.)	2,196,000
Hull material (bolts, rods, nuts, and washers)	334,124
Nails and screws	21,574
Paint	8,266
Oakum	12,824
Dredge machinery	1,883,592
Pumps and piping	42,224
Wire rope and belts	50,601
Motors, transformers, and electric wiring and fittings	91,657
Total	4,640,862

Hull.—The hull has a total length of 150 ft., the beam is 58 ft. 6 in., with 5 ft. of deck overhang on either side, making 68 ft. 6 in. width of housing. The depth is 12 ft. 6 in. The well in which the digging ladder works is 82 ft. long. In all 732,000 bd. ft. of lumber was used in the construction of each of these hulls.

The Digging Ladder is 119 ft. long, of plate-girder construction, and weighs 210,740 lb., exclusive of ladder, rollers, and attachments. The upper tumbler body is a single high-carbon steel casting, and weighs 35,495 lb. with the shaft and cushion plates. The upper tumbler shaft is a hollow-bored, forged, nickel-steel shaft, 25 in. diam. at the centre, and is 14 ft. 11 in. long. The cushion plates are of chrome nickel steel, and are securely bolted to the tumbler. The lower tumbler body is a single casting of high-carbon steel, weighing 25,000 lb. with the shaft. The lower tumbler shaft is of 15¼ in. diam. by 7 ft. 8 in. long, and has a 4⅞-in. hole passing through its centre, through which the tie-rod passes. This tie-rod prevents the spreading of the lower end of the ladder under the pressure which it is obliged to support.

The Digging Buckets are 90 in number, and arranged in a close-connected line, each bucket having a digging capacity of 15 cu. ft. Each bucket is made up of three sections, a bottom, hood, and lip. The bottom is made of high-carbon steel, with an insert plate of manganese steel fitted in a cored recess under the back eye. The hood is made of ½-in. steel plate, pressed to the required shape. The lip is a manganese-steel casting 2¼ in. thick on the cutting edge, and 13 in. wide. These parts are all properly and securely riveted together, making the complete bucket, which weighs 3700 lb. approximately. The bucket pins, 90 in number, are made of high-carbon steel, finished 7⅜ in. diam. and 33 in. long. They are oil tempered and annealed, and weigh (approximately) 445 lb. each. The bucket bushings, 184 in number, are of manganese steel. The ladder rollers, 17 in number, are 16 in. diam., and together with the bearings weigh 52,330 lb. The entire weight of the digging ladder, bucket line, upper and lower tumblers, and ladder rollers is over 350 tons, distributed as in the following table:

	Pounds
Digging ladder	210,740
Upper tumbler and shaft	35,495
Lower tumbler and shaft	25,100
90 buckets, pins, and bushings	378,065
Ladder rollers and bearings	52,330
Total	701,730

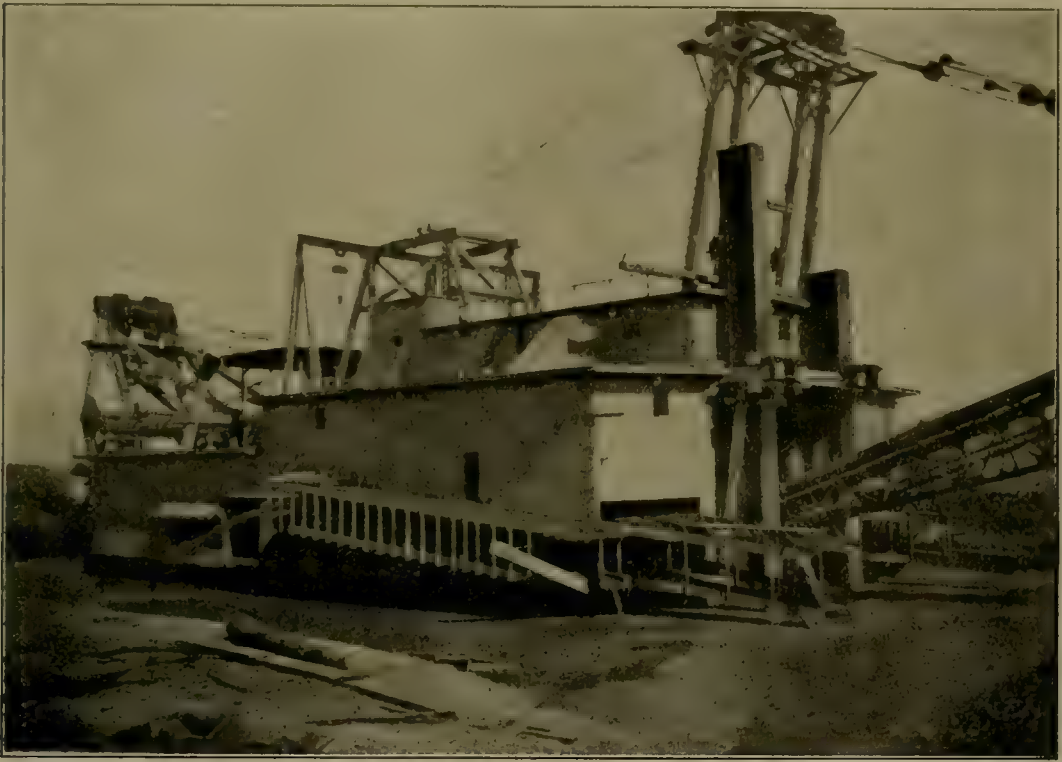
The upper tumbler shaft is driven at both ends through a double train of cast steel gearing. The total weight of this main drive is 59,322 lb., exclusive of tumbler and shaft.

The Main Hopper, into which the buckets dump, is built of ½ in. plate steel, and the discharge spout, lined with a cast manganese wearing plate 1½ in. thick, weighs 17,003 lb., and conveys the material from the bucket-line to the revolving screen. This is 9 ft. diam. by 50½ ft. long, and is lined with ⅝-in. high-carbon steel plates, with holes tapering from ⅜ to ½ in. throughout its surface. It weighs 111,921 lb. The screen-drive mechanism is of the single-friction roller type, and weighs, complete, 26,064 lb. The stacker hopper, which delivers the material from the lower end of the screen to the conveyor belt, weighs 5072 lb. The stacker ladder is of latticed-girder type, built of steel plates and angles, and is 142 ft. long. It carries the conveyor belt, which conveys and stacks the tailing in a pile beyond the stern of the boat, and together with the idlers and bearings weighs 40,410 lb. A 60-hp., 2000-volt, variable-speed motor is used to furnish power to run this conveyor belt. The bucket idler, for taking up the slack of bucket-line when in operation, and protecting the sides of the well, is unusually massive. On the sides of the well, in which the digging ladder works, are a set of ladder-roller girders, weighing 16,056 lb., that prevent damage to the well from the ladder.

The Spuds, 2 in number, are built of steel plates and angles, and each spud has a cast steel point, weighing approximately 21,000 lb. Each spud is 38 by 60 in. and 70 ft. long, and weighs 89,097 lb., including the spud point, or over 44 tons. Two steel castings, one for each spud, are attached to the stern of the dredge for distributing pressure from the spud over the stern. Each of these castings weighs approximately 18,300 pounds.

The Ladder Suspension Tackle is double in type, that is, there is a pair of six sheave blocks, 48 in. diam., on each side of the digging ladder. These sheaves revolve on steel pins 8½ in. diam. The forward hanger bars are of forged steel links, and the rear hangers are in two sections. The tackle weighs 118,280 lb., and is made of extra size and strength for the purpose of providing sufficient material and strength on either side of the ladder, to sustain it should the other side give way. The stacker suspension is from the rear gantry cap through a set of sheave blocks of six sheaves each, and 0.30 in. diameter.

Winches. The ladder hoist winch, consisting of one double drum, gears, shafts, bearings, and clutches, and mounted on a cast iron base, weighs 67,016 lb. The swinging winch consists of 8 drums with suitable gearing and friction clutches, is mounted on a cast iron base, and weighs 34,193 lb. The stacker hoist winch, the drum of which is cast steel driven through a set of worm gearing—the worm of steel and the worm wheel of bronze—is mounted on a rigid cast iron sub-base, and weighs 3732 lb. The arrangement of operating levers, quadrants, reach-rod, bell cranks, shafts, and bearings are so placed that the entire operation of the dredge may be conveniently controlled by one man in the winch room.



STERN VIEW, SHOWING OUTSIDE SLUICES, SPUDS, AND STACKER.

The Gold-Saving Tables, of a double-bank type, have an approximate area of 7000 sq. ft. of table surface. The arrangement is as follows: (1) 14 transverse sluices, 2 ft. 8 in. wide and having a grade of 1¼ to 12 in., built on each side of the dredge, which discharge into 10 longitudinal sluices of the same width on a slope of 1⅛ to 12 in., and extend to about 5 ft. aft of the stern line; (2) 84 trays so placed between the upper and lower bank of tables that all the material passing from the upper to the lower bank passes over them, thus giving about 600 sq. ft. of additional table surface. This gives approximately 7600 sq. ft. of riffled table surface for the collection of gold.

Tail Sluices, for discharging sand at the stern of dredge, are so arranged that the sand can be discharged far enough astern not to interfere with the operations of the dredge, or it may be discharged close to the spud if desired. These sluices are constructed of ¼-in. steel plates, and are so arranged that the plates may be removed when worn out.

The Save-All, placed at the rear of the well and under the bucket idler, and covered by the grizzly, to prevent damage from large rocks or heavy material that escape from the buckets as they dump into the hopper, is an extra gold-saving table of limited area, that recovers the gold from such material as passes through the grizzly bars, and which would otherwise drop directly into the pond and be lost.

Pumps.—Four pumps are in use on each boat for supplying water for the washing of gravel, both in the revolving screen and in the gold-saving tables, as well as for fire and other purposes.

The weight of the pumps, with the necessary piping, is 42,224 lb. They are:

No.	Size, inches.	Type.	Capacity, gal. per min.	Head, feet.
1	14	Centrifugal	5500	70
1	14	"	5500	40
1	6	"	700	120
1	12	Monitor		

Electrical Equipment.—Nine motors are needed to operate the dredge, aggregating 1072 hp., distributed as follows:

No.	Hp.	Volt.	Type.		Use.
1	400	2000	Variable	speed	Main drive
1	30	2000	"	"	Winch
1	150	2000	Constant	"	70-ft. head pump
1	75	2000	"	"	40-ft. head pump
1	30	2000	"	"	5-in. pump
1	75	2000	Variable	"	Screen drive
1	60	2000	"	"	Stacker drive
1	2	110	Constant	"	Tools
1	250	2000	"	"	Monitor pump

A three-panel switch-board, placed in the winch room, together with its wiring, completes the electrical equipment of the dredge. The weight of the motors and transformers is 75,057 pounds.

The Wire Rope required for construction and operation is a total of 8760 ft. or 1⅔ miles, weighing approximately 35,317 lb., and distributed as follows:

Construction.	Diam. in.	Number req'd.	Length each, ft.	Total length, ft.
Bow gantry guys	2½	2	239	478
Stern gantry guys	2	2	135	270
Tail sluice support	½	2	250	500
Foot bridge suspension	½	2	250	500
Stacker sling	2	1	172	172
Stacker guys	1	2	120	240
				2160
Operation.				
Ladder hoist	1½	2	1200	2400
Stacker hoist	1	1	600	600
Spud hoist	1	2	600	1200
Bow swing	1¼	2	700	1400
Stern swing	1	2	500	1000
				6600

The Belts required for operation are as follows:

	Width, in.	Length, ft.
Conveyor belt	42	275
Ladder hoist	32	60
Main drive	32	80
Winch	16	50
Screen shaft	14	50
Screen motor	18	60
Stacker hoist	6	40
Total		340

The first successful dredge in California started operations on March 1, 1898, on the Feather river, near Oroville, and had a monthly capacity of 40,000 cu. yd. A comparison between this boat and the one herein described may be of interest.

Started.	Bucket cap., cu. ft.	Hull dimensions. ft.	Power used, hp.
March 1, 1898	3½	80 by 30 by 7	63
August 10, 1911	15	150 by 58½ by 12½	1072

Institute Meeting Provisional Program

Detailed programs for the week of meetings in San Francisco and excursions in the vicinity, arranged for the American Institute of Mining Engineers, will be available at headquarters in the St. Francis hotel Tuesday morning, October 10. Sessions for reading of papers and for discussions will be held Tuesday afternoon, Wednesday forenoon, and Thursday forenoon. Evening sessions will be arranged if desired. The list of papers promised is:

Historical Sketch of the Mining Industry of Japan, by K. Nishio.

The Laramie Tunnel, by D. W. Brunton.

Notes on the Liberty Bell Mine, by C. A. Chase.

California Oil, by Mark L. Requa.

Progress in Electro-Amalgamation, by S. B. Christy.

Notes on the Geological Structure of Tonopah, Nevada; Classification of Ore Deposits for Miners, by Augustus Locke.

The Laws of Igneous Emanation Pressure; Physical Data of Igneous Emanation, by Blamey Stevens.

Electrolytic Oxygen in Cyanide Solution, by T. H. Aldrich, Jr.

Fuel Problems of the Pacific; Government Coal Mines in the Philippines, by Oscar H. Reinholdt.

The Black Mountain Coal District, Kentucky, by J. B. Dilworth, with discussion by J. Langdon.

Reminiscences of the Beginning of the Institute, by R. W. Raymond.

Some Features of Replacement Orebodies and the Criteria by Means of Which They May Be Discovered, by J. D. Irving.

Slime Filtration, by Geo. T. Young.

A Modification of the 'Gay Lussac' Method for Silver Bullion Containing Tin, by E. J. Hall.

Geology of Some Mines in South of Colombia, S. A., by F. P. Gamba.

Vadose Ore Deposition in Arid Regions, by C. R. Keyes.

Biographical Notes on S. F. Emmons, by G. F. Becker.

Electrolytic Refining at the U. S. Mint, San Francisco, by E. B. Durham.

The Fritz and Coxe Laboratories, by J. Daniels.

Rapid Estimation of Available Calcium in Lime Used in the Cyanide Process, by L. W. Bahney.

Phosphorus in Coking-Coal, by Charles Catlett.

Electrical Practice in Mines, by Burton McCollum.

Geology and Operation of the Newport Mine, by B. W. Vallat.

Mineral Production and Resources of China, by T. T. Read.

Rational Valuation and Quality Efficiency of Furnace Stock, by J. J. Porter.

Cyanide-Plant at the Treadwell Mines, Alaska, by W. P. Lass.

The excursion Wednesday afternoon will be to Stanford University, Thursday to the University of California, Friday to Natoma, and Sunday to the Bohemian Grove. Members of the Institute and the immediate members of their families are invited to participate. Saturday will be devoted to the exercises incident to beginning work on the Panama-Pacific exposition, and Monday to short excursions to the Mint and other points of interest in and around the City. A cordial invitation has been extended to members to visit the plants of the following companies: Columbia Steel Co., George E. Dow Pumping Engine Co., The Paraffine Paint Co., Selby Smelting & Lead Co., A. Schilling & Co. Arrangements will be made for small parties as desired.

American Institute of Mining Engineers

PROPOSED AMENDMENTS TO THE CONSTITUTION

The Board of Directors and the Council of the Institute, after careful deliberation, has unanimously recommended to the Institute revisions and amendments to its Constitution, embodying changes which are considered necessary for the immediate and the permanent welfare of the organization. These amendments will be presented for action at the next annual business meeting February 20, 1912.

The change of name, to the 'American Institute of Mining and Metallurgy,' is proposed as a tardy recognition of the fact that since its foundation the Institute has been not only the distinctive mining society of America, but also the metallurgical society of America. It is obvious from an inspection of the Institute's Transactions that its field of activity has been, in fact, largely metallurgical.

The re-classification of membership is submitted because the existing classification does not meet the requirements of present conditions, and a strong sentiment has developed for such a re-classification as will raise the standard of membership. The increase of dues of *corporate members* to $15 per year is proposed partly in order to enable the Institute to offer its advantages to the younger *junior members* at a lower rate, and partly to enable it to extend its field of useful activities; moreover, this increase in full members' dues has long since been found absolutely necessary by all the other national engineering societies. In order that opportunity may be afforded for informal discussion of the proposed amendments during the progress of the San Francisco meeting the more important articles are given in full below.

ARTICLE II

Section 1.—The membership of the Institute shall, after September 1, 1912, be divided into four classes, namely: (1) *corporate members;* (2) *honorary members;* (3) *associate members;* and (4) *junior members.* Only members of the first class *(corporate members)* residing within the United States of America, Republic of Mexico, or Dominion of Canada, shall be entitled to vote or hold office.

Section 2.—The first class, or *corporate members*, shall comprise all members of the Institute as the same existed prior to September 1, 1912, who shall not, at their own request, have been transferred to the class of *associate members* or the class of *junior members;* and all persons who shall thereafter be transferred to or elected to membership in this class. The second class, or *honorary members*, shall comprise the present *honorary members* of the Institute and such persons as shall hereafter be elected to such class. The number of *honorary members* shall not exceed twenty-five. The third class, or *associate members*, shall comprise all the *associates* of the Institute except such as may, upon presentation to the committee on membership before September 1, 1912, of satisfactory evidence of their qualifications for transferral into the class of *corporate members,* be duly enrolled in the class of *corporate members;* and such persons as shall thereafter be elected *associate members.* The fourth class, or *junior members*, shall comprise such present members as shall, prior to September 1, 1912, express to the committee on membership their desire to become enrolled in the class of *junior members*, and present evidence of their qualifications to enter such class; and such persons as shall thereafter be elected to this class.

Section 3.—The following classes of persons shall be eligible for membership in the Institute, namely: As *corporate members,* all professional mining engineers, geologists, metallurgists, or chemists, and all persons practically engaged in mining, metallurgy, or metallurgical engineering. As *honorary members*, such persons of eminence and distinction as, in the judgment of the committee on membership, shall be deemed suitable. As *associate members*, all other persons desirous of being connected with the Institute who in the opinion of the Council, are suitable. As *junior members*, students of any of above professions or persons engaged in learning the same. The term of *junior membership* shall be limited to six years.

Section 4. Every candidate for election as a *corporate member*, *associate member*, or *junior member* of the Institute must be proposed for election, in writing signed by three members; must be approved by the committee on membership as directed in the by-laws; and must be elected by the Council. At least three fourths of the votes cast must be in favor of a candidate to secure his election. The membership of each person so elected shall commence upon the payment of his initiation fee and current dues, as hereinafter in Article III prescribed. Each person proposed for election as *honorary member* must be recommended in writing by at least ten members; must be approved by the Council, and must be elected by ballot at a meeting of the Board of Directors by unanimous vote of all the directors present.

Section 5.—If any person elected a *corporate member*, *associate member*, or *junior member* does not within sixty days after notice of his election, accept the same and pay his initiation fee and dues for the current year, his election may, in the discretion of the Council, be canceled.

Section 6.—The Council may at any time, for reasons which, to a majority of the members thereof, seem sufficient, change the classification of any *corporate member, honorary member, associate member*, or *junior member.*

ARTICLE III

Section 1.—The dues *of corporate members* shall, beginning with the year 1913, be $15 per annum, payable in advance on the first day of each calendar year. Each newly elected *corporate member* shall, when notified of his election, pay an initiation fee of $10, in addition to his dues for the current year; *provided, however*, that each *corporate member* whose residence or place of business is or shall be located within fifty miles of the headquarters of the Institute in New York City, shall, so long as he shall maintain such residence or place of business, pay $20 yearly dues.

Section 2.—The dues of *associate members* shall be $10 per annum, payable in advance on the first day of each calendar year. Each newly elected *associate member* shall pay, when notified of his election, an initiation fee of $10, in addition to the dues for the current year; *provided, however*, that each *associate member* whose residence or place of business is or shall be located within fifty miles of the headquarters of the Institute in New York City, shall, so long as he shall maintain such residence or place of business, pay $15 yearly dues.

Section 3.—The dues of *junior members* shall be $5 per annum, payable in advance on the first day of each calendar year. *Junior members* are not required to pay any entrance fee; but when the period during which any person shall be entitled to *junior membership* shall have expired, such person shall, upon being promoted to the class of *corporate members*, pay an initiation fee of $10, as well as the dues of a *corporate member* for the current year.

Section 4.—*Honorary members* shall be exempt from payment of fees and dues.

Section 5.—Any *corporate member, associate member*, or *junior member* who shall not pay his dues within one year after they shall become due, shall, unless otherwise ordered by the Council, be deprived of all privileges of membership, and if he shall continue in arrears for two years, his name shall be stricken from the roll of the Institute. Any person whose name shall have been stricken from the roll because of non-payment of dues and for no other reason, may be restored to membership by the Council on payment of all his arrears or may, after an interval of three years, be proposed for election on the same terms as any non-member.

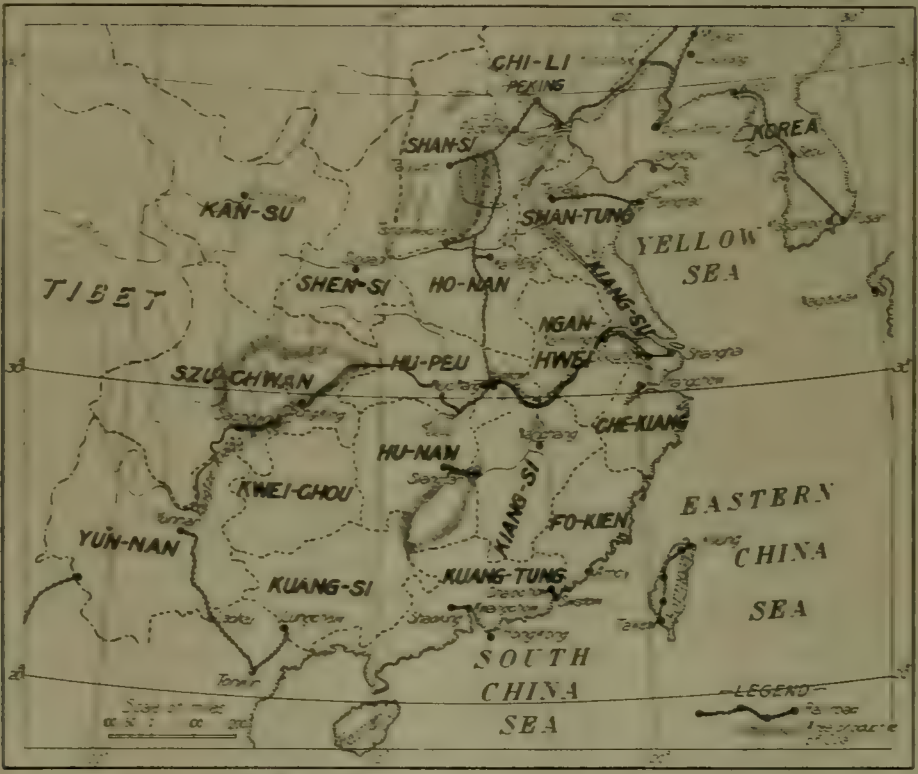
Section 6.—Any *corporate member* or *associate member* in good standing may, by the payment at one time of $250, become a *life member* or *life associate member*, as the case may be, and shall not be liable thereafter for any dues.

Mineral Production and Resources of China

By Thomas T. Read

*When so much has been written upon a subject on which so little definite information is available as upon this, some reason must needs be assigned for adding to the volume of literature. A sufficient reason is found in the probable great future importance of China as a producer of mineral wealth. The present undeveloped state of mining in the Empire is due to many causes, among which the most important are the relatively simple needs of the population, the lack of transportation facilities, the inelastic regulations governing the industry, and the superstitious reluctance of the people to make excavations which might disturb the spirits of the earth and air, or of ancestors.

Iron is the metal most in demand, yet the needs of the population, until recently, only made necessary a production of approximately 1½ lb. of iron per capita per year. The present annual production of iron for domestic consumption in the United States is nearly 600 lb. per capita. The curious state of development of transportation in China has been a greater handicap upon the mining industry than upon any other. The point upon which it hinges is the absence of a road system. Except for a few military roads, now almost impassable, there are no roads in China, that is to say, there is no land which is set aside as a right of way, belonging to the commonwealth. Throughout the agricultural districts, generally speaking, the entire area is in private ownership and the lines of travel are between fields. There is a constant struggle for existence between the owners of the land and the traveling public, with the natural result that the so-called roads usually are simply lines along which it is merely possible to travel. Most merchandise is carried in baskets over the shoulder, pushed in wheelbarrows, or transported on pack-animals, or in carts, to the streams. Really cheap and efficient transportation is confined to the rivers, and great ingenuity is exhibited in utilizing them to the fullest extent. On the Lan river, for example, the boats, to use an expressive colloquialism, "can float in a heavy dew." The regions where mineral wealth is abundant are naturally but poorly supplied with navigable streams, and it is only where Nature has been so kind as to gather together in one place all the materials necessary for the extraction and reduction of the minerals that any considerable industry has been able to develop. Now railroads are penetrating all parts of the Empire, the streets built in the cities are being extended as roads through the surrounding territory, and the mineral industry is taking on a new aspect.



MAP OF CHINA, SHOWING APPROXIMATE COAL AREAS.

Theoretically the mineral wealth of the Empire is the property of the central Government, and is only worked by permission upon a royalty basis. Practically this is difficult to enforce, and there have grown up relationships between the operators and the government which are complicated in the extreme. The development of the mining industry is correspondingly hampered, and it is hoped that a simple and direct code of mining regulations may be put in force at no far distant date. The importance of the superstitions regarding graves and 'Fêng-Shui' has been overemphasized. It has undoubtedly operated to restrict prospecting work, but where valuable deposits are found it is always possible to have graves moved for a reasonable sum, and it is but seldom that a regard for 'spirits' is allowed to operate to financial disadvantage. With the spread of education this factor will lose the limited importance it now possesses.

COAL

Coal is easily the first of the mineral resources of China.

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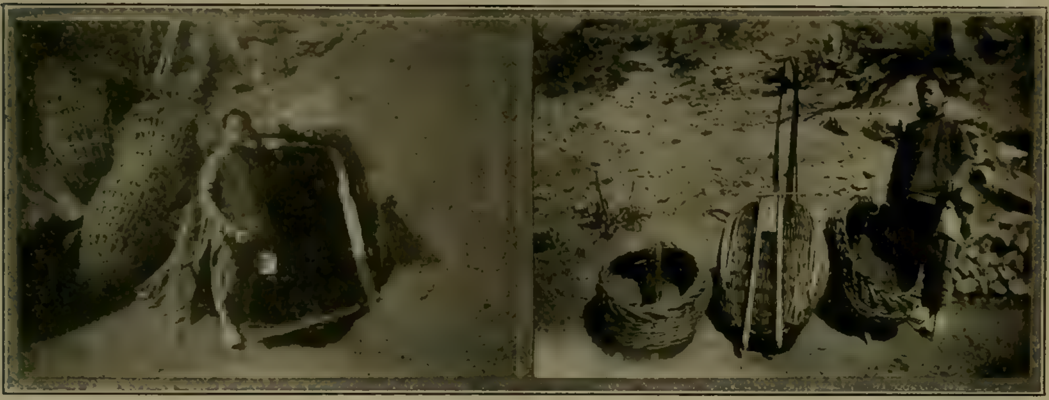
*Abstract of a paper to be presented at the San Francisco meeting of the Amer. Inst. of Min. Eng., October 16 to 17.

The great extent of the deposits has already been indicated, and a conservative estimate of the present production is over 13 million tons annually. The casual visitor to North China, where the winter climate is rigorous, seeing the children of the villagers, armed with rake and basket, engaged in collecting every scrap of vegetable material that can be utilized as fuel, is likely to wonder why coal is not more generally used. The reason is not recondite; the low cost of labor, the high cost of transportation, and the low scale of living put coal beyond the reach of the population in many regions. It is probably safe to estimate that one half the cost of the food of an ordinary workman is chargeable to the fuel used in cooking it, and where the otherwise unemployed children can be sent out to gather grass and pull up the roots of the larger cereals, such as corn and *kao liang*, there is little market for coal, except for industrial purposes. Near mines, where coal is abundant and cheap, it is freely employed. The development of railroads, steamships, and industrial plants will not only create a greater market for coal, *per se*, but, by raising the scale of living through the higher wages paid for labor, will increase the consumption of coal for household purposes. The annual consumption of coal in the United States is approximately $3\frac{1}{2}$ tons per capita per annum; the consumption in China is approximately $\frac{1}{25}$ ton per capita per annum. An approximate estimate of the present coal production in China is given in Table I.

P'ING-HSIANG COLLIERY (GENERAL VIEW).



NATIVE COAL MINE. BASKETS FOR DRAGGING COAL TO SURFACE.

TABLE I.

APPROXIMATE ESTIMATE OF THE PRESENT COAL PRODUCTION OF CHINA.

Province.	Anthracite. Tons.	Bituminous. Tons.	Sub-Bituminous and Lignite. Tons.
Manchuria	....	25,000	1,000,000
Chili	840,000	2,090,000	150,000
Shansi	4,000,000	25,000	....
Shensi	....	500,000	....
Kansu	....	500,000	....
Shantung	300,000	500,000	....
Honan	1,000,000	....	....
Ssu-chuan	....	500,000	....
Kweichou	....	250,000	....
Yunnan	....	300,000	....
Chekiang	....	10,000	....
Kiangsi	....	700,000	....
Hunan	....	200,000	....
Kuangtung	....	50,000	....
Kuangsi	....	100,000	....
Other provinces	....	100,000	....
Total	6,140,000	5,900,000	1,150,000
Grand total	13,190,000		

The sketch-map on the preceding page shows in general the coal areas of China.

The coalfields of China were described in the *Mining and Scientific Press* of January 2, 1909, and the P'ing-hsiang colliery, one of the most important mines worked by modern methods, was described in detail in the *Mining and Scientific Press* of October 29, 1910. The coalfields of China may be briefly divided into six groups: (1) the Manchurian fields; (2) the fields of eastern Chili and Shantung; (3) the Shansi, western Chili, and northern Honan field; (4) the Hunan field; (5) the Ssu-chuan field; (6) the Yunnan and Kweichou fields. In all these fields coal is worked by primitive native methods; only small openings are made, which are temporarily held open by a scanty use of small timber, and the coal is dragged to the surface in baskets provided with iron or bamboo runners much like a sled. Working is confined to the parts of the seam which are comparatively dry; where water is met it is handled by bailing, or by a primitive type of pump. The number of native mines is very great and their aggregate production is large. The coal brings a very low price at the mine, and the larger part of the selling price in the large cities is chargeable to transportation. In the first four groups there are a number of mines worked on a large scale by modern methods; where they are favorably situated with respect to transportation good profits are made; the largest mines, at Tongshan and Linsi, Chili province, owned by the Chinese Engineering & Mining Co., having produced more than a million tons of coal in 1910 at a profit of a little over $1 per ton. For a more extended discussion of the coal mines of China, reference should be made to the original paper. In conclusion it may be said that the coalfields of China are of great extent, the coal is generally of good quality, and the fields are widely scattered, so that no parts of the Empire are far distant from the sources of supply. In extent and quality the coal resources of the Empire compare favorably with those of the United States. As a rough comparison it may be said that Chinese coals are slightly younger than those of North America, most of the fields being upper Carbonic or Permian. In the north Jurassic and Tertiary coals occur, but except for the Fushun field are of little importance as yet. There is a good deal of controversy over the exact age of these coals, but it is of little interest to mining engineers. Bituminous coking coal is very common; coke made by native methods can be obtained almost anywhere in the Empire. When made from washed coal the resulting coke is of excellent quality and will afford an abundant supply for the smelting industries which are likely to develop. The anthracite is of excellent quality, but the bituminous is often friable, yielding an excessive proportion of fine coal. When worked on a large scale this can, in many cases, be washed and converted into coke. The Chinese custom is to make the dust into briquettes with clay as a binder, which are dried and burned. In recent years the number of mines equipped with modern machinery has become comparatively great and the present supply amply meets the demand. The mines of the Fushun company and the Chinese Engineering & Mining Co. now chiefly supply the railway and shipping trade of North China, because of the superior transportation facilities which they enjoy. These two companies also send coal to the cities along the southeast coast, competing with Japanese coal. Coal production throughout China exhibits a healthy and vigorous growth. The annual production of the Empire, as shown in the tables, is estimated at over 13,000,000 tons, but this amount is only approximate. The amounts given for Yunnan and Ssu-chuan, for example, should be designated as guesses rather than estimates, and the figures occasionally seen in statistical tables giving the production of the Empire to the nearest thousand tons present a misleading appearance of accuracy inconsistent with the data upon which they are based.

Analyses of Shansi Coals

No	Locality.	Moisture, %	Volatile hydro-carbon, %	Fixed carbon, %	Ash, %	Sulphur, %	Phosphorus, %	Analyst.	Sp. gr.	Remarks.
1	Chuang-chuang-kou	0.91	8.20	78.75	12.14	0.67	0.476	C. H. Wang	....	Semi-anthracite, does not coke.
2.	Han-ho-kou	0.94	6.15	85.70	7.21	0.59	n.d.	C. H. Wang	....	Hard dry anthracite.
3.	Han-ho-kou	0.38	8.55	81.00	6.72	0.409	0.23	F. N. Lu	1.38	
4.	Tuan-chia-kou	0.76	6.41	79.10	13.66	0.683	1.80	F. N. Lu	1.35-1.38	
5.	Lao-hsien-sheng-kou	0.66	4.49	89.50	5.46	0.509	2.53	F. N. Lu	1.4	
6.	Nan-t'ien-meng	2.01	7.05	81.35	9.61	0.867	n.d.	F. N. Lu	1.3-1.5	
7.	Meng-tsen-cheng	0.33	4.39	89.25	6.03	0.405	2.15	F. N. Lu	1.3 high	
8.	Chuang-chuang-kou	14.75	19.28	52.42	13.45	0.890	n.d.	F. N. Lu	....	Coked in crucible, probably due to oxidation.
9.	Chang-tsai-kou	0.50	14.20	75.89	9.41	0.258	n.d.	C. H. Wang	....	Semi-bituminous, coked in crucible.
10	Tung-chia-chuang	1.73	10.72	84.22	3.33	1.150	n.d.	C. H. Wang	....	Semi-anthracite, does not coke.
11.		1.93	3.45	81.44	14.17	0.35	n.d.	Average of 6 analyses by Drake.		
12.		2.91	86.80	86.80	9.88	0.11	n.d.	Average of 6 analyses by Shockley.		

Samples 1 to 8 were taken throughout the district (113° 30′ E., 38° N); sample 9 from (112° 40′ E., 37° 55′ N.); and sample 10 from (112° 40′ E., 37° 50′ N.).

IRON

Iron is the second in importance of all the mineral resources of China, and the security of the future of the Empire as a mineral-producing nation is easily appreciated, since it is founded upon an abundant supply of coal and iron, the two bases of industrial development. In the case of other minerals it may be inferred, without falling into serious error, that practically every occurrence of importance has been worked, to a slight extent at least, by native methods. But this is not true of iron deposits. The great importance of the lack of transportation facilities upon the development of mineral wealth has already been mentioned, and it is in the case of iron that its influence has been most marked. In the native method of iron-smelting such large quantities of coal are used that it is necessary to have both coal and iron ore in close

Table VII.

Average Phosphorus and Sulphur Content of Native Pig Iron of P'ing-t'ing-chou, Shansi, China.

Sample No.	Locality.	Phosphorus, %.	Sulphur, %.	Remarks on samples.
1.	Li-chia-chuang	1.7314	0.5489	Clean, malleable.
2.	T'ao-p'o	0.4671	0.1781	Dirty, malleable.
3.	Yang-chia-chuang	4.8400	0.4577	Rather clean, brittle.
4.	Nan-yao-kou	2.6066	0.2486	Dirty, globular.
5.	Chien-mu-p'ing	0.8527	0.1254	Dirty, porous, brittle.
6.	San-ch'uan	0.6854	0.1365	Clean, porous, brittle.
7.	Yang-shu-kou	1.5075	0.6140	Dirty, porous, slightly malleable.
8.	San-tu	0.4645	0.4945	Dirty, porous, slightly malleable.
9.	Ing-Ying	3.5700	0.6375	Clean, hard, massive.
10.	Han-ho-kou	3.7645	0.2999	Clean, hard.
11.	Wu-tu	0.7315	0.2155	Clean, malleable.
12.	Yang-chü Hsien	6.9540	0.2196	From a cast iron bar.
	Average	2.3479	0.3480	

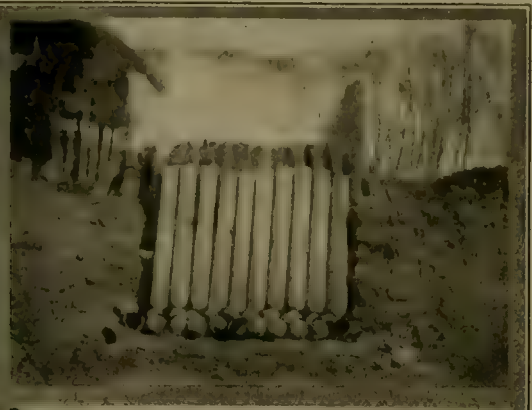
Note.—Analyses by Cheng-Fu Wang.

proximity in order to permit the development of a smelting industry. This condition obtains in several provinces, but most notably in Shansi, where it has been described by von Richthofen and Shockley. But while these deposits are adapted to the native methods of working, they are not at all suited to modern methods, where a large supply of ore of uniform quality and high iron content is necessary. It is reasonably certain that such deposits exist in numerous places, but, except in the case of the Ta Yeh mine, they have not yet been developed, because the necessary supply of coal does not exist nearby. I will first describe the P'ing-t'ing-chou district in Shansi, the principal one in which iron is produced by native methods. The accounts of this by von Richthofen have already been mentioned; what is here given, however, is based upon notes made during the winter of 1910. The analyses given of the raw materials and products have been made by Messrs. C. F. and C. H. Wang and F. N. Lu, three of my former students.

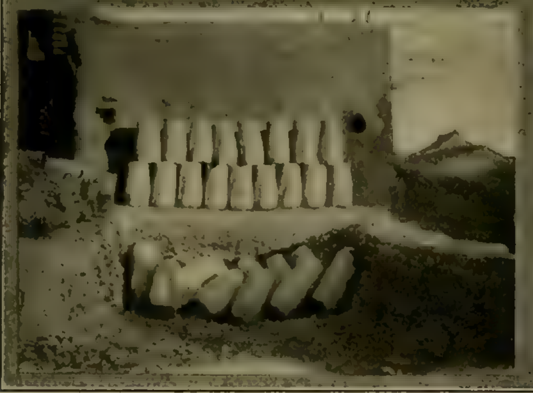
The iron ores of Shansi are limonite and hematite, occurring in shales and sandstones of Carboniferous age; the varieties of method of occurrence are so numerous that to attempt their description would require too much space. Usually they are in masses of no great size, commonly in or near a disturbed zone in the strata, or else in beds or flat veins, from a few inches to not over three feet thick, of limited extent. It follows, therefore, that no sufficient supply of uniform enough quality can be obtained from the Shansi deposits, so far as yet explored, to form the basis of blast-furnace work on a large scale. More recently it has been reported that on the southern border of this district, in Honan province, a suitable deposit has been found, and it has been proposed to erect there another government iron-works, similar to the one described later.

The ore, mined through shallow round or rectangular shafts (see illustration), is broken into small pieces and hand-sorted into several grades, which are sold to the smelting plants. Here it is mixed with 50% of its volume of coal and packed into cylindrical crucibles (see illustration) 5 in. inner diameter and usually 15 in. high. From 250 to 275 of these are set upright in a rectangular furnace, about 12 by 6 by 4 ft. Air space is secured at the bottom of this by a layer of broken crucibles over which is placed a layer of coal, then the crucibles are set in place, with coal between them; the front side is closed, the whole is covered over, ignited, and allowed to burn by natural draft for three days. The crucibles are then removed and the contents taken out. This operation usually involves breaking the bottom part of the crucible, which now contains an irregular 'bloom' of iron of very variable composition (see table of analyses), irregular fragments of iron, earthy residues, and a certain amount of coke. The bloom is sold to the makers of wrought iron, the small pieces of iron are sold to the makers of cast iron, and the coke is used in the manufacture of crucibles. It should be noted that the product of this method of smelting is not pig iron, in the ordinary sense of the word, as it contains very little carbon and is malleable. The bloom is worked into wrought iron by heating in a wood fire and hammering until it is worked down into a rectangular ingot, which is then sold, and either manufactured locally into various objects and utensils, or shipped in the ingot form to all parts of the Empire. The small pieces of iron are mixed with coal and placed in crucibles, about 7 by 14 in., and 50 to 80 of these are placed in a smaller furnace (see illustration) blown by hand. When the iron is melted the covering of the furnace is removed, the crucibles taken out, the contents of several crucibles are poured into one, and this is then poured into molds, which have previously been prepared with extraordinary skill. In this way various cooking utensils, especially *kuo*, are cast, often remarkably thin, as the castings contain as much as 5 to 7%

SHAFT FOR EXTRACTION OF IRON ORE.



CRUCIBLE FURNACE FOR REDUCING IRON ORE.



CRUCIBLE FURNACE FOR REMELTING IRON FOR THE MANUFACTURE OF CASTINGS.

TRANSPORTING *kuo* TO MARKET.

(The clay for crucibles is pulverized by the hoofs of the mules.)

of phosphorus which has been taken up from the coal during the reduction and re-melting. Note the high percentage of phosphorus in the cast-iron bar, analysis 12. It is the high phosphorus content of the Shansi coals (see analyses given) which has been the chief factor in the great development of the industry, as it has afforded an easy means of securing the high-phosphorus iron necessary in making thin castings. Formerly the iron products of this locality found their way through the channels of trade to nearly all parts of the Empire. Now the trade in native iron flourishes chiefly in the interior, as foreign scrap iron and steel, especially old horseshoes, are imported in large quantities into all the treaty ports, and because of their superior quality and low price tend to drive out the native product. The native industry, therefore, is steadily dwindling, though it will continue to exist until foreign cooking utensils displace the high-phosphorus cast-iron *kuo* and teapots. Shockley has called attention to the amount of decrease between the time of Richthofen's visit and his own. The annual production of the chief districts of Shansi, as estimated by Shockley, in 1901 was 51,248 tons.

The only modern steel works existing in China at present is the blast-furnace and steel plant of the Han-Yeh-P'ing Iron & Coal Co., situated at Hanyang, just across the Han river from Hankow, in central China. Its iron ores are mined at Ta-Yeh, about 50 miles southwest, and its coke is obtained from its colliery of P'ing-hsiang in Kiang-si province, more than 300 miles distant.

The iron ores at Ta-Yeh occur about 15 miles west of the Yangtze river, and lie along the contact between a marble and a large intrusive body of a dark gray syenitic rock. The ore is a good quality of hematite of about the following range of composition, furnished by the Han-Yeh-P'ing Iron & Coal Company:

	Iron ore, Ta-Yeh. Per cent.
Fe	60.00 to 62.00
P	0.05 " 0.25
S	0.05 " 0.12
SiO_2	3.00 " 5.00
Al_2O_3	1.00 " 2.00
Mn	0.20 " 0.40
Cu	0.05 " 0.25

At one place it is slightly magnetic, apparently having been partly reduced to the magnetic oxide by the action of reducing solutions which have deposited small amounts of copper and iron sulphides along the foot-wall. During the Ming dynasty efforts were made to work this deposit as a copper mine, but could scarcely have been very successful. The iron ore is developed over a length of more than two miles, but apparently is not continuous over that extent. The contact runs nearly east and west, and for considerable distances to each side of the present workings the ores can be traced. Where it is worked the orebody is about 200 ft. thick and is nearly vertical, dipping slightly to the north.

At the steel plant two blast-furnaces, each of 100 tons daily capacity, are in operation, and a third unit of 250 tons capacity has just been completed. Three Siemens-Martin open-hearth furnaces are in operation, two are under construction, and five more are projected. The rolling-mill has a capacity of 800 tons per day; the larger part of it is devoted to rolling railway material, as the greatest demand in China is for material of this nature. During 1909 there was produced 307,500 tons of iron ore, of which a large part was exported to Japan and America and the remainder smelted at Hanyang. Of the resulting pig iron, 44,300 tons was sold as such, and the remainder converted into 28,500 tons of steel, chiefly steel rails. Thirty-six hundred tons of manganese ore of good quality was produced in 1908 at P'ing-hsiang in the province of Kiangsi. In several other places the company owns deposits of manganiferous limonite which contains about 20% manganese, which can also be utilized, if necessary. The company has a contract with the Japanese Government iron works at Wakamatsu to supply them with ore of bessemer grade, and has recently made a contract with the Western Steel Corporation to furnish it yearly with 36,000 tons of ore and 36,000 tons of basic pig iron at its works at Seattle, Washington.

In Kiang-su province iron ores are widely distributed, occurring chiefly in the region about Nanking in association with the limestone previously mentioned. Richthofen seems to regard these of little promise because of the absence of coal of suitable quality in the neighborhood. But if the distance to which iron ores are transported in the United States is considered, and the fact that the ores in question are conveniently adjacent to the Yangtze river, it seems much more probable that these ores will be the next to be developed on a modern scale. The ore is probably of similar character to that at Ta-Yeh, previously described.

The cost of production of iron ore in the open-cut workings at Ta-Yeh is approximately as follows:

	Pesos per ton.
Stripping	0.08
Mining	0.18
Tramming	0.03
Powder, steel, etc.	0.015
Superintendence	0.06
Loading cars, freight to Yangtze, etc.	0.30

This would make the probable cost of the ore delivered at the blast-furnace a little over ₱1 per ton. The cost of limestone is about two-thirds of this; the cost of coke is ₱15 and coal about ₱8. These low costs are largely due to the low cost of labor. Ordinary unskilled labor receives from 200 to 300 cash per day or 8 to 12c. Skilled labor receives from ₱10 to ₱50 per month, and the efficiency of this labor is remarkably high. As a result pig iron and steel can be produced at a low cost, and the company at Hanyang has been correspondingly successful.

In the province of An-hwei the geological conditions are similar to those in Kiang-su and Hu-pei. When the concession of the London & China Syndicate, in this province, was about to be abrogated in 1909, it was claimed by the concessionaires that they had proved the existence of iron ore worth over four million dollars, but I have been unable to secure any further exact data regarding this area. For a description of all the areas in China in which iron ores are known to occur, reference should be made to the original paper; those mentioned here are the districts which seem to offer the greatest promise of development by modern methods.

In conclusion, it may be said that, while our knowledge of the iron resources of the Chinese Empire is still inadequate, yet the general features appear to be these: Iron ores are widely distributed throughout the Empire, from north to south. In many places these have been the source of a more or less considerable native industry, which is steadily waning, because of the unsatisfactory quality of the product. Owing to the peculiar features of the native methods it is not to be supposed that modern industries will necessarily develop in the same localities; on the contrary, the one modern plant is utilizing ores not previously worked by natives, and this will not improbably be the policy of its successors. In this development of the iron and steel industry it is most probable that the Yangtze valley will have a leading place, as there seems good reason to believe that iron ores of satisfactory quality and in sufficient quantity occur along a considerable portion of its length, and it also possesses the great commercial advantage of easy and cheap transportation, and a situation in the commercial centre of the Empire. The extremely low cost of labor permits a low cost of production, making tariff for the protection of the industry entirely unnecessary. The low price of silver in recent years has operated to benefit China in a two-fold manner, both by stimulating export trade, and by discouraging imports. The resultant increase of wealth will give increased ability to meet the initial large expenditures necessary to develop modern plants. A large and increasing market is assured by the Imperial regulation that all materials required in the construction of railroads and other public works shall be purchased from the Chinese plants, so far as these are able to furnish them. As a result it is to be expected that the iron and steel industry in China will have a large and healthy growth.

Copper Deposits of the Burro Mountains

By Sidney Paige

*The Burro mountains lie near and southwest of Silver City, Grant county, New Mexico. Silver City is reached by a spur of the A. T. & S. F. railway, which connects with the main line at Deming, New Mexico, a town about 46 miles to the south. The Southern Pacific railroad likewise passes through Deming.

The Burro mountains consist of two distinct mountain masses, Big Burro and Little Burro, rising near the border of a semidesert region. The Big Burro mountain mass is subconical in form, and its flanks slope from a central peak, at an elevation of 8054 ft., at first steeply and then gently, to meet and finally merge with the desert deposits at its base. The chalcocite deposits of the Burro mountains lie at the foot and on the northeast side of the Big Burro mountains. Four companies were developing the field at the time of my visit—the Burro Mountain Copper Co., the Chemung Copper Co., the Savannah Copper Co., and the Mangas Development Company.

The first and salient fact connected with the occurrence of the chalcocite orebodies near Leopold and Tyrone is the intrusion of a mass of quartz monzonite of subcircular outcrop into a pre-Cambrian granitic complex, for the important chalcocite orebodies are connected with this intrusive rock. The pre-Cambrian complex comprises various types of coarse to medium grained granites and associated porphyry and pegmatitic dikes, with still later rhyolitic dike and stock-like intrusions. The quartz monzonite is a medium to coarse grained granular rock of rather light appearance when fresh. Both even granular and porphyritic phases are present, and dikes of nearly the same composition as the main mass are locally abundant. These dikes are later than the main mass and are characterized by very large phenocrysts of feldspar, some an inch or more in length. The quartz monzonite when coarsely granular is composed of quartz, oligoclase and orthoclase feldspar, and a subordinate amount of biotite and hornblende. The oligoclase crystals are fairly well formed, and many of them are partly inclosed in crystals of orthoclase and quartz. Sphene, apatite, magnetite, and a little chlorite are present. The porphyritic phases contain phenocrysts of oligoclase, with perhaps a little andesine and albite, and of biotite embedded in a fine mosaic of quartz and orthoclase with a little twinned feldspar. Quartz makes up about half of the groundmass. Apatite, sphene, and magnetite are accessory minerals. In both the even-grained and porphyritic phases of the quartz monzonite the biotite mica is noticeable in hand specimens, its lustrous black color contrasting strongly with the otherwise light appearance of the rock. In the ore-bearing zone, however, the monzonite takes on a quite different apearance; it is iron stained, fractured, and silicified; the biotite has generally disappeared: kaolinization of the feldspars is prominent, and hills in this zone have a characteristic rough, jagged, gossan-like appearance.

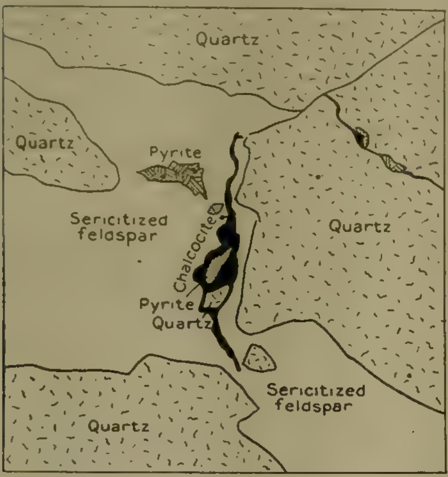


Fig. 1. VEINLET SHOWING NODULE OF PYRITE SURROUNDED BY CHALCOCITE.

The second important condition affecting the locus of the ore deposits is the intensity and distribution of the fracturing of the quartz monzonite. Where solid and unaltered this rock does not carry ore. Where intensely fractured it carries ore. There is a distinct and traceable gradation from the zone of intense fracture to the areas of essential solidity, and the surface exposure of the fractured mass has a comparatively definite form. It may be represented as a triangle pointing southwest, its point approximately 1½ miles southwest of Leopold and its base formed by a line passing from Tyrone to Oak Grove. The line of greatest fracture lies between Leopold and Tyrone and forms roughly the north side of the triangle. This north edge follows for a portion of the distance the contact between the quartz monzonite and the pre-Cambrian granites to the north, and present data seem to indicate that mineralization of this type is not extensive north of this contact. Southward from this zone of greatest fracture the rock gradually becomes more solid and less altered. A study of the mines shows clearly that the depth to which oxidation has penetrated the rocks increases in a northeasterly direction, from Leopold to Tyrone—and, further, that toward the south the dip and strike of the fractures shift. In the region about Tyrone the strongest fractures observed in the mines strike northeasterly and dip at different angles to the south. On the southern border of the fractured zone the dominant fractures strike east, with a northward dip, though here also many other fractures are found. Considering a number of these fissures as fault planes, it may readily be seen that a pyramid-shaped block is involved in the ore-bearing

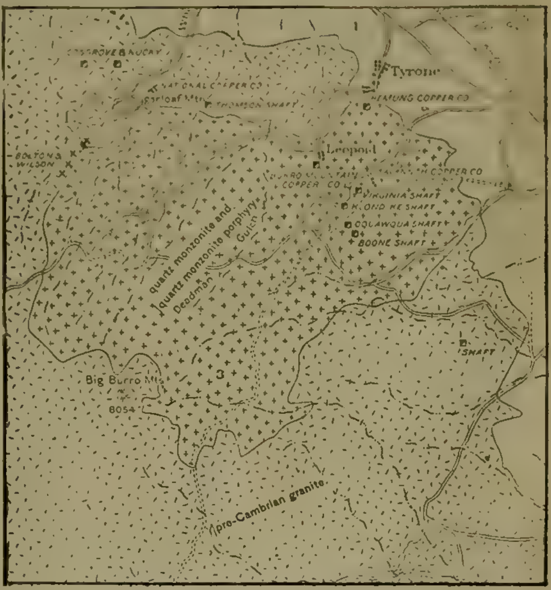


Fig. 2. GEOLOGICAL MAP OF THE BIG BURRO MOUNTAINS, NEW MEXICO.

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*Abstract from 'Contributions to Economic Geology, 1910,' U. S. Geol. Surv., Bull. 470-C.

zone and that while the limiting fractures of this block (those near the northern and southern edges) will meet at the surface near the point of the pyramid, they will meet at increasing depths as distance from the point is gained. It would be expected that percolating water under the influence of such a system of breaks would tend to migrate down the planes of the breaks and would move toward the zone of most intense fracture.

The present conditions of the orebodies, so far as mineralization is concerned, may be attributed to three processes—primary mineralization, enrichment, and leaching.

Primary mineralization consisted in the deposition of cupriferous iron pyrite (probably finely intergrown chalcopyrite with pyrite) and locally quartz. The introduction of the pyrite followed the fracturing of the quartz monzonite. The solutions which carried the sulphides not only deposited their burden in the innumerable fractures but likewise soaked into the body of the rock. Deposition was greatest along lines of easiest passage, that is, in well defined fissures. At the close of the period of deposition of the primary ore the mass of the rock consisted of a network of veins and veinlets of iron pyrite, with locally quartz and a little chalcopyrite. The feldspar of the rock was much altered to sericite and the ferromagnesian minerals were chloritized.

The formation of orebodies from this stockwork of pyrite veins was clearly a result of secondary enrichment. An opportunity for such enrichment was afforded before and during the Quaternary cycle of erosion, in which were laid down those widespread deposits of gravels and sands which now fill the Mangas valley and the country east and south. The process of enrichment is well known, and consists first in the oxidation of the unaltered pyrite near the surface by surficial waters, and second, in the deposition of chalcocite at lower levels by downward-percolating water, which in the main carried copper in a sulphate solution. The junction of several fissure systems and the local damming of percolating waters against relatively impervious dikes have tended to produce enrichment. A microscopic examination of a number of thin sections cut from sulphide-bearing rocks in the mine of the Chemung Copper Co. shows rather plainly certain of the stages in the formation of the chalcocite. Fig. 1 shows a veinlet cutting feldspar in which a nodule of pyrite is surrounded by chalcocite; a little quartz is present. Near this veinlet may be seen grains of unaltered sulphides. In other specimens the rock is speckled with grains of unaltered pyrite, near which are chalcocite grains, some without any signs of the original pyrite and some showing replacement.

It is a characteristic of this district that much of the ore-bearing territory has been thoroughly leached. Portions of strong veins of chalcocite are locally leached, nothing remaining of the original mineralization except a network of limonite veins. The disseminated stockworks also are locally so impoverished as to preclude their extraction at the present price of copper. This process of late leaching is well shown in some places where vertical fractures cut across eastward-dipping veins.

The thickness of the blanket of barren ground overlying the orebodies is extremely variable. In the country southeast of Leopold it varies from a few feet to 500 feet. Near Leopold there is reason to believe that the topography of the surface affects the upper limit of the ore. For example, an orebody at a certain level will pass horizontally into leached ground, as a gulch on the surface is approached—that is, locally leaching is at lower levels directly beneath stream channels. Near strong veins and faults, too, leaching is deeper than in the adjacent ground. The thickness of the chalcocite zone also is variable. Southeast of Leopold unaltered sulphides are found locally at a depth of 380 ft., above which is 180 ft. of secondarily enriched ground. The leached ground therefore is 200 ft. deep. Again, a drill found unaltered sulphides at 250 ft., and at another locality unaltered sulphides appear at 300 ft. The ground carrying chalcocite is locally 200 to 300 ft. thick. In the Tyrone country leaching is locally very deep, 700 ft. or more.

Permanent water-level also is variable, standing 300 to 500 ft. beneath the surface. It may vary as much as 200 ft. in half a mile. The amount of water increases rapidly as the foot-wall fault near Tyrone is approached, indicating increased flowage near such breaks and accounting for the deeper leaching adjacent to them.

Broadly considered, the orebodies that have been best developed fall into two classes—those which are directly connected with veins and those which are not. Of the former several have been worked extensively in the territory southeast of Leopold, and much rich ore was extracted. In the mines near Leopold and Tyrone, also, much rich ore has been extracted from veins. The second class includes cigar-shaped masses of chalcocite ore and irregularly shaped blocks of ground grading off at the edges into rock too poor to be commercial. This grading off into lean material is in some places due to a change to unaltered sulphides, in others to a change to leached material. A number of these orebodies are several hundred feet in length, breadth, and thickness.

The material considered ore in these mines varies in copper content from 2.5 to 3%. As a rule the costs of mining and price of copper will determine when an orebody will cease to be profitable to work. At the time of my visit development by the Savannah Copper Co. was confined to drilling. A number of mines now closed, but worked in the past, are controlled by this company, but it was not practicable to study the underground workings. The more important shafts are shown in Fig. 2. The Mangas Development Co. also confined its operations to drilling. Active development by driving and shaft-sinking was under way only on the property of the Burro Mountain Copper Co. and the Chemung Copper Company.

Cupferron

Under the name 'Cupferron,' Oskar Baudisch has introduced the ammonium salt of nitrosophenyl-hydroxylamine, $C_6H_5(NO)ONH_4$, into quantitative analysis as a precipitant for cupric and ferric ions. By means of cupferron, iron and copper may be separated very rapidly and exactly, not only from one another, but also from almost all the other metals. The new method exceeds in elegance, simplicity, and rapidity of operation all the methods previously known for the separation of iron and copper, and has already met with great favor in technical chemical analysis in factories and mining and metallurgical plants. The advantages of precipitating with cupferron, as given in a recent number of *The Journal of Industrial and Engineering Chemistry*, are: (1) Iron and copper are precipitated from solutions strongly acid either with mineral or acetic acids. The precipitated iron and copper salts may be easily and thoroughly washed free from the chlorides, nitrates, and sulphates of any other metals which may be in solution. (2) The precipitate settles rapidly and may be filtered off without loss of time. (3) The separation of the iron from the copper is accomplished simply by washing the precipitate on the filter with dilute ammonium hydroxide solution. The ferric salt is completely insoluble and remains on the filter. (4) The iron salt is readily soluble in ether, chloroform, and acetone, and may be dissolved, on the filter, away from any other metallic salts such as Pb, Ag, Hg, Sn salts, which may have been simultaneously precipitated. The particular value of the new method lies in the fact that by its means iron may be rapidly separated from aluminum, manganese, chromium, nickel, and cobalt. The 'cupferron' method has been thoroughly tested from many sides. Cupferron will undoubtedly find extensive application in the quantitative analysis of widely different materials, for it has also been discovered that titanium, cerium, and zirconium may be quantitatively precipitated from acid solutions by it.

THE Santa Maria oilfield furnishes the greatest amount of natural gas in California. There are no dry wells, and gas is separated from the oil in gas traps. About 70% of the total production is used for industrial purposes.

Arizona Metal Production in 1910

The total value of the mine output of gold, silver, copper, lead, and zinc in Arizona in 1910, according to V. C. Heikes, of the United States Geological Survey, was $42,731,519, against $44,053,023 in 1909. The decrease in value in Arizona, as in California, was due mainly to the decrease in the production of copper.

The total production of gold in Arizona in 1910 was 152,350.58 oz., valued at $3,149,366, an increase in value of $411,866. Of this output, 1257.27 oz. came from placers, 95,395.07 oz. from silicious ore, and 52,707.40 oz. from copper ore. From bullion in gold and silver mills were recovered 84,173.85 oz., concentrate produced 9955.76 oz., and crude ore sent to smelters contained 56,443.59 oz. The largest production of gold was from Mohave county $1,145,022 in 1910, against $356,363 in 1909.

Arizona's silver production in 1910 was 2,566,528 oz., valued at $1,385,925, against 2,601,161 oz., valued at $1,352,604, in 1909. Of this output 1,934,363 oz. came from copper ore, 440,126 oz. from silicious ore, and 119,034 oz. from lead ore. Bullion at gold and silver mills produced 59,812 oz. of silver in 1910, concentrate produced 96,894 oz., and crude ore sent to smelters contained 2,402,229 oz. Cochise county produced 1,208,274 oz. of silver in 1910, against 1,454,390 oz. in 1909, and Yavapai county, 699,702 oz. in 1910, against 578,580 oz. in 1909.

Copper production decreased in Arizona from 303,899,461 lb., valued at $39,506,930, in 1909, to 297,491,151 lb., valued at $37,781,376, in 1910, but Arizona still ranked first among the copper-producing States in the country in 1910. Concentrate produced 59,425,058 lb. of the output and crude ore sent to smelters produced 237,774,349 lb. Cochise county, which includes the great Warren or Bisbee district, produced 145,310,623 lb. of copper, against 140,810,472 lb. in 1909. Greenlee county, embracing the former eastern portion of Graham county and including the famous Clifton-Morenci copper region of Copper mountain and Greenlee districts, produced 72,878,094 lb. of copper, against 71,825,750 lb. in 1909. Yavapai county, incluring the Verde district, produced 40,824,556 lb. of copper, against 37,125,964 lb. in 1909, and Gila county, including the Globe district, produced 31,330,222 lb. of copper in 1910, against 39,451,896 lb. in 1909.

The production of lead in Arizona in 1910 was 2,696,998 lb., valued at $118,668, against 3,098,083 lb., valued at $133,218, in 1909. Cochise county, in which are the Tombstone mines, produced 1,176,416 lb., followed by Mohave county, with 740,091 lb. Increased output in 1910 was made from Mohave and Santa Cruz counties. Concentrate produced 300,268 lb. of lead in Arizona in 1910 and 2,393,610 lb. was contained in crude ore sent to smelters.

The zinc production of Arizona was 5,484,899 lb., valued at $296,184, in 1910, against 5,977,237 lb., valued at $322,771, in 1909. Mohave county, mainly from Union Pass camp, produced 5,474,046 lb. of zinc in 1910, against 5,264,121 lb. in 1909. Cochise county, which produced 713,116 lb. of zinc in 1909 from the Tombstone district, produced none in 1909.

There were 373 mines producing gold, silver, copper, lead, or zinc in Arizona in 1910, against 268 in 1909.

The total quantity of ore sold or treated in Arizona in 1910 was 3,914,969 short tons, a decrease of 111,986 tons.

Mine Production of Gold, Silver, Copper, Lead, and Zinc in Arizona in 1910 by Counties.

[By Victor C. Heikes, U. S. Geological Survey.]

Counties.	Ore treated, Tons.	Gold.*	Silver,* Fine ounces.	Copper, Pounds.	Lead, Pounds.	Zinc, Pounds.	Total value.
Cochise	1,294,282	$587,476	1,208,274	145,310,623	1,176,416	....	$19,746,155
Coconino and Maricopa	13,907	65,631	2,729	67,527	....	....	75,680
Gila	312,057	25,229	174,696	31,330,222	6,102	....	4,098,772
Graham	18	1	145	....	20,824	....	995
Greenlee	1,561,167	48,191	147,060	72,878,094	31,576	....	9,384,511
Mohave	99,283	1,145,022	112,445	529,753	740,091	5,474,046	1,601,183
Pima	177,675	4,982	109,355	6,137,313	289,907	....	856,229
Pinal	239	1,999	9,956	11,361	13,081	....	9,394
Santa Cruz	793	2,658	83,219	42,261	107,500	10,853	58,279
Yavapai	417,308	881,970	699,702	40,824,556	264,911	....	6,456,184
Yuma	38,240	386,207	18,947	359,441	46,590	....	444,137
Total	3,914,969	$3,149,366	2,566,528	297,491,151	2,696,998	5,484,899	$42,731,519

*Includes placer production.

Galvanizing Steel in Zinc Dust

By Alfred Sang

*The instantaneous galvanizing of steel in zinc dust above 420 C. is readily explained by completing the theory which I developed as far back as 1907. I will now state it in its complete form. Zinc dust is produced by the sudden cooling of the vapor of zinc, and the transition from the gaseous to the solid state is so rapid that, for all practical purposes, the liquid state is skipped. The setting of the zinc, brought about by sudden chilling, prevents regular arrangement of the molecules along determined stereochemical lines; it forbids the formation of crystals, for which time is required. The heat of solution of matter in an amorphous state is always higher than when in a crystalline state; the same is true of a strained condition, which likewise presents an amorphous appearance. At the time of formation, considerable heat is retained which would have been radiated by slow cooling. The condition is one of physical instability resulting in readier and, oftentimes, explosive decomposition.

The physical instability of zinc dust may be explained thus: in the prolongs of zinc furnaces the uncondensed vapor is suddenly chilled and collects in minute drops which are instantly congealed at the surface and oxidized, forming a rigid spherical skin or crust. Within this crust the liquid zinc cools and contracts more slowly, but the rigidity of the crust does not permit the drawing in of the surface to form the facets of a crystal and compensate this internal contraction. Thus, voids must exist within the crust and we may presume a structure which might be described as 'piped radially' or as negatively crystalline. Below the melting point of zinc this condition persists, but affinities and thermal inducements find a readier response from zinc dust than from any other form of zinc, both by reason of the enormous amounts of free surface and because of this unstable condition. At about 415°, which is the melting point of zinc, the strain within the zinc dust particles is totally or almost totally relieved, as indicated by the loss of heat, although some of the latent heat must be retained for fusion.

At high temperatures zinc dust is pasty, because formed of innumerable little bags of melted zinc, but these will not coalesce on account of their small size and closely packed condition, unless considerable pressure is used. These minute bladders might be compared to soft-shell turtle's eggs; they form a plastic and cellular mass. If, however, a reducing agent, say a drop of coal tar, is introduced, reduction of the skin takes place and we get a small mass of more or less spongy metallic zinc. If a metal which is electro-negative to zinc, such as iron, is put into contact with these bags of zinc, reduction and an exchange of metals take place, the bag is punctured at the point of contact, and the zinc spreads itself on the iron. Hence it is that steel can be galvanized in this manner by means of a plant closely resembling a hot galvanizing plant, for the process is, in fact, one of hot galvanizing.

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*Excerpt from a paper presented before the American Electrochemical Society, Toronto, September 21 to 23.

Sluices

At the LaGrange mine, near Weaverville in Trinity county, California, the sluice-boxes have a grade of 8 inches in 12 ft. and sand and gravel travel in them at the rate of 27 ft. per second; boulders weighing from 300 to 600 lb. each, 20 ft. per second; boulders weighing 600 to 2000 lb., 16 to 17 ft. per second; boulders weighing 2000 to 5000 lb., 13 ft. per second; boulders weighing 5000 lb. upward, 6 ft. per second. The ratio of water to solids by volume is 9 to 1, or, in other words, water will carry 10% of solid matter. On ordinary sand and gravel a velocity of not less than 10 ft. per second of water is required to move solid material, and it may be seen from the actual data given above that a much higher velocity is required where the gravel carries large boulders. Without knowing the dimensions of the LaGrange flume, the velocity of the water in the specific case mentioned above cannot be calculated, but the formula as ordinarily used for this purpose is as follows:

P = Length of wetted perimeter in feet.

T = Top width in feet of surface of water.

B = Bottom width in feet of ditch.

D = Depth in feet from surface of water to bottom.

C = Constant which varies from 30 to 100.

H = Height in feet of difference of level of the section under consideration.

A = Cross-section area of waterway in square feet.

V = Mean velocity of flow in feet per second.

Q = Flow in cubic feet per minute.

L = Horizontal length in feet of section of ditch under consideration.

$$V = C\sqrt{\frac{A}{P} \cdot \frac{H}{L}}$$

$$Q = VA \times 60$$

The constant, C, is ordinarily taken as 32 for trapezoidal earth ditches, 100 for trapezoidal flumes built of planed wood or sheet steel, and 90 for rectangular flumes of unplaned plank. For ditches in clay, etc., with good smooth sides an approximate estimate should be made in which the constant would lie somewhere between that for trapezoidal earth ditches and for planed wood flumes.

Where the topography is such that any gradient desired can be secured, the grade adopted will depend upon the character of the gravel to be moved; with 2 inches in 12 ft. as a minimum, and 12 inches in 12 ft. as a maximum. Where the gravel is coarse, or cemented, or there is much clay, steeper gradients are necessary. But even when light gravel is being washed it is better to use a grade of at least 6 inches in 12 ft., as more material can be washed and the labor of handling large rocks is much decreased. In washing heavy gravel the water should be deep enough to cover the largest boulders sent down, while for light gravel the water only needs to have enough force to carry the rocks through the sluice without allowing the packing of black sand. The packing of the black sand is worse when too much water is used, and the best results are obtained with shallow streams on as light a grade as is consonant with a reasonable rate of working and a not excessive amount of labor for removing rocks from the sluice.

Placer Gold in Northwestern Montana

Many glacial moraines contain particles of gold, yet the metal is rarely so abundant as to make their treatment profitable. This is due to the fact that running water has not had opportunity to concentrate the precious metal scoured by the glacier from the decomposed surface of the mountains. In a short report, however, just issued by the United States Geological Survey, F. C. Schrader gives an interesting account of gold-bearing ground moraines at Kennedy creek and Libby creek, Montana. The Kennedy creek deposit, says Mr. Schrader, is commonly known to mining men who have examined it as ancient lake gravel, but it seems plainly to be a subglacial or ice-laid deposit of till—a ground moraine. The material is evidently derived from the upland mountains on the northeast, whence it was scoured off the surface by the ice-sheet, shoved and dragged down the slopes, crushed, ground, and finally compressed beneath the ponderous ice mass. The ice sheet probably covered the basin with a thickness of a thousand or more feet for a period of centuries.

A most unusual feature is the fact that this glacial deposit does not seem to have been concentrated by later streams nor to have derived its gold from pre-existing placers. If this view is correct there must occur in the mountains or uplands to the northeast, in the path of the ice that deposited the moraine, some rich gold-bearing vein or bedrock area as yet undiscovered.

Tests made of the deposit in six different shafts fairly well distributed over about half a square mile in the southern part of the basin show the gold content of the deposits to range from 20c. per cubic yard near the surface to about $5 per cubic yard in the bottom foot of gravel next to bedrock, from which it is readily apparent that the deposits contain considerable gold. By some mining men the amount of gold present in the basin has been estimated at $18,000,000. From the data obtained in the present tests, after reasonable allowance is made for boulders, which in the lower part of the section constitute about 10% of the material, the deposit in the southern part of the basin seems to contain on the average about 80c. per cubic yard, including everything from the surface down to bedrock, or about $4 per bedrock yard. This would amount to about $17,360 per acre, or more than $5,500,000 for the Kennedy placer portion of the area examined. The estimate does not include the neck of the deposit in the downstream outlet, which in places attains a thickness of 80 ft. or more and is known to carry considerable gold. In the basin as a whole, if gravel of this grade is present throughout, there is probably more than $11,000,000 worth of gold.

The entire district of which Kennedy creek is a portion is roughly estimated by Mr. Schrader to contain about $100,000,000 worth of gold, much of which, he states, to judge from the attention the district is receiving, will probably be won in the near future. A copy of Mr. Schrader's report, which is contained in Bulletin 470-B, may be obtained on application to the Director, United States Geological Survey, Washington, District of Columbia.

Increased Use of Oil on Railroads

An interesting feature shown in the report on petroleum for 1910, by the United States Geological Survey, now in preparation, is the statement of the extent to which oil enters into railroad transportation. The total length of railroad line operated by the use of fuel oil in 1910 was 21,075 miles, a trackage equivalent to that of practically five transcontinental lines stretching across the United States from ocean to ocean. Some of the lines that use oil, however, also use coal. The number of barrels of fuel oil (of 42 gal. each) consumed by the railroads of the country in 1910 is stated to have been 24,526,883. This includes 768,762 bbl. used by the railroads as fuel otherwise than in locomotives. The total number of miles run by oil-burning engines in 1910 was 88,318,947.

Discussion

Readers of the Mining and Scientific Press are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Cyaniding Base Silver Ores

The Editor:

Sir—In reading over articles on fine grinding as they appear in the various mining journals, as well as enthusiastic metallurgical reports by firms supplying mining machinery, one may in time become convinced that all-sliming must, in some mysterious way, prove a solution of the treatment problem, even for the most basic and refractory ores. One feature, however, that is not always given the prominence which its importance demands, is that the finer the pulp is ground the more readily will it give up its undesirable base minerals as well as the precious metals.

A very base partly oxidized silver ore with which I recently had to deal, in Mexico, gave rise to some interesting results when I came to examine the working solutions after a month's run. The ore contained traces of copper and manganese, some zinc and antimony, considerable amounts of arsenic as mispickel, calcium and magnesium as carbonates, and alumina and silica; also large quantities of iron, both as sulphide and oxide, with occasional small amounts of ferrous iron as ferrous sulphate.

In assaying the solutions by the addition of lead acetate and throwing down the silver in a lead sponge by means of zinc shavings, I found it necessary to filter and scorify before cupelling. A heavy white precipitate which formed on introducing a solution of lead acetate precipitated a portion of the silver from solution, and the white precipitate could not be satisfactorily collected with the lead sponge. 4 A.T. of working solution containing 18.3 mg. of silver to which were added 10 c.c. of a 10% lead acetate solution, yielded 3 gm. of white precipitate containing 0.3 mg. of silver. Hence, 1.60% of the silver was thrown out of solution by the white precipitate under the above conditions. I later found this white precipitate to be soluble in ammonium acetate, which would indicate a lead salt, so that it was possible to shorten the work somewhat by collecting the sponge and cupelling direct, though not advisable. Other results obtained were: total sulphur, 0.11%; sulphocyanides and nitrites, 0.18%; soluble sulphides, trace; copper, 0.09%. The remedy usually recommended for copper is the use of a zinc-lead couple in the zinc-boxes.

Tests with mercuric chloride gave unusual results. The addition of sufficient $HgCl_2$ to destroy all free cyanide in 4 A.T. of the working solution, containing 18.3 mg. of silver, yielded a precipitate weighing 4.5 gm. and containing 18.2 mg. of silver, thus indicating that the precipitation of the silver had been practically complete. In a second test a precipitate weighing 0.5 gm. contained silver amounting to 2.03 mg., which would indicate that the silver thrown out of solution was approximately proportional to the amount of the yellow precipitate found. Examination of this yellow precipitate showed that it was composed mainly of silky white mercurous chloride, occluded and masked by a yellow precipitate containing copper. The HgCl was reduced from the $HgCl_2$, due to the strong reducing action of the working solution. As HgCl is soluble in a KCN solution, why it should be formed and remain in suspension in this particular case is another interesting problem. Remedies which suggest themselves for this condition, are to remove the copper and to try to decrease the reducing power of the solution.

A test for reducing power of the working solution as compared with that of a newly made up solution was made by oxidizing each with a standard N/10 $KMnO_4$ solution. Ten cubic centimetres of the new solution (KCN 0.235%) required 0.1 c.c. of the standard $KMnO_4$ solution, while 10 c.c. of the working solution (free KCN 0.235%) required 11.6 c.c. of the standard $KMnO_4$ solution, which means a reducing power of 116 times that of the new solution. Inasmuch as it is now thoroughly established that gold and silver require oxygen for solution, and this high reducing power can hardly be taken otherwise than indicating an absence of oxygen and oxidizing agents, it would seem to be no discredit to the cyanide process that an extraction of 70 to 85% could be maintained under such conditions, even though a higher extraction had been hoped for from the results of the preliminary examination.

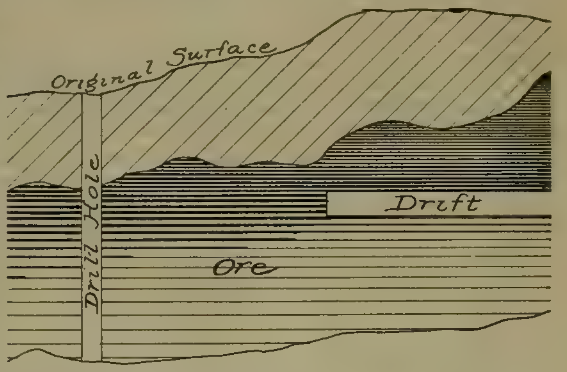
J. E. Clark.

Los Angeles, September 21.

Recent Problems In Copper Production

The Editor:

Sir—A few further points concerning some practical features may be of interest in supplementing your very interesting article on recent problems of copper production. In regard to exploration by churn-drills, which I believe more accurate and far less expensive than the use of drifts and raises, it should be noted that the holes are cased and the casing follows down, thus eliminating the possibility of salting, and giving a larger and more accurate sample than can be taken by cutting a vertical sample in a raise. As the ore is generally richest immediately under the capping, decreasing in grade as depth is attained, there will be less liability of error when all the samples representing a block of ore are taken from vertical sections. For example, assume the average condition as in the accompanying sketch, in which the heaviest shading represents the richest ore. It will be seen how important it is to take only vertical sections and not drift samples, which, running horizontally, only represent the grade at the elevation of the drift itself.



The fact that a steam-shovel is only engaged in useful work for 40% of the time may appear low, but it must be remembered that shovels often go out of commission, and the best plan is to give them sufficient motive power and cars to secure minimum costs. For this reason a shovel can be oversupplied as well as undersupplied with cars. That 1.75 to 1 is the most desirable slope for economical operation at the Nevada Consolidated is true while retaining the track benches for further stripping, but when the ore limits have been reached, the benches can be cut away and the final slope brought to about 42 to 45 degrees.

At the Steptoe Valley smelter the average throat draught of the reverberatory-furnaces with coal firing was 1.4 in water and at the stack 1.8 in. With oil the throat draught averages only 0.5 in., and stack about 1.6 in. The best boiler to employ for the recovery of heat from the furnace gases is the vertical tubular type. This allows some self-cleaning of tubes from flue-dust by gravity. In the management of converters it is found that basic linings cannot stand excessively high temperatures so well as acid linings, neither can they stand the same range of temperatures without serious deterioration. This is a very important point in the successful use of basic lining.

C. B. Lakenan.

Ely, Nevada, September 30.

Special Correspondence

NEW YORK

Spasmodic Condition of Market.—Dull Copper Outlook. — Development at Chino. — Calumet-Hecla Merger.—International Combination.—Kerr Lake Annual Report.—La Rose Surplus.

Not since the days of 1907 has there been such market history made as that recorded on the tape during the past ten days. It is a patent example of the irony of market action that the Standard Oil Co., long held up to view as the most iniquitous of monopolized combinations, could be dissolved by decree of the United States Supreme Court without suffering unduly in market price, while the United States Steel Corporation, the greatest of J. P. Morgan's achievements, the chief monument of his constructive genius, pointed to as a beneficent example of the modern-day triumph of coöperation over the old principle of competition, should lead in a market smash of terrific proportions when the rumor of impending prosecution began to look as if there were some measure of truth behind it. For two weeks Steel has been under heavy pressure. The press has demanded some expression as to intended prosecution from the Attorney General of the United States, as to dissolution or rumored reorganization from the various heads of the steel corporation, but such fragmentary utterances as have been forthcoming have by no means cleared the atmosphere. Early in the current week, J. P. Morgan made his first public move since his recent return from Europe, when in conjunction with E. H. Gary, he issued a statement to the effect that the Steel trust has always been careful to keep within the limits of the Sherman Anti-Trust Act and that there was no intention of dissolution or reorganization. A sharp rally, the first for several long strenuous days, followed, only to be swept aside by a renewed flood tide of liquidation. The volume of trading has on some of the recent days been larger than any time since 1907. New York as a market centre is feeling the strain of the situation both at home and abroad. Germany and France on the verge of a conflict that is now said to have been much more narrowly averted than was shown by general report, England's universal sympathetic strike development, riots in Vienna, and war between Italy and Turkey indicate that in some form, unrest is everywhere.

The mining industry is more affected by the influences controlling the copper metal market than in any other way. The European markets have been consuming copper in record-breaking quantities. Now the most optimistic are forced to anticipate a lessened demand from abroad. Quick improvement at home is out of the question, and as there are some mines that must 'willy nilly' produce at capacity, the higher cost coppers are facing a most unenviable situation. The recent changes in the United Metals Selling Co. left that concern where it is no longer maintaining prices as it once did. It can only be said therefore that although technically the position of copper is all that could be asked, accumulated stocks on this side equaling only thirty days output and the world's visible supply as estimated, equivalent to but three months production (certainly not more than a safe margin under normal conditions), yet there is nothing to be seen in the future, at least for some months, but lower prices and an increasing surplus. There are some copper mines that can view the outlook with equanimity. Utah Copper's recent breaking of all records for one month's output, Nevada Consolidated's preparation for winter work by stripping as far ahead as possible, the rushing of work on the newer properties, Ray, Chino, Miami, Braden, Inspiration, Mason Valley, and others, can mean but one thing. There is at hand a period when those mines that cannot produce copper for less than 10c. will be forced to suspend until increased constructive activity so augments the demand as to push prices up and as such demand rises and falls so will production from the higher-cost properties be regulated. In this class are such mines as the Granby, the Imperial, the Shattuck-Arizona, the Ballaklava, many Michigan mines, and others less important.

The Guggenheim string is growing in importance. Chino is to be a steam-shovel mine; its potential production is figured at 55,000,000 lb. per annum, with a cost of not above 8c. The concentrator of which the first 1000-ton unit goes into commission this month, is to be of 5000 ton daily capacity. The concentrate presumably will go to the American Smelting & Refining plant at Hayden, Arizona, which was originally planned and erection begun as the independent smelter of the Ray Consolidated Copper Co. The latter mine is now looked upon as second in importance to Utah Copper only, being capable of producing 100,000,000 lb. of copper per annum at a cost of 8½c. per pound. The estimated expenditure is $8,000,000. The market situation of each of these two immense enterprises is strikingly and consistently inconsistent. Months ago, each sold at nearly twice present market prices. The future of each was then undemonstrated. In the interim, money has been poured into each in vast quantity. The life of each has been made certain for a long time with long extensions more than possible. Yet, today both are regarded without great enthusiasm even by that part of the public which invests in mining issues and proclaims itself as looking for bargains. The attitude of the public is past understanding.

The Boston copper share market is suffering from the snarl occasioned by the Calumet-Hecla merger. It seems impossible to learn the real attitude of the sponsors for the consolidation. Stories to the effect that the whole matter would be dropped if it could be done without loss of dignity or prestige, are followed by defiances and announcements of determination to fight all the various suits through every possible tribunal until disposed of. Under prevailing conditions, it would seem that any talk of a copper merger could hardly be received seriously. Yet, the tour of W. E. Corey, John D. Ryan, L. D. Ricketts, and W. D. Thornton, of the Greene-Cananea, R. L. Agassiz, vice-president of the Calumet & Hecla, and some other associates, is said to mean a coming coalition of the important producers. To avoid a clash with Federal authorities, it is said the parent organization will be formed in England and headed by Baron Rothschild. While such a solution of the copper situation seems at first somewhat improbable, yet it must be admitted that the formation of a merger within the jurisdiction of the United States is out of the question, while the need of an organization to correct conditions is as universally recognized. If the legal minds, which have been unable so far to plan a copper merger that would not be born an outlaw, have at length devised some way of seeking cover abroad while retaining control of property in this country, England may prepare headquarters, not only for the yet unborn copper trust, but for numberless other hard-pressed corporations that are ready to seek sanctuary and that would welcome an opportunity to elude the Attorney General.

The Kerr Lake annual report was given out this week, showing a production of 2,388,420 oz., as compared with 3,046,295 oz. for the year preceding. The cost of production was 14.69c. per oz., as compared with 13.27c. per oz. for the year 1910. The report shows that Kerr Lake owns some 150,000 shares of Wettlaufer. Perhaps the item in which shareholders are most vitally interested is that of the ore reserves and the future life of the mine. On this point the mine manager says, "on account of the great irregularity in the ore deposits, your manager does not feel warranted in making an estimate, either of the total ore in sight in the mine, or of the value of the probable ore," which is, to say the least, somewhat indefinite. It is greatly to be deplored that the Cobalt deposits lend themselves so little to adequate measurement. The camp has produced so much from so small an outlay that its record will stand a long time, as a poor man's camp, but the public has shied at the element of uncertain length of life; and dividends and share prices have for months held no proper proportions. The La Rose directors are expected to meet within two or three weeks and to take some action in distributing the $1,400,000 surplus which has accumulated since the dividend rate was cut down to 8% per annum.

GOLDFIELD, NEVADA

Deep Prospecting at Goldfield.—Development of Diamondfield Black Butte.—Work on the Vernal.—Reorganization of Silver Pick.—Notes of District.

At the annual stockholders' meeting of the Goldfield Merger Mines Co., held at Seattle last week, J. Ross Clark, brother of William A. Clark, C. O. Whittemore, vice-president and general counsel for the Clark railroads, C. E. Redman, an officer of the roads, John Erikson, and George A. Kernick were elected directors, and the purchase of all property and assets of the Goldfield St. Ives Mining Co., one of the components of the Merger company, for $530,000, or on a basis of practically 35c. per share, was authorized. The directors will meet in Goldfield on October 5, when officers will be chosen for the ensuing year and announcement will be made of plans for the development of the Merger Mines ground, including the sinking of a 2000-ft. 4-compartment shaft at once, according to official statements. It is now regarded as probable that the directors will decide to enlarge and deepen the old company shaft on the Moonshine claim, already over 600 ft. deep.

Details of a deal that will involve the extensive development of the Diamondfield Black Butte mine will be announced soon. Three leases are producing ore of good grade from shallow workings about the butte and another lessee will operate on the 300-ft. level from the main shaft. It is said that the impending deal will mean either the merging of the Black Butte with the adjoining Goldfield Belmont, and possibly another property, or the passing of control of the Black Butte to the men who head the Goldfield Belmont and who are large stockholders in Tonopah-Belmont. The Black Butte has produced over $600,000 in ore of shipping grade, all from above the 300-ft. level, and has a large tonnage of milling ore exposed; enough to justify the erection of a mill of considerable capacity. A new ore-shoot, yielding $300 ore from 18 in. to 2 ft. wide, has lately been exposed in driving from one of the old adits.

Work is now in progress on the Vernal, adjoining the Belmont on the north and having the same vein from which the latter is extracting shipping ore on its 300-ft. level. Control of the Vernal has been acquired by J. A. Steinmetz, J. A. Vincent, and J. A. Janney, of Philadelphia. The work has been started from an old shaft on the Belmont, near the boundary, and driving is in progress at a depth of 112 ft., where seams of good ore are still exposed in the old drifts. A working shaft will be sunk as soon as the dip of the ore is determined.

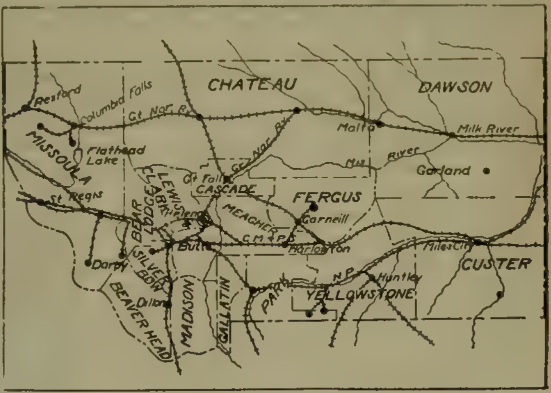
Another deep shaft and extended exploration will be started soon on the Silver Pick. This company has been reorganized on the assessable stock basis, with Herman Zadig, of San Francisco, at its head. The claims adjoin the Mohawk and Combination mines of the Consolidated. Seams of high-grade ore have been exposed recently by lessees working in the old company shaft of the Daisy. Other lessees, working on the west end of the Daisy and east end of the Great Bend, are shipping good ore to the Nevada Goldfield mill. It is said that work will be started on a good scale before long on the property of the Goldfield Five-to-One Mines Co., which owns 13 claims near the Yellow Tiger, which has a main vein from 60 to 80 ft. wide and a large cross-vein intersecting the north vein. Work will also be resumed during the fall on the Nancy Donaldson group, which has produced small quantities of extremely rich ore. Reports of damage caused by the caving of a stope in the Florence mine are said to be unfounded, as many of the old stopes on upper levels have been backfilled and abandoned and their caving can cause no damage. The Florence mill continues to treat 170 tons per day, with excellent extraction and economy of operation. The Jumbo Extension is driving south on the 1030-ft. level and has some fairly good milling ore in workings on the 800 and 850-ft. levels, some of which was recently shipped to the sampler as a test. The Polverde claim of this company can now be regarded as permanently immune from the possibility of apex trouble with the Consolidated or any other adjoining properties.

BUTTE, MONTANA

Zinc Smelter at Butte.—Fire in the Neversweat.—Lowered Costs at Anaconda.—Soft Ground in the Ophir.—East Butte Production.—Good Ore in Little Annie.

It is reported that W. S. Clark will erect a large zinc smelter somewhere near Butte early next spring. The zinc mine Mr. Clark is now working in Butte is proving a profitable investment, and last year for the 12 months ended May 1, 1911, produced some 90,000 tons of high-grade ore which was treated at the concentrator of the Butte Reduction Works, leased from the Anaconda Copper Mining Company.

The Anaconda Copper Mining Co. is experiencing some difficulty with the fire which has been burning for years in the Neversweat and Anaconda mines. Only a short time ago some men were overcome by escaping gases through slight holes or leaks in the bulkheads of the Neversweat, and now the company is making preparations to effectually wall in the fire zone and forever prevent any further danger from escaping gas. Plans are being prepared and work will soon be started to build immense cement walls from the 1800 to the 1300-ft. level and thus completely close in the fire. It is estimated that the work will require six months, and this means the practical closing down of the mine for that time, but the shut-down will not mean that any less men will be employed or less ore hoisted, as the miners will be distributed among the other properties and the output increased accordingly.



MONTANA.

The closing up of several shafts, except for ventilation purposes, and the extensive use of electricity is bringing the costs of production to a point where the Anaconda company can easily earn its dividends and add something to the treasury surplus besides. Just now the company is undoubtedly putting copper down in New York at around 9c. per lb., and should reach 8c. per lb. by the end of the year.

At the Ophir mine of the Butte Central Copper Co. there is difficulty in finding solid ground for a station at the 1000-ft. level. The company is continuing its shipments of about 50 tons per week. All the ore is being taken from the 300-ft. level, where the rich find was made some months ago. The East Butte company will produce about 1,000,000 lb. of copper per month from now until the first of the year, and after the first of January, if conditions warrant, the production will be increased to about 1,225,000 lb., as the smelter can easily handle that amount. The only custom ores being received at the smelter come from the Butte & Ballaklava, the Butte-Alex Scott, and the Keating, the last gold ore. The Little Annie of the Butte-Alex Scott is developing into a valuable silver property. Although only down 200 ft., some ore is being taken out which averages 25 oz. in silver and about $1.50 in gold. The 200-ft. level is proving so rich that it has been decided to abandon for the time being the sinking of the shaft another 100 ft. and devote all energy to further developing the property on that level.

JOPLIN, MISSOURI

Prices and Production.—Bureau of Mines Investigation.—Importance of Proper Ventilation.—Steady Production from New Kansas District.—Zinc and Lead Notes.

Continued high prices for blende and calamine have resulted in the heavy surplus that had accumulated during the first part of the year being well cleaned up. In the bins of the district less than 4000 tons is available at present prices, that is, $42 to $45, basis of 60% for zincblende, and $23 to $25, basis of 40% for calamine. About 3000 tons, being held for $50 basis, is not considered a drug on the market. At the mines of the American Zinc, Lead & Smelting Co., at Prosperity, Mo., the blende reserves are in excess of 1200 tons, due to the inability of the American company to smelt its ore, strikes at the Kansas smelters having troubled that company for the past few months.

Among the new soft-ground mines that are figuring conspicuously in the weekly turn-ins is the Tilho, on the Scotia Mining Co.'s land, west of Joplin. The mine is within 1000 ft. of the famous old Scotia property, from which $300,000 worth of ore was produced, all treatment being on hand-jigs. Although the ore is found at shallow depths, 75 ft. being the extent of present development, and although the big pockets now being worked reach to within a few hundred feet of the outlying drifts of the old Scotia mine, operators who gouged the tract with drill-holes years ago, following the abandonment of the Scotia, failed to find the continuation of the run. Recent prospectors found the orebody by drilling, and the mine is now turning out about 120,000 tons of high-grade blende concentrate weekly.

Through inefficient milling methods, according to the belief of C. A. Wright, of the U. S. Bureau of Mines, who is now in the Joplin district, thousands of dollars worth of zincblende is lost annually. Mr. Wright has been detailed to spend eight or nine months investigating local conditions. That operators are appreciative of the efforts of the Bureau of Mines to improve local mining and milling conditions, if possible, is evidenced by the warm welcome received by Mr. Wright. The rehandling of tailing has become a factor of great importance throughout the district. Frequently the mill recovery from tailing is in excess of 2%. The Government is working on the theory that the saving of this ore in the first milling would eliminate the big expense of the rehandling. Mr. Wright lays great stress on the proper treatment of the finer ores. After thoroughly investigating conditions, he intends to make a detailed report on his findings.

Safety of its employees will be the first consideration of a new company that has taken over the Symmes mines on the Riseling estate west of Joplin. Development, in the past, has been along lines looking more toward a heavy production of concentrate than to proper handling of the ground. Ventilation in the ground has always been bad. J. B. Morsman and L. C. Sly, the new owners, intend to connect the north and south workings of the property as an initial step. Small side drifts are to be cut toward several drill-holes, through which pure air can flow into the workings. The company has remodeled the mill, and for the time being will handle ore from the upper level at a depth of 70 ft. The company has five shafts in ore, all connected by tramways with the mill. The capacity of the remodeled mill will be 300 tons per shift.

The pumping capacity has been doubled at the mines of the Eastern Lead & Zinc Co. at Lawton, Kan. The company, although working only shallow deposits at 40 to 70 ft., has since the floods been making several carloads of concentrate per week. The richer runs at 110 to 160 ft. are just being drained. This field was opened less than a year ago. A number of other companies are sinking shafts and conducting prospecting operations. Zincblende, lost to early-day operators, is being milled at the plant of the Harmon Mining Co. on the Prudential land, at Galena, Kan. The recovery is 4%. Pioneer miners cleaned their dirt on hand-jigs. Coarse boulders were discarded, as crushing devices at that time were inadequate to handle them. Thousands of tons of these old rock-heaps are to be re-worked. Development was carried down to the 100-ft. level, below which it was impossible to operate because of the heavy water. Pumping operations have now resulted in the water being lowered and a big stope is to be taken up. The water, heavily impregnated with sulphuric acid, has deleterious effects upon any metal; hence a wooden 2-stage centrifugal pump is employed. Gougers can find big profits in ground abandoned by larger companies. Several years ago the Lincoln Mining Co. constructed one of the largest plants in the sheet-ground district of Duenweg. It was operated for only a short time. Individual prospectors have now taken small leases on the tract, have gone into the old workings and from the small but rich seams of ore in roofs, walls, and ceilings, are producing weekly turn-ins which, to them, represent incomes far better than wages. Interest centres in new developments in the suburbs of Pierce City, Mo. This field has never been a producer of zinc. To the east mines have been opened at Aurora and Wentworth, and to the west are the Joplin and other well known camps. Henry Mulrein and associates are developing property owned by Fred Smith. Blende has been found in several prospect holes, and in the shaft, at the extremely shallow depth of 20 ft. Free ore is being sold in the rough for $8 and $10 per ton.

JOHANNESBURG, TRANSVAAL

Slump in East Rand Proprietary.—Over-sanguine Expectations.—Failure of Giesecke Mill.—Unfounded Claims.—Tin and Talk in Rhodesia.—Rhodesian Gold Mines.

A sensation has been created on the Rand through the shares of the East Rand Proprietary Mines, for some time the largest gold producer on the Rand, falling 25% during the last few months. It seems that it has been decided to reduce the dividend declaration for the year owing to, as stated in an official circular, the inability of the metallurgical plant to recover the usual percentage of gold sent to the mill. Dividends of 40% have been paid for some time, and according to R. R. Mabson, author of the 'Mines of South Africa,' there was every likelihood of the dividend being increased to 50%. This prognostication has, however, proved unjustified. As a matter of fact, the gold recovery of the East Rand Proprietary Mines has been causing some uneasiness for some time past, but the metallurgical difficulties indicated in the official circular issued to shareholders seem to be doubted as being the true cause in some quarters. The metallurgical talent in this department of the East Rand Proprietary is certainly quite as up to date as any other on the Rand, and it is feared that, after all, any falling off in the yield may be due to deeper causes than those given in the official explanation. It has been the practice on the East Rand Proprietary Mines to send to the mill a selected output such as would fairly represent the full average yield of the whole property and could be maintained as far as could be seen. Recently, however, certain sections of this huge property have not come up to expectations, and it may be that the strain thus thrown on the richer sections with the object of maintaining the average yield has been more than they could bear. That the deeper stopes have been entering poorer ground is also well known, as also the fact that a fairly large area of low-grade country is known to exist to the dip. As likewise there has been a modified change in the control of these mines, the new control may have deemed it necessary, or at all events advisable, under the circumstances, to reduce the dividend so as to prevent further disappointments. How long this reduced dividend may be paid is of course difficult to judge, but it shows how, even on extensive Rand properties with profits divided up to the hilt, unforeseen difficulties may arise and disturb what for years has been regarded as a fixed profit from what has hitherto been considered as almost a gilt edged security.

The Giesecke tube mill, as indicated in an earlier letter, has failed to come out of the Chamber of Mines trials with credit, and the Committee, in the face of the guarantees, have had no other alternative but to reject the machine after an expensive four months' trial at the Geldenhuis mine. It cannot be said that the Giesecke mill, despite the loud trumpeting with which its appearance on the Rand was announced, has done even as well as an ordinary ball mill, and its failure has been a keen disappointment to those who looked for a $\frac{2}{3}$ reduction in the capital costs of future Rand milling equipments. The truth appears to be that in its design and application the lessons taught by ordinary ball and tube milling equipment have been totally disregarded, with the results that the wear and tear, low efficiency, and high costs have proved stumbling blocks to its success. For some time to come the Californian stamp-mill will still hold the field on the Rand, and the recent mills employing stamps aided by tube-mills seem far more reliable and cheaper to work on the Rand than any of the substitutes yet introduced.

MANILA, P. I.

HEADWATERS MILL. — PROGRESS IN BENGUET DISTRICT. — START OF COLORADO MILL. — DREDGING THE GUMAUS RIVER.—COAL INDUSTRY DULL.—IRON DEPOSITS, AMBOS CAMARINES.

Actual mining operations in the Philippines have been at a low ebb during the past year. While there has been very little production, there has been considerable activity along the line of genuine exploration and development. All those who are interested in the mining industry in the Philippines have come to the conclusion that haste had better be made slowly. Of all the early ventures very little in the way of results can be shown. The chief events of the past year have been the beginning of operations of the Headwaters 10-stamp mill on the Antamok river in Benguet. This mill was erected by C. T. Durell of San Francisco. After the first successful clean-up Mr. Durell resigned, and is now about to leave for the United States, having turned over the mill to F. L. Cole, a Stanford man, who has had much experience in the Far East. The other properties in this district are fairly quiet. The Major Mining Co.'s mill is in operation. The stamps are dropping on the Benguet Consolidated, turning out a 100-oz. bar of bullion quite regularly. It will be recalled that in 1909 the cyanide plant in connection with this mill was destroyed in a typhoon. It is reported that this mill will very soon be rehabilitated.

PARACALE DREDGING GROUND, UPPER RIVER.

On the last boat going north a party of mining engineers from the Division of Mines went to Benguet to make an examination of about six properties at the request of some Hongkong capitalists. If this examination proves satisfactory these properties will be consolidated and a large mill erected on the Antamok or the Batwaan river. The recent injury to the Benguet road will probably cause some inconvenience for a time in the matter of getting in supplies and machinery to the mines. It is not yet known whether this road will be rebuilt, but at present the old Naguilin trail from San Fernando to Baguio is being put in shape. During the recent storm in the Beguet region the Weather Bureau reported a rainfall of 38 inches in 24 hours, which is probably the world's record. The mines in the district were uninjured by this storm. The proper location and construction of mills in this district, it will be readily seen, is a very serious matter and the exercise of foresight is necessary to prevent disasters.

In the Masbate district the 20-stamp mill on the Colorado properties will begin crushing about September 1. This mill is in charge of C. M. Eye, a graduate of the Colorado School of Mines, formerly of the Benguet Consolidated. There is very little else going on in the district, with the exception of more or less development work on various properties. A bar of gold was sent up a few days ago from the Mount Cogran mill in this district. In the Paracale Mambulao district practically all operations on the quartz properties have ceased for the time being, but in the adjacent property of Nalasvetan Mr. Boag has completed the installation of a Huntington mill, and a bar of gold has reached Manila from that property. The chief items of interest from this district are the successful floating of a company to place a Bucyrus dredge on the Gumaus river, a stream adjacent to the Paracale river. During the past three or four months some Australian capitalists have had engineers on the Paracale and Malaguit rivers, testing various properties, with a view to a consolidation. Among these is that on which the Paracale dredge has been so successful. The report of the Australian engineers is awaited with interest.

The coal industry of late has not prospered. The East Batan Coal Co. went into the hands of a receiver in May of this year, and William T. Nolting, special agent for the Governor-General, who has had marked success in handling various business enterprises in the Philippines, was appointed to act as manager and receiver for this company. He has the aid of E. Randolph Hix, an engineer from West Virginia, and it is believed that a severe setback to the coal industry will be averted by the timely stepping in of the Government. The United States Army mine has been indefinitely shut down.

The Mitsui Bussan Kaisha has recently had a Japanese mining engineer looking over an iron deposit on a small island in Mambulao bay, Ambos Camarines. A preliminary report on this property was also made by the Division of Mines some time ago. It is the opinion of all who have seen the deposit that there is a considerable amount of ore there and that it can be worked successfully. However, one bad feature is the export tax of $1 gold per ton on all ore shipped from the Philippine Islands. A petition has been presented to the Insular Collector of Customs of the Philippine Islands to have this tax removed, and he will make a recommendation in regard to this to the American Congress, but no immediate relief can be expected.

During the past year the Division of Mines Bureau of Science has had a party in the field about six months examining localities which might afford raw materials for cement manufacture, and a very promising area has been discovered on the island of Cebu. It is practically assured that one of the large New York firms having a branch office in Manila will consider the matter of erecting a plant there. Recently a prospector brought in some gem stones; garnets, ruby spinel, and emeralds, claiming to have discovered them on the island of Mindanao. They were examined by the Division of Mines and found to be very promising specimens. However, nothing definite is known about the locality.

General Mining News

ALASKA

Alaska Peninsula

L. L. Bales, a Seattle guide, is reported to have found extensive deposits of almost pure sulphur 200 miles from Unimak pass and about 45 miles from Sand Point. The deposit is 15 miles from the steamship route, but a good harbor has been found near by. Copper, iron, gold, coal, and oil discoveries have been reported on the peninsula in the past, but this is the first discovery of sulphur. A company is being organized in Seattle to develop the property.

Prince William Sound

A big rush has been started to Port Wells by a remarkably rich discovery made by Toolson & Stanton.

The Skyscraper group of claims adjoining the Valdez Bonanza M. Co.'s property, between Mineral creek and the glacier, has been bonded by C. G. Hubbard and B. Silverman.

With almost everything in place but the shafting, the new stamp-mill at Valdez will be ready to start this month, according to late reports.

Bornite has been discovered on Valdez creek by J. E. Smith, who recently returned to Valdez with about $3000 worth of gold dust.

Seward Peninsula

The *Northwestern*, the last steamer to leave Nome in October, will bring $1,000,000 in gold dust, according to advices from Seattle. It is estimated that 2000 persons will remain at Nome during the winter, as against 2600 last year.

The Tanana

A large placer deposit panning from $40 to $50 has been discovered on Hammond river, a tributary of the upper Koyukuk, according to despatches from Fairbanks. It is 116 ft. to bedrock there.

ARIZONA

Gila County

At a special meeting of the Superior & Boston Copper Co.'s stockholders, in the mine office at Globe, September 30, a vote was passed in favor of extending an offer of consolidation to the Arizona Commercial Copper Co. The vote was unanimous for the 157,512 shares represented. The McGaw 3-compartment shaft is down 1140 ft., or 170 ft. below the tenth level. A station will be cut when a point 30 ft. deeper has been reached. The shaft is in diabase.

(Special Correspondence.)—J. Parke Channing, who is at the Miami mine, said in an interview this week: "The compressed-air hoists at shaft No. 4 are surpassing my expectations in their smoothness of running. I think this is the coming way of hoisting when long transmission of power is an imposed condition. The early difficulties encountered in the power-plant have been overcome, and we are getting good figures on evaporation and steam consumption. One generator easily carries the whole load of 1000 to 1200 kw., including the pumps at Burch. The fourth section of the mill has just started at full capacity, the Burch rolls in this section being followed with two 8-ft. Hardinge pebble-mills instead of Chilean mills. One Hardinge mill has been in operation in this section for the past month and the results have been satisfactory. We will now give the two mills a good test and compare the cost of the silica lining and pebbles of the Hardinge with the cost of steel and screens of the Chilean. While the capacity of the mill was originally figured at 2000 tons per day, I have no doubt that the ultimate capacity, with all six sections running, will be 3000 tons. The mill extraction for August was 76%, and I think this will be increased to my original estimate of 80%. A duplicate 400-hp. motor is being installed in the pumping plant at Burch. In one section of the mine near the periphery of the orebody, we are cutting out under the capping and placing light square-sets. The capping is caving of its own weight, and the timbers are being crushed, forming a mat between the ore and the capping. In another section we are working three shrinkage stopes and getting two more started. The main cross-cut on the 570-ft. level has been started. We had ore in No. 2 shaft from the 270-ft. level all the way down to the 720-ft. level. While I have always figured on a cost of 9c. per pound, I think we can attain a lower figure."

Miami, September 29.

Pima County

The Arivaca Gold Mines Co., which is being financed in New York, has bought the Union group of seven claims, state late newspaper articles. Development work is to be started this month.

The Copper Queen Con. M. Co. has made payments aggregating $4250 on options on property in the Old Hat district near Tucson. An amended agreement with F. Geeseman has been filed on the Eagle, Copper Peak, York, Eagle No. 2, and Golden Peak No. 2. The balance due on these claims, $59,750, is to be paid on August 15, 1912.

Pinal County

Four units of the Ray Con. Copper Co. have been in operation for over a week, and 3200 tons of ore per day has been treated. The fifth unit will be placed in operation probably late in October. It is believed that this month's production will exceed 2,500,000 lb. of copper. The main source of production has been No. 1 shaft, which is down 270 ft. No. 2 shaft, in the near future, should be a regular producer. Two-thirds of the company's proved supply of about 80,000,000 tons of ore is above the 270-ft. level.

The Ray Central Copper M. Co. is planning to build a 1500-ton mill in the near future and set up other equipment. Frank R. Probert is engineer for the company, which has its mine office at Ray.

CALIFORNIA

Eldorado County

By order of the Superior Court of Los Angeles, the Lucky Baldwin quartz mine, near Nashville, has been sold to M. Effinger for $40,000. Effinger is to pay $20,000 cash and the remainder within two years. H. A. Unruh, executor of the Baldwin estate, is authorized to collect 20% of the gold produced until full payment has been made.

Inyo County

The Skidoo Mines Co. in August produced bullion to the value of $15,381, and, with the cyanide receipts had a total income of $19,212. During the month $627 was spent on development and $9924 on operation, leaving a net profit of $9660.

Nevada County

L. B. Doe, of the Union Hill M. Co., has purchased a diamond-drill to prospect below the 600-ft. level. This method is an innovation in the district, and it is believed that the results will be of value to the whole district. The shaft is to be sunk to a depth of 2000 feet.

Sierra County

(Special Correspondence.)—The Sierra Buttes Mines Co. is developing and blocking out ore in the No. 6 adit along the Serpentine-Porphyry contact vein and dropping 15 of the 20 stamps in the upper mill. The tailing is sluiced to a cyanide leaching plant at the No. 9 mill and treated for a period of four to seven days. The flume is six miles in length, bringing an unlimited supply of water for power from the Sardine, Salmon, and Summit series of lakes, that at a minimum flow can furnish 20,000 electrical horse-power, available from a 1700-ft. fall. The construction of two hydro-electric plants is being considered by the company. The mines and water-power are owned by E. A. and J. O. Hayes of San Jose. J. C. Folsom is superintendent.

The Sovereign M. Co. is completing the installation of two Beer roller mills and is to begin milling some time in October. F. O. Richardson is superintendent.

The Grey Eagle M. Co. is repairing its 10-stamp mill at Gold Point, about five miles below Sierra City, and expects to be operating at full capacity during the latter part of October. W. F. Arbuckle is superintendent.

Sierra City, September 30.

Trinity County

The Union Hill M. Co. has sold the Union Hill mine, near Douglas City, to New York capitalists represented by W. A. Boland. The last payment has been made. The property is a hydraulic placer mine, and five years ago was sold for $180,000, according to newspaper reports. Since then about $250,000 has been spent in building a 20-mile canal and pipe-line. The price paid this time is believed to be close to $500,000.

Later despatches affirm that Mr. Boland is believed to be representing the Guggenheims, and quote him as saying that he has completed all arrangements for acquiring all placer properties in the Weaverville basin, extending along the Trinity river for 5 miles, close to Douglas City. Over 20 groups are included in the deal, and the total price is believed to be between $10,000,000 and $15,000,000, exclusive of the La Grange. Among the leading properties are the Union Hill, Douglas City, Testy, Fields, and other hydraulic mines.

Tuolumne County

(Special Correspondence.)—Ore rich in free gold has been uncovered in the Gem mine, near Confidence. The property is owned and operated by J. M. Wulzen.

A new hoist has been installed at the Wheal Ruff, situated near Soulsbyville, and sinking was resumed a few days ago. In the new shaft, which is 20 ft. deep, the vein is only a few inches in width, but has rich free-milling ore. According to the conditions of the bond, sinking must be continued for 200 ft. and drifts then driven at both the first and second levels, the one to the east at the bottom to be extended into the Frank Burns claim, which adjoins the Wheal Ruff. The property was bonded a few months ago to W. C. Austin, of Nevada City, for $16,000. George W. Richards is superintendent.

It is understood that general mining operations will begin at the Starr King not later than November 1. Nearly all the machinery to be put in is on the ground, and the 5-stamp mill will be completed about October 20. Four electric motors with an aggregate capacity of 100 hp. will be used in the operation of the plant.

Three quartz claims adjoining the Shawmut mine and owned by the Gold Ridge M. Co. have been bonded to Clarence Woods, of Tuolumne, who represents Eastern investors in the transaction. A hoist and a compressor will be installed at once and the work called for in the bond commenced as soon as possible.

Tuolumne, September 30.

Work will soon be resumed at the Keltz mine, state reports from Sonora. A. L. Huston of Chicago is in charge of the preliminary work for reopening the mine.

Concrete mortar blocks are being placed for the additional 20 stamps of the mill of the Dutch mine, and the stamps will be dropping within 60 days. An electric hoist and compressor are planned, and the mine will be unwatered for deeper exploration. The shaft is now down to the 900-ft. level. G. Metz has bought the Longfellow mine at Big Oak Flat.

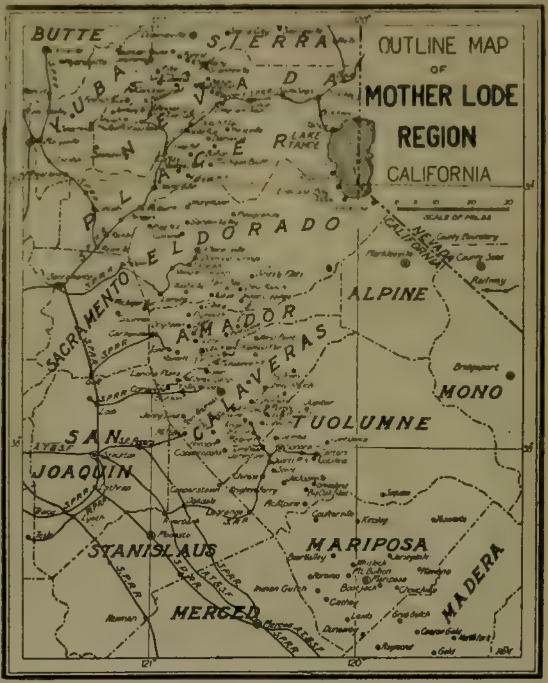
Yuba County

Remarkably rich gold ore has been discovered on the ranch of Joseph Rose, in the Dobbins district, state reports from Marysville. Ore shipped to the Selby smelter is reported to have yielded $15,000 per ton. The mine is near the Red Ravine property.

(Special Correspondence.)—The Indian River Drift M. Co., situated about seven miles from Camptonville in the Orient district, is building housing for the miners and accommodations, and constructing tanks, sluice-boxes, and the necessary piping for active drift gravel mining. An adit about 2500 ft. long has been run to the rim of an old channel, and after going through 200 ft. of the rim-rock gravel on bedrock, it was decided that a complete washing plant should be erected. The entire channel will be worked by the pillar and caving system, thereby doing away with handling the large boulders. The company will have 30 men at work in a few weeks handling full capacity. W. L. Breese of Four Oaks is manager for the company.

J. P. Lyon, of Vacaville, has arrived to open the Rube St. Clair mine, seven miles east of this town. The property has been bonded to Mr. Lyon for six months, and as all indications from sampling have been excellent, a force of men will be put to work on development.

The Two Grit Drift M. Co., 9 miles east of Camptonville, is opening up a property which paid rich returns 25 years ago and has every prospect of duplicating its past record. R. H. Deal is foreman of development. W. B. Meek is owner and manager.



Camptonville, September 26.

COLORADO

Clear Creek County

(Special Correspondence.)—The capacity of the Leebrick mill is to be doubled. Ore from the mines being operated through the Central adit is being treated. A. W. Doud & Co. are installing the Johnson electro-chemical process in the McCormick mill situated on Chicago creek. Ore from the P. T. mine will be treated. A. Anderson, lessee on the Papoose mine on Seaton mountain, has made arrangements with the Blue Bell M. Co. to treat a heavy tonnage of ore in the company mill. The machinery is being placed in position in the Combination mill on Water street, and ore treatment will probably be started inside of 30 days. Work is progressing in the removal of the machinery at the Idaho Reduction Works preparatory to equipping the plant with the Motter process. O. W. Lowell is manager. A body of ore 14 ft. wide has been found in the breast of the Lucania adit that shows assay values varying from $4 to $52 per ton in gold.

Idaho Springs, September 26.

(Special Correspondence.)—The Burleigh mill is again running after a shut-down of two weeks. George Tarkington is operating under lease. The Mineral Chief mine and mill have been taken under lease by A. L. and P. T. Stephens and John W. Old. Operations were put under way Monday. Report is current that work is to be resumed on the Kelly adit, the portal of which is situated on Democrat mountain. H. O. Marcy of Boston is owner. Work has been resumed on the Big Blue property, situated on

Saxton mountain. A. Santo is owner. An 8-in. streak of gray copper has been uncovered in the west drift of the Kirtley vein that is worth 227 oz. silver per ton. E. S. Weaver is owner. A streak of smelting ore 12 in. wide is showing in the drift on the Riley vein that is worth 80 oz. silver per ton.

Georgetown, September 27.

The Linn M. Co.'s property has been leased for five years to A. L. and P. T. Stephens and J. W. Old. Repairing the mill will be started immediately, and a short tramway will be built from the Boston dump to the workings above, according to reports from Georgetown.

Teller County

The Pride of Cripple Creek, on Ironclad hill, will be started up in the near future, after being closed down for several months. The Pride M. & L. Co. is the lessee. Fred Johnson is superintendent of the property. It is believed shipments will be started in a short time.

New machinery for finer grinding will be placed in the Homestake mill on Globe hill, according to Joseph Cooper, president of the Cripple Creek Cyanide Co., which is operating the mill under a lease from the Rex M. & M. Co., state recent reports from Cripple Creek. The mill is undergoing repairs incident to the breaking down of a set of rolls.

IDAHO

Idaho County

Fifty thousand dollars in bonds has been voted by the stockholders of the Mizpah M. & M. Co. to purchase machinery and equipment for the mine. The property consists of 18 claims in the Hoodoo district. A gasoline truck will be used to carry the ore to the railroad, over a natural road of 18 miles. J. C. Northrup, general manager, is directing the installation of an air-compressor and drills on the property. The company has offices at Spokane, Washington.

Lemhi County

The Wilber M. Co., near Gilmore, is about to start construction on a 100-ton mill, and the machinery is said to practically have been contracted for. M. M. Johnson is consulting engineer for the company.

Shoshone County

(Special Correspondence.)—On Wednesday, October 4, the Bunker Hill & Sullivan M. & C. Co. paid dividend No. 169, of $65,400. This makes the total amount of dividends paid $13,028,850.

Kellogg, October 5.

William T. Tracy, of Galesburg, Ill., has purchased the Amazon-Manhattan group. The price is reported to have been $300,000. The property consists of eight patented claims on Carbon creek, on the west slope of Sunset peak. For the last 12 years the claims were owned by the estate of B. N. Hillard, H. M. Davenport, Ben S. Revett of Colorado, and C. M. Asp.

A 14-ft. vein of rich silver-lead ore has been found in the 2000-ft. adit now being driven on the Nabob M. Co.'s property, state reports from Wallace. The discovery is said to be the richest yet made in the Pine Creek district.

The report of the Snowstorm M. Co. for the year ended June 30 shows that in that period dividends amounting to $44,985 were paid. During the year 34,463 tons of ore assaying 7.98 oz. silver and 3.93 oz. copper per ton was mined. The gross receipts were $171,384, and the net earnings for the year were $26,691. The small tonnage of ore is reported due to unfavorable market conditions. Leo Greenough has been elected president to fill the vacancy caused by the death of his father.

The Snowshoe M. Co., operating a property of the same name near Mullan, says in its statement that the development of the mine, driving adit, getting in wood, building roads and pipe-line, and clearing ground to avoid possible loss from forest fires, has cost $11,072.93, making a total expenditure of $14,858.70 for the year. The company now has everything in good shape to push the development work ahead. Seven hundred feet of adit remains to be driven to reach the point where the vein should be cut. This, it is announced, will place the property on a paying basis.

C. W. Clark, son of W. A. Clark, stated in an interview in Spokane that his father would begin systematic development at the Sunset mine in the Coeur d'Alene in the spring. A 5-drill compressor has been erected at the Nellie mine of the Wallace Development Co., near Osburn, and a hoist and 75-hp. motor are on the ground ready to be erected. Later on a small mill for concentrating will be constructed.

MONTANA

Lincoln County

(Special Correspondence.)—The Snowshoe mine now has a force of men at work on Cherry creek, on the opposite side of the mountain from the mine workings, who have started to run an adit to cross-cut the vein. This adit will cut the vein about 1000 ft. below the present workings. The adit will be 5½ by 7 ft. in the clear. The company is shipping in 60 head of horses to be used in transporting ore and supplies. A motor truck was experimented with for this work, but the one that was tried lacked power to do the heavy hauling and the company has now decided to use horses.

Libby, October 2.

Silverbow County

(Special Correspondence.)—T. F. Murray of St. Paul, and A. B. Wolvin of Duluth, president of the Butte & Superior Co., with several local capitalists, have organized the Black Diamond Gold Mining Co. with a capital of $700,000, divided into shares at $1 each, the principal place of business to be at Butte. The property secured by the company is in the Radersburg district, and is said to be surrounded by some properties which are now producing.

Butte, September 30.

Excavation has been started for the Butte & Superior concentrator, state Butte despatches. The machinery will be taken from the Basin reduction works.

Denial from a high source has been made in regard to the rumor that the Tuolumne Copper M. Co. will pass the next dividend. Extraordinary demands on the treasury will be made in the near future.

NEVADA

Clark County

After inactivity covering a year and a half, work has been resumed in the Fraction shaft of the Duplex property, owned by G. F. Colton, according to despatches from Searchlight. R. H. McCreary, of Hanford, California, has taken over six lead-zinc claims in the Yellow Pine district. The claims were the property of Richard Feaster.

Esmeralda County

(Special Correspondence.)—At Lida, one of the earliest producing camps of southern Nevada, the New York Smelting & Mines Co., headed by A. A. Redmond, and in which San Francisco investors are interested, has acquired two of the early producers and is developing on a good scale. The old Centennial mine is being developed and cross-cuts from the main shaft on the 192-ft. level have proceeded for over 200 ft. in ore with only the hanging wall in sight as yet.

Goldfield, October 2.

(Telegraphic Correspondence.)—Estimated September production of the Goldfield Con. M. Co., 26,766 tons; gross value recovered, $650,000; operating expenses, $225,000; net profit for month, $425,000. Mines are looking well. These figures are from a recent report prepared by A. H. Howe of the company.

Goldfield, October 3.

The State bullion tax collector has reported an increase of 12% in the production of this county for the last quarter.

Control of the Silver Pick M. & M. Co. has been acquired by a group of men headed by Herman Zadig, according to recent newspaper despatches, and the company has been reorganized on an assessable stock basis under the name of the Silver Pick Con. Mines Co., capitalized at $1,500,000. Mr Zadig is president, and E. S. Van Dyck is treasurer and manager. The main office will be in the offices of the Florence Goldfield company in Goldfield. The properties owned are the Silver Pick, Silver Pick Fraction, Northend, Deserted, and Pipe Dream claims, adjoining the Combination and January claims of the Goldfield Con. M. Co., and the Webfoot claim in the Hornsilver district. Development is to be started on the Silver Pick property at an early date. The monthly report of J. F. Thorn, general superintendent for the Goldfield Con. M. Co., shows that in August a new tonnage record for the company was made, 30,580 tons of ore, valued at $910,477, or an average of $29.77 per ton. A new record was made at the mill, which during the month treated 30,508 tons, or an average of nearly 1000 tons per day. The net profit for the month was $634,658. The total operating cost was $7.53 per ton. During the month 3744 ft. of development work was done.

HUMBOLDT COUNTY

The Indian Con. M. Co., capitalized at $5,000,000, has taken over the Limerick, Plainview, and other groups of claims in the Limerick canyon district, and is planning extensive development work. M. C. Scully is the organizer of the company, which was formed under the South Dakota laws.

GOLDFIELD CON. MILL.

LANDER COUNTY

A 100-ton concentrating and milling plant is being erected at the Jersey Valley mine, which is owned by George W. Abel.

MINERAL COUNTY

(Special Correspondence.)—At Douglass, a camp that produced some $600,000 in bullion during the early nineties, G. C. Webb, who some time ago purchased the Tennessee group, has shipped several cars of high-grade ore to the sampler of the Western Ore Purchasing Co. at Hazen and has exposed ore of shipping grade at four or five points on his claims. At one point average assays across 3 ft. yielded around $200 per ton, and farther up the mountain samples taken across 15 ft. gave an average of $50 per ton. The ore is free milling throughout and the veins are between well defined walls wherever they have been opened.

Goldfield, September 25.

NYE COUNTY

(Special Correspondence.)—The Steen-Poak-Cicala lease has opened on the 400-ft. level of Big Four what appears to be an entirely new orebody. It was intersected by the cross-cut which is being driven to tap the main Big Four vein. Driving now under way continues and it is expected will intersect the main vein within a few days. A heavy flow of water has developed on the 400 ft. level, and another pump has been erected. No further trouble from this source is anticipated. The winze from the 285-ft. level is reported going down on ore averaging $54 per ton. It is understood that sinking will be resumed from the 400-ft. point shortly. The Big Four is now the deepest mine in Manhattan, with the orebody showing satisfactorily. The War Eagle mill is operating on ore from Union No. 9 claim, on Manhattan Dexter estate. About 40 tons per day is treated, the ore coming from above the 235-ft. point. The ore is reported to assay from $35 to $40 per ton. The Putman-Kendall lease on the Jumping Jack has been incorporated under title of the Manhattan-Jumping Jack Leasing & Mining Co. Reports are current of important developments on Mineral hill, but the management has not confirmed stories of a recent rich discovery. It is understood, however, that good ore is being opened.

Manhattan, September 29.

STOREY COUNTY

The Crown Point G. & S. M. Co. made a profit of over $5000 during August, according to officers of the company. A mill-run of 1690 tons showed an average return of about $9 per ton. The mill run was made in addition to regular development work. Pumping arrangements will be made in a few months so as to work below the 1400-ft. level.

The discovery of 3 ft. of quartz of low assay value in the bottom of the Union & Sierra Nevada winze has raised hopes of finding valuable ore. A point 562 ft. below the 2000-ft. station, where it was planned to stop, has been reached, and sinking will be continued for the present.

The south drift from the west cross-cut on the 2400-ft. level of the Ophir is in a strong vein.

WASHOE COUNTY

Ore assaying $591 per ton was discovered recently on the property of the Nevada United Mines Co., by Edwin Arkell, according to press reports. The cross-cut in which the ore was found is at a depth of 131 ft. The ore was found about 40 ft. from the shaft.

WHITE PINE COUNTY

The Ohana M. Co. at Sacramento pass is about to erect a 60-hp. gasoline hoist and a 4-drill compressor, which have been shipped to the mine. Four Chicago 2¼-in. air-drills also have been ordered. The main shaft, now 100 ft. deep, will be sunk 200 ft. deeper, if water is not found at the lower levels.

NEW MEXICO

SOCORRO COUNTY

(Special Correspondence.)—The two clean-ups of the

Ernestine M. Co. for the first and second 10-day periods of September resulted in 10,376 oz. of gold and silver bullion, with 7½ tons of high-grade concentrate. The ore treated the past two weeks amounted to 1160 tons. The new power-house is nearing completion and the equipment for the same will arrive in Silver City in about two weeks.

Work will be started on the new buildings of the Oaks Co. at the main drainage and transportation tunnel within a few days. The adit is being steadily advanced.

Further development will be started on the Trilby group claims about October 1.

Work in the new shaft of the Maud Mining Co. and drifts therefrom has been temporarily suspended. Good ore has been found, and it is said full operations will be in force within a few days.

Mogollon, September 29.

UTAH

SALT LAKE COUNTY

The Utah Copper Co. this year will produce more than 100,000,000 lb. of copper, state advices from Boston. The 9,000,000-lb. output of August will be exceeded in the last four months of the year. The company has never carried surplus stocks of unsold copper. It is believed that an 8c. cost can be maintained. With the prospect of an annual production of 140,000,000 lb. of copper, made possible by the Magna and Arthur mills, and the completion of the Bingham & Garfield railroad, it is believed that $3 dividends can be continued with copper at 11½c. per pound. This estimate was made aside from the equation of ownership in the Nevada Consolidated.

The Ohio Copper Co. has ordered 20 Wall rolls from the Salt Lake Engineering Works for the Ohio mill. Four rolls are now in operation, a fifth is under way, and the other fifteen will be in operation, it is believed, within three months, giving the mill a capacity of 3000 tons per day.

SAN JUAN COUNTY

The town of Mexican Hat, in the Goodrich basin, is getting illuminating and cooking gas from new wells being sunk by the Producers Oil Co., a Kansas City corporation. Some oil also is coming from the well, which is down 660 ft., state newspaper reports. The town is the first in Utah to be lighted by natural gas. Work is being resumed at many of the oil properties in the San Juan field.

SUMMIT COUNTY

The Daly West M. Co. has declared a dividend of 30c. per share, payable October 20. The dividend will mean a disbursement of $54,000. The total in dividends paid by the company will then be $6,255,000, of which $162,000 will have been paid since the first of the year.

CANADA

ONTARIO

The Kerr Lake M. Co., in the year ended August 31, produced 2,388,420 oz. of silver, against 3,046,295 oz. a year ago, at a cost of 14.69c. against a cost of 13.27c. per ounce for the previous year. The development work of the year resulted in the discovery of six new veins in the No. 7 shaft workings. The recent extra dividend was cut from 25c. to 15c. The company paid during the year $1,200,000, while its net profit for the year was $937,379. The dividends paid last year amounted to $990.000.

The net production of the Temiskaming & Hudson's Bay M. Co. for the year ended August 31 was slightly larger than for the previous year, although dividends were slightly less, owing to the purchase of the Gowganda properties, the erection of a mill, and other heavy expenditures. The gross revenue from ore, rents, ore adjustment, and $957 from the Gowganda ore, was $403,412. Total expenditures were $173,362. Dividends paid amounted to $181,501. A balance of $111,188 remains in the treasury after a stock discount of $40,000. Since January 1 the company has maintained a force about double that of previous years. The cost of producing silver was about 14.9c. per ounce for the total production of 804,624 oz. of silver for the year. The total output cost in production $120,055, leaving a profit of $288,973. During the year a concentrator has been erected, and a new shaft-house, pump-house, and transformer house have been built. George Taylor was elected president of the company. The meeting was held in New Liskeard, September 25.

A new vein was found during exploration work on the McKinley-Darragh property near Cobalt. About ten cars of high-grade ore per month are sent to the smelters.

It is reported that Mackenzie & Mann have purchased the Goselin property, in Shining Tree district, for $30,000 cash. The deal is reported from Sudbury.

PRINCE WILLIAM SOUND

The Mayfield group of claims has been acquired by M. M. Reese, president of the Ibex company, and associates, state Valdez reports, and a $1,000,000 corporation known as the Mayfield Gold Mining Co. has been formed to develop the claims.

YUKON

The Dominion Government's report on the Yukon, recently issued shows that since the discovery of the rich placer mines in 1897 the Yukon has produced $136,500,000 worth of gold. The production increased from $300,000 in 1896 to $22,275,000 in 1900, from which it decreased, owing to the exhaustion of the richer gravels, to $3,150,000 in 1907. The production for 1910 was $4,550,000. Large companies are carrying on extensive operations for working over the old tailings and the large deposits of low-grade gravel.

Five tons of native copper from the Solomon mine in the heart of the White River district recently was taken to Dawson. The copper, which is the finest seen in the Yukon, according to Dawson despatches, was brought in by Solomon Albert, Joseph Slaggard, and James Kingston.

A rich vein has been found on the Conrad property near Carcross. The tunnel is in about 1750-ft. and has penetrated several highly mineralized orebodies, state newspaper reports. A 250-hp. electric plant is being set up at the mouth of McDonald creek, on the railroad, five miles south of Carcross.

Rich gold discoveries have recently been made in Dublin gulch. The gold can easily be washed with a pan, state press reports, and several men are working on the vein. Efforts are under way to have a quartz mill constructed there, according to B. C. Sprague, in an interview at Dawson.

MEXICO

CHIHUAHUA

(Special Correspondence.)—The San Toy in August shipped 33 cars of ore, of which the gross value was ₱207,546.

Chihuahua, September 30.

SONORA

Rich ore has been found in the Klondike district, 65 miles southeast of Magdalena, according to newspaper reports. The vein was traced from the Patsy claim to free ground by Jesus Villalva, who, with associates, denounced 10 *pertenencias*. Another denouncement, covering 21 *pertenencias*, and named the Juan Cabral, was made by Holt brothers.

The Mexican Metals Co. will resume operations in the Arizpe mines as soon as the necessary help can be secured, according to an announcement by August Fritsche, president and manager. The property was formerly owned by the Arizpe M. Co. Work probably will be started in the Alacran and Palo Seco shafts.

The Mexican company owning the La Junta mine is reported to be negotiating the purchase of the custom mill at Sobia, where its milling ore is treated. The company in the past has treated rich ore in Mexican furnaces, or *rascos*. The Piedras Verdes mine has been acquired under option from José M. Quirez by Boston investors. The property lies in a low-grade copper district about ten miles from Alamos.

Market Reports

LOCAL METAL PRICES

San Francisco, October [illegible].

Antimony	12 – 12½c	Quicksilver, flask	46½
Electrolytic Copper	14 – 15½c	Tin	47–48½c
Pig Lead	[illegible]	Spelter	7¼–8½c

Zinc dust, 100-lb. casks, per 100 lb., small lots [illegible], large [illegible]—8.50

METAL PRICES

(By wire from New York.)

Average daily prices in cents per pound

		Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Sept	28	[illegible]	4.48	5.86	52,
"	29	12.13	4.48	5.86	52¼
"	30	12.13	4.48	5.86	52¼
Oct	1	Sunday.	No market.		
"	2	12.15	4.48	5.89	52¼
"	3	12.15	4.48	5.90	52¼
"	4	12.18	4.48	5.93	52¼

ANGLO-AMERICAN SHARES.

(Cabled from London.)

(By courtesy of W. P Bonbright & Co., 24 Broad St., N. Y.)

	Sept. 28. £ s. d.	Oct. 4. £ s. d.
Camp Bird	1 8 3	1 7 0
El Oro	1 3 0	1 3 3
Esperanza	1 14 0	1 16 6
Dolores	1 5 0	1 5 0
Oroville Dredging	0 5 7½	0 5 7½
Mexico Mines	6 16 3	6 12 6
Tomboy	0 17 9	0 18 0

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing Prices. Oct. 5.		Closing Prices. Oct. 5.
Amalgamated Copper	$ 49	La Rose	$ 4
A. S. & R. Co.	65¼	Mason Valley	7⅛
Braden Copper	4¼	Miami Copper	17¼
B. C. Copper Co.	3⅝	Mines Co. of America	4
Butte Coalition	14¼	Nevada Con	16⅛
Chino	17½	Nevada Utah	⅛
Davis Daly	⅞	Nipissing	7¾
Doble	1⅝	Ohio Copper	1⅛
Dolores	4	Ray Central	1¼
First National	1	Ray Con	12¾
Foley O'Brien	¾	South Utah	⅛
Giroux	3⅝	Superior & Pittsburg	15
Goldfield Con	5¼	Tenn. Copper	33¼
Greene-Cananea	5⅝	Trinity	3¼
Guanajuato Con	¼	Tuolumne Copper	3⅝
Hollinger	11½	United Copper	1¼
Inspiration	6¼	Utah Copper	40¼
Kerr Lake	3⅝	Yukon Gold	3⅛

COPPER SHARES—BOSTON.

(By courtesy of J. C. Wilson, Mills Building.)

	Closing prices. Oct. 5.		Closing Prices Oct. 5.
Adventure	4	Mohawk	$ 39
Allouez	23	North Butte	24
Calumet & Arizona	48	Old Dominion	35
Calumet & Hecla	380	Osceola	82
Centennial	8⅛	Parrot	8⅛
Copper Range	50¼	Shannon	6¾
Daly West	5	Superior & Boston	2⅛
Franklin	6⅛	Tamarack	20⅛
Granby	27¼	Trinity	3¼
Greene Cananea, ctf.	5¾	Utah Con	11⅛
Isle-Royale	12⅛	Victoria	1⅛
La Salle	3¾	Winona	5
Mass Copper	5	Wolverine	89

NEVADA STOCKS.

(By courtesy of San Francisco Stock Exchange.)

San Francisco, October 5.

Atlanta	$ .16	Mayflower	$ .03
Belcher	.45	Mexican	3.37
Belmont	7.75	Midway	.24
B. & B.	.18	Montana-Tonopah	.76
Booth	.08	Nevada Hills	2.90
Chollar	.11	Ophir	1.72
Combination Fraction	.09	Pittsburg Silver Peak	.90
Con. Virgina	.74	Round Mountain	.64
Florence	1.10	Sandstorm Kendall	.04
Goldfield Con.	5.20	Savage	.21
Gould & Curry	.04	Tonopah Extension	1.00
Jim Butler	.23	Tonopah of Nevada	5.95
Jumbo Extension	.24	Union	1.07
MacNamara	.22	West End	.60

OIL SHARES

(By courtesy of San Francisco Stock Exchange.)

San Francisco, October [illegible].

Associated Oil	$[illegible]	Palmer	$ .95
Bay City New Stock	.60	Palmer Union	
Brookshire	.90	Peerless	4.95
Caribou New Stock	.95	Premier	.40
Claremont	1.00	Producers	2.50
Coalinga National	1.[illegible]	Republic	.40
Con. Midway	.05	Sauer Dough	1.00
Crescent	.12	Silver Tip	.50
Empire	1.50	S. A. T. McKittrick	20.00
Enos	.70	S. W. & B.	.50
Maricopa National	.22	Sunset Monarch	
Monte Cristo	1.25	Turner	.90
Nevada Midway		United Oil	.35
Occidental	.45	Wolverine	.30
Pacific States Petroleum	.25	W. K. Oil	2.90

Current Prices For Chemicals

(Corrected monthly by Braun-Knecht-Heimann Co.)

Prices quoted are for ordinary quantities in packages as specified. For round lots lower prices may be expected, while in smaller quantities advanced prices are ordinarily charged. Prices named are subject to fluctuation. Other conditions govern Mexican and foreign business.

	Min.	Max.
Acid, sulphuric, com'l, 66°, drums, 100 lb.	$0.75	$1.00
Acid, sulphuric, com'l, 66°, carboy, 100 lb.	1.00	1.50
Acid, sulphuric, C.P., 9-lb. bottle, bbl., lb.	0.13	0.18
Acid, sulphuric, C.P., bulk, carboy, lb.	0.09½	0.12
Acid, muriatic, com'l, carboy, 100 lb.	1.60	2.00
Acid, muriatic, C.P., 6-lb. bottle, bbl., lb.	0.15	0.20
Acid, muriatic, C.P., bulk, carboy, lb.	0.10½	0.15
Acid, nitric, com'l, carboy, 100 lb.	5.25	6.50
Acid, nitric, C.P., 7-lb. bottle, bbl., lb.	0.16	0.22
Acid, nitric, C.P., bulk, carboy, lb.	0.12½	0.15
Argols, ground, bbl., lb.	0.20	0.25
Borax, cryst. and conc., bags, 100 lb.	2.75	3.85
Borax, powdered, bbl.; 100 lb.	3.00	4.00
Borax glass, gd., 30 mesh, cases, 100 lb., tin lined	10.00	13.00
Bone ash, 60 to 80 mesh, bbl., 100 lb.	4.50	5.50
Bromine, 1-lb. bottle, lb.	0.55	0.65
Candles, adamantine, 12 oz., 40 sets to case	3.50	4.15
Candles, adamantine, 14 oz., 40 sets to case	4.00	4.55
Candles, Stearic, 12 oz., 40 sets to case	4.95	5.50
Candles, Stearic, 14 oz., 40 sets to case	4.65	5.20
Clay, domestic fire, sack, 100 lb.	1.50	2.00
Cyanide, 98 to 100%, 100-lb. case, lb.	0.20¾	0.24¾
Cyanide, 98 to 100%, 200-lb. case, lb.	0.20	0.24
Cyanide, 129%, 100 lb. case, lb.	0.27½	0.28½
Cyanide, 129%, 200-lb. case, lb.	0.26¾	0.27½
Lead acetate, brown, broken casks, 100 lb.	8.75	9.00
Lead acetate, white, broken casks, 100 lb.	10.00	10.25
Lead acetate, white, crystals, 100 lb.	11.75	12.25
Lead, C.P., test., gran., 100 lb.	13.00	15.00
Lead, C.P., sheet, 100 lb.	15.00	18.00
Litharge, C.P., silver free, 100 lb.	10.50	13.00
Litharge, com'l, 100 lb.	7.50	9.00
Manganese ox., blk., dom. in bags, ton	20.00	25.00
Manganese ox., blk., Caucasian, in casks, ton (85% MNO_2—¾% Fe)	42.50	50.00
Nitre, double ref'd, small cryst., bbl., 100 lb.	7.00	8.00
Nitre, double ref'd, granular, bbl., 100 lb.	6.50	7.50
Nitre, double ref'd, powdered, bbl., 100 lb.	7.25	18.00
Potassium bicarbonate, cryst., 100 lb.	12.00	15.00
Potassium carbonate, calcined, 100 lb.	15.00	18.00
Potassium permanganate. drum, lb.	0.11	0.12½
Silica, powdered, bags, lb.	0.03	0.05
Soda, carbonate (ash), bbl., 100 lb.	1.50	1.75
Soda, bicarbonate, bbl., 100 lb.	2.00	2.50
Soda, caustic. ground, 98%, bbl., 100 lb.	3.15	3.50
Soda, caustic, solid, 98%, drums, 100 lb.	2.65	2.85
Zinc shavings, 850 fine, bbl., 100 lb.	11.00	12.00
Zinc sheet, No. 9—18 by 84, drum, 100 lb.	9.75	10.75

Current Prices for Ores and Minerals

(Corrected monthly by Atkins, Kroll & Co.)

The prices are approximate, subject to fluctuation, and to variation according to quantity, quality, and delivery required. They are quoted, except as noted, f.o.b. San Francisco. Buying prices marked*.

	Min.	Max.
Antimony ore, 50%, per ton	*$20.00	$25.00
Arsenic, white, refined, per lb.	0.01¾	0.02¼
Arsenic, red, refined, per lb.	0.06¾	0.07¼
Asbestos, according to length and quality of fibre, per ton	100.00	350.00
Asbestos, lower grades, per ton	10.00	100.00
Asphaltum, refined, per ton	15.00	20.00
Barium carbonate, precipitated, per ton	42.50	45.00

Barium chloride, commercial, per ton	37.50	42.50
Barium sulphate (barytes), prepared, ton	20.00	30.00
Bismuth ore, 10%, upward, per ton	*75.00	upward
Chrome ore, according to quality, per ton	10.00	12.50
China clay, levigated, per ton	15.00	20.00
Cobalt metal, refined, f.o.b. London, per lb.	2.50	
Coke, foundry, per 2240 lb.	15.00	17.50
Diamonds:		
Borts, according to size and quality, per carat	2.00	15.00
Carbons, according to size and quality, per carat	75.00	100.00
Feldspar, per ton	5.00	25.00
Firebrick:		
Bauxite, per M	175.00	
Magnesite, per M	190.00	275.00
Silica, per M	42.50	47.50
Flint pebbles for tube-mills, per 2240 lb.	15.00	25.00
Fluorspar, per ton	10.00	15.00
Fullers earth, according to quality, per ton.	20.00	30.00
Gilsonite, per ton	35.00	40.00
Graphite:		
Amorphous, per lb.	0.01½	0.02½
Crystalline, per lb.	0.04	0.13
Gypsum, per ton	7.50	10.00
Infusorial earth, per ton	10.00	15.00
Magnesite, crude, per ton	7.50	10.00
Magnesite, dead calcined, per ton	22.50	27.50
Magnesite, brick (see firebrick).		
Manganese ore, oxide, crude, per ton	10.00	25.00
Manganese, prepared, according to quality, per ton	30.00	70.00
Mica, according to size and quality, per lb.	0.05	0.30
Molybdenite, 95% MoS_2, per ton	400.00	500.00
Monazite sand (5% thoria), per ton	150.00	200.00
Nickel metal, refined, per lb.	0.45	0.60
Ochre, extra strength, levigated, per 100 lb.	2.25	3.25
Platinum, native, crude, per oz.	30.00	40.00
Scheelite (see tungsten ore).		
Sulphur, crude, per ton	15.00	25.00
Sulphur, powdered, per ton	40.00	45.00
Talc, prepared, according to quality, per ton.	20.00	50.00
Tin ore, 60%, per ton	450.00	475.00
Vanadium ore, 15%, per ton	150.00	180.00
Vanadium ore, 15%, per ton	200.00	250.00
Wolframite (see tungsten ore).		
Zinc ore, 50% up, per ton	*15.00	20.00

Obituary

JOSEPH H. FRAZER, of Newark, Delaware, a young contractor and engineer, died of pneumonia at La Paz, Bolivia, after seven days illness. Mr. Frazer was a son of Eben B. Frazer, and was born in Maryland about 28 years ago. He was graduated from Delaware College in 1903, spent two years in the engineering department of the B. & O. railroad in Pennsylvania, Maryland, and West Virginia. In 1905 he was employed as engineer with the Commission for the Study of Railways of the Bolivian Government. From 1905 to 1907 he was chief engineer of the Andes Tin Co., which position he resigned to form with William R. Rumbold, of Tunbridge Wells, England, the firm of Rumbold & Frazer, mining engineers, Oruro, Bolivia. In 1909 he sold his interest in the above mentioned firm to A. Basil Reece in order to form with Adam W. Yount the contracting and engineering firm of Yount & Frazer, Bolivia. The firm took and completed successfully contracts for the construction of important railways in Bolivia, among them being large parts of the lines from Rio Mulato to Potosi and from Oruro to Cochabamba. Mr. Frazer was one of the few Americans who ably managed important contracts with the native labor, and although a young man, by hard work and careful judgment, was able to amass a considerable fortune in a few years. Mr. Frazer was a man of high ideals and lovable character and leaves a record of clean, honest work, and was one of the most popular foreigners in Bolivia. He was a member of the American Society of Civil Engineers.

The Royal Society of Arts, London, has awarded a gold medal under the Fothergile Trust to the self-contained breathing apparatus manufactured by SIEBE, GORMAN & Co. LTD., under the Fleuss and Davis patents. The award was based on tests made at Birmingham University.

The Anaconda Copper Co., Butte, Montana, has placed an order with the GENERAL ELECTRIC Co. for 13 locomotives.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

ALBERT BURCH has returned to San Francisco.

M. L. REQUA will be in New York next week.

E. A. PECKEY, of Goldfield, is in San Francisco.

ALEXANDER P. ROGERS will return to New York soon.

GEORGE H. GARREY has gone to Plumas county, California.

ELLARD W. CARSON, of Los Angeles, is at Goldroad, Arizona.

COURTENAY DE KALB has gone to Shasta county, California.

J. W. MALCOLMSON has returned from a summer in Europe.

ROSS B. HOFFMANN returned to San Francisco this week from London.

VERNE A. HART is examining the mines of the Arizona Copper Co. at Metcalf, Arizona.

J. MALCOLM MACLAREN has completed his work at Porcupine and is at Cobalt, Ontario.

L. R. BUDROW and L. H. FORBES will be among the visitors to San Francisco next week.

CHARLES G. S. GORDON has left the Bote Mining Co. of Zacatecas, and is now at Mexico City.

F. G. COTTRELL has returned from Montana and will be in San Francisco for the next few weeks.

R. B. MCGINNIS has returned to Berkeley, California, from a seven months trip to Brazil and Bolivia.

CLIVE S. NEWCOMB has removed his offices from No. 32 Avenida Cinco de Mayo to Edificio La Mutau 414, Mexico City.

E. M. HAMILTON has returned from England and expects to spend the month of October at the El Rayo mine, at Santa Barbara, Chihuahua, Mexico.

CHARLES KIRCHHOFF, who is this year president of the American Institute of Mining Engineers, is unable to attend the meeting at San Francisco, owing to sickness in his family.

R. R. FOSTER has resigned as superintendent of the mill and cyanide plant of the La Tula Mining Co. at La Luz, Guanajuato, and is taking over the engineering business of Lineberger & Rone.

DOUGLAS D. STAVELEY has given up the position as manager of the Sintoeroe mine, Sambas, Dutch West Borneo, where he has been for four and a half years, and is on his way back to London.

The Western members of the *Mining and Metallurgical Society of America* will dine October 16 at the Fairmont Hotel. The subject for discussion will be 'The Revision of the Alaska Land Laws.'

CHARLES H. FULTON has resigned the presidency of the South Dakota School of Mines to accept the chair of Metallurgy and acting head of the Mining Department of the Case School of Applied Science, at Cleveland, Ohio.

Among those who will attend the meetings of the American Institute of Mining Engineers at San Francisco next week are: W. H. ALDRIDGE, W. S. AYRES, W. B. CLARK, H. C. FARNUM, CHARLES W. GOODALE, ROBERT W. HUNT, WILLIAM R. MCILVAIN, E. B. MATHEWS, F. H. MORLEY, R. W. RAYMOND, W. L. SAUNDERS, JOSEPH STRUTHERS, EDWIN THOMAS, and BENJAMIN W. VALLAT.

THE 15-ft. dredges described on another page are two of five designed and built by the YUBA CONSTRUCTION Co. of Marysville, California, during the past year. A sixth, embodying certain improvements, including a steel hull and designed by the same company, is now under construction.

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EDITORIAL

SAN FRANCISCO will entertain the President today, and he, being a believer in reciprocity, will entertain San Francisco.

TELEGRAPHIC despatches record that Mr. J. D. Rockefeller has said that young men should take lots of exercise if they wish to keep healthy. Brokers please note this important information.

GOLD bars valued at $1,500,000 were delivered by the Government assay office at New York last week for shipment abroad and the use of gold bullion instead of coin for foreign exchange is likely to prove popular.

TONOPAH, properly enough, is congratulating itself on a probable dividend record for this year of $3,120,000, of which the larger part is derived from the Tonopah Mining Company and the Tonopah Belmont Development Company.

CHICAGO will entertain the American Mining Congress October 24 to 28, and a handsome booklet recently sent out by the central committee gives brief reviews of the many important topics which will come up for discussion. With the President of the United States, the Secretary of the Interior, the Director of the Bureau of Mines, and other notable men in attendance, the meeting assumes a semi-official air and results of permanent value should be attained.

SETTLEMENT of the labor dispute at the Veteran mine at Ely is officially announced. The miners have agreed to forego recognition of the Western Federation and the company has made concessions as to leases and the wage scale for underground work, thus making possible the resumption of working, and it is reported that ore won underground will be used to regulate the production of the Nevada Consolidated during the winter months when climatic conditions hamper the work in the open-cuts.

JAPAN a scant half century ago was a hidden land which, industrially, was organized as was Europe in the Middle Ages. Now it is a great modern nation. Sons of men who served the Shogun today manage enterprises that are extremely modern and some of which rival in size the great American corporations misnamed 'trusts.' Since Nippon first opened her gates to the world the relations between the Island Empire and the United States have naturally been close. Americans and Japanese are cooperating in mining ventures in Korea and elsewhere. Mr. Toranosuke Furukawa, owner and director of the Ashio mine, elsewhere described, is by no means the only Japanese mining engineer trained in America. The American Institute of Mining Engineers has a considerable membership resident in the Islands, and it is appropriate that an occasional meeting should be held there. To the sessions to be held in Tokyo next month a large delegation of American members of the Institute are going. They take with them from the larger number who cannot make the trip, the sincere good wishes for the health and prosperity of their Japanese associates in the profession, and for their country.

“IN mining there is no royal road to success,” pertinently remarks the *West Australian Mining, Building & Engineering Journal*. “The best men come to the top through ability, diligence, and honesty, and if these attributes be backed up by a good mine and liberal capitalists at head of the stockowners, then something like success may be claimed by the mining engineer. The average director in Australian companies, however, pays too small a salary to command the services of good men. Mines, as a consequence, suffer for want of scientific men to control them.” To this we would add that the problem is by no means confined to Australia.

RESIGNATION of Mr. C. W. Hayes, chief geologist of the United States Geological Survey, takes from the public service another of those engineers who have given distinction to the technical work of the Government. It is understood that Mr. Hayes is to devote his time hereafter to professional work in connection with the Mexican oil industry. For this he is especially qualified, having in fact served for two years as consulting geologist for the companies controlled by Lord Cowdray. His work as a geologist and explorer is well known and he is an executive of proved ability. While in charge of diamond-drilling for the Nicaraguan Canal Commission, as well as in numerous missions for the Government, he has had much engineering experience and is sure to do well in his new work.

NO APOLOGY is necessary for devoting so much space this week to the meeting of the American Institute of Mining Engineers. The sessions and the excursions both at Los Angeles and San Francisco have been of much technical interest and have served greatly to reinforce that solidarity of interests so important among professional associates. We print abstracts of a number of the papers presented, and others will follow in later issues. One of our Editors will accompany the party of engineers going to Japan, and we can promise a full account of the trip, which is sure to prove of much professional and personal interest. In the meantime, as the engineers scatter by steamer and train, to the mine, the mill, and the office, we give them the word which so fitly expresses the Western spirit of welcome—Mizpah.

DEFINITE STEPS have been taken to raise a fund for a memorial commemorating the life and work of S. F. Emmons as suggested in our issue of April 22. A committee consisting of Dr. James Douglas, chairman, J. Parke Channing, J. F. Kemp, F. W. Bradley, H. L. Smyth, Benjamin B. Lawrence, Seeley W. Mudd, David D. Brunton, T. A. Rickard, George Otis Smith, J. A. Holmes, and H. Foster Bain, has been formed to take charge of the matter. It has been determined to endow a research fellowship in economic geology at Columbia University, the first school of mines in the United States, an institution of which Emmons was an honorary alumnus, and one with which he had many close ties. We can conceive no more appropriate tribute to the geologist who did so much to bring geology to the aid of mining. The successive holders of the fellowship will keep alive the Emmons spirit of patient, accurate, scientific work as a prerequisite to economical exploitation of orebodies. We are sure the committee could not have chosen a memorial that would have better pleased Emmons himself. To carry out the plans formulated it will be necessary to raise approximately $25,000. Of this sum a tenth was subscribed at the first meeting of the committee, held in New York this week. The full amount should be secured quickly and engineers and geologists are requested to send their subscriptions promptly to Mr. Benjamin B. Lawrence, treasurer, No. 60 Wall Street, New York City. The committee is especially desirous that there be a large number of small subscriptions so that the matter may be a really popular tribute to one who was the personal friend of mining engineers and geologists around the world, and the benefactor of his profession for all time.

WASTE of experience is the problem which should call for the greatest efforts of conservationists and 'efficiency engineers.' Numberless cases could be cited where companies have wasted much time and more money in experiments that had previously been carefully performed in some unrelated line of work. Less striking, but amounting to a greater loss in the aggregate sum, is the daily waste of effort in a large company in securing information that is actually readily available. One man may spend some time in a hunt for data that another could produce on the instant if he were aware of the need for it. Some companies have solved this problem by establishing a clearing house for information in the form of a library, the librarian in charge being a technically trained man, and at a recent meeting of the Special Libraries Association, Mr. F. N. Morton described in some detail this work as carried on at the library of the United Gas Improvement Company. Recent lines of growth in the mining industry have tended toward the formation of the larger aggregations of capital that permit the carrying out of such refinements of practice, and the example set will repay consideration.

NEW YORK CITY has many notable features, and not the least of them are the engineering problems that arise in the corporate life of so large a municipality. The securing of an adequate water-supply gives rise to many, and, for example, the geologic engineering work performed by Mr. James F. Kemp and his associates to secure a safe crossing of the Hudson river by the new aqueduct is already well known. At a recent meeting of the Society of Municipal Engineers Mr. F. S. Cook described the heaving and fracturing of large areas of solid gneiss at Croton Falls when stripped and exposed to the sun's rays, ascribing the phenomenon to the expansion due to the rise in temperature. Mining engineers are familiar with the swelling and splitting of shales when exposed to the air in underground excavations, and quarrymen are equally familiar with a similar phenomenon, after the superincumbent layers have been removed, in deep quarries where the rocks are under enormous lateral pressure. The splitting of rocks at night, due to temperature changes, is a familiar phenomenon to every miner who has 'slept out' in the mountains, but a civil engineer may well be surprised when the solid rock at the botton of an excavation bulges up over a quarter acre of the exposed surface.

THERE is a well known story of a prisoner who, upon relating to his attorney the circumstances of his incarceration, was told: “They can't put you in jail for that,” and who replied, “Maybe they can't, but they did.” The question whether the United States Government can successfully run a coal mine is interesting, but academic. Maybe it can't, but it does. In fact, it already runs two coal mines, aside from those opened in the Philippine Islands by the United States Army. Near Pittsburg, Pennsylvania, the Bureau of Mines now operates a mine. This was primarily opened in order that the Bureau might make large-scale tests of safety explosives, of ventilation systems, electrical equipment, and conduct other technological investigations. Incidentally, however, the Government mines coal on a royalty basis and sells it through one of the large Pittsburg coal companies. Even more to the point is the mine at Williston, North Dakota, opened by the Reclamation Service. In this case, no questions of testing or studying mining conditions enter into the matter. Like the portland cement plant built by the same service in Arizona, it is purely a business project. The Reclamation engineers needed fuel at a pumping station, and, lignite outcropping abundantly nearby, they did just what a private concern would have done—opened a mine. It has now been in operation some years, to the entire satisfaction of every one concerned. An ounce of fact is worth more than a pound of theory.

AT Seattle there glimmers an *ignis fatuus* entitled 'The Modern Aladdin's Lamp Called 'Mining',' published fortnightly by Prentice & Co. It bears the motto 'We are nettled by the simplicity of truth,' and after reading the issue of September 18 we are convinced that though the editor may be only nettled, the reader will assuredly be stung. Since it is announced that no advertising is accepted, the description of a method of preventing the advance of old age by the use of certain books and medicines, as well as a 'write-up' of the Mt. Baker Gold, Copper & Tin Company, which, like an afterthought, is slipped in at the bottom of the last page, are doubtless inserted merely from an altruistic regard for the needs of humanity, and the better to serve these needs a subscription blank for the shares of the Mt. Baker company is enclosed with each issue. To quote further:

> "*The activity* of our minds is accelerated—rapidly WHEN *a bucket of cold water is dashed suddenly in our faces. We are also moved to higher animation through observation of the vigor, virility and vitality that springs suddenly and full-grown from the copulation of connected but fertile facts, which roughly rouses and wakens us up like a clap of midnight thunder; or, gently works us up to a point of acute attention, like children that see a prestidigitator produce through ledgerdemain and seemingly from nowhere, a glass bowl filled with water in which swim, live fish—which is the reason for writing this stuff, since—*
>
> Truth and facts *are often more strange than fiction.*"

The kind that emanate from Prentice & Co. undoubtedly are.

Technical Journalism and ——?

Our excitable contemporary at Salt Lake City, *Mines and Methods*, discharged a broadside last week at *The Mining Magazine* and the *Mining and Scientific Press*. The editorial in question is principally interesting as illustrating a peculiar point of view as to the functions of a technical paper. *Mines and Methods* seems quite unable to believe that a technical journal can praise technical work without having some ulterior purpose, such as raising or depressing the price of stocks. To our way of thinking, a technical paper should not be concerned with the manipulation of the stock market. As a matter of fact, no member of the staff of the *Mining and Scientific Press* owns a single share of mining stock, nor does any member have any financial interest in the rise or fall of the market. We are interested, as are all mining men, in seeing capital flow abundantly into legitimate mining investments. We do not consider it part of our function either to 'boost' or 'knock' any mining enterprise so long as it is conducted legitimately. We have not hesitated to state the exact facts, when procurable, about illegitimate stock-selling companies where the result of a promotion campaign was certain to be disastrous to the investors and to the mining industry. Our stand for honest mining is so well known that it needs no exposition. We usually have on hand the threat of at least one libel suit and have become so accustomed to it that we should not feel sure we were hitting the sore spots if we did not hear an occasional shriek. Among legitimate enterprises, however, we do not feel that it is the function of a technical journal to discriminate, and we believe that its columns can be put to much better use than in a systematic campaign either to raise or depress the price of a particular security. Evidently *Mines and Methods* thinks differently. No attentive reader of that interesting journal can doubt that one of its main purposes has been from the first to discredit the Utah Copper Company and its affiliated enterprises. That, of course, is its privilege, but when a publication adopts such an attitude it places itself in the category of brokers' circulars rather than of technical journals. This is said with no intention whatever to disparage the literature sent out by the brokers. Much of it is excellent and is prepared by thoroughly competent engineers. Such publications as Thompson, Towle & Company's *News Letter*, Hayden, Stone & Company's weekly letter, and Walker's *Copper Letter* so roundly berated by *Mines and Methods*, contain large amounts of first-class technical information. They are, however, *ex parte*, but this does no harm so long as it is understood by their readers. No matter how much excellent technical material any paper may print, when it engages in a market campaign it is a market letter. That a lawyer should defend his client vigorously is taken for granted, and we think nothing the less of him for so doing. We do not expect a lawyer's brief to be an impartial statement of fact, but that is exactly what is expected of a technical journal.

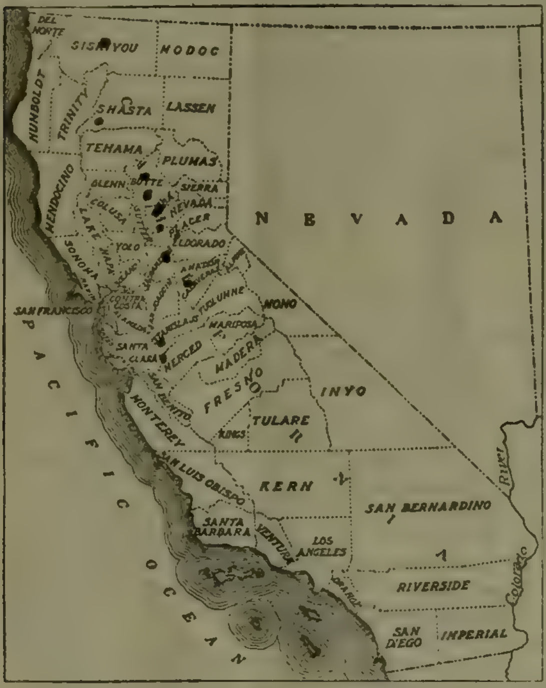
The Mining Magazine, in the paragraphs which so roused the ire of the Salt Lake paper, stated in substance that the otherwise excellent technical articles written for *Mines and Methods* by Mr. Claude T. Rice lost something of their value by evident prejudice against a particular group of properties and operating officials. This we think sound criticism abundantly justified by the facts. Readers of the *Mining Age*, published in New York, cannot fail to have been impressed with the cleverness and ability exhibited by that defender of Mr. George Graham Rice and his schemes. No one, however, looked to it for other than a partial statement. Market letters and market papers serve a useful function. They are of necessity interesting, and we welcome them all, but we vigorously protest against the assumption that a market paper is a technical journal, and we further protest against the imputation that good words for one enterprise or criticism of another in the *Mining and Scientific Press* can be bought. A publisher who has that attitude of mind is suffering from myopia.

In digging up and republishing the history of the Stratton's Independence affair, *Mines and Methods* has been misled as to matters of fact and makes insinuations that are so far from warranted as not to be excusable on the basis of mere misinformation. Such things are the accustomed, if not the legitimate, weapons of offense of a certain type of attorney and broker. The facts in the case were fully published at the time and are thoroughly understood among engineers and mining men. Mr. T. A. Rickard's professional career needs no defense. It was one of distinguished service and won for him the merited esteem of his professional associates. Criticism and innuendo by *Mines and Methods* can not affect his standing. While we do not approve of *Mines and Methods*, any more than that journal approves of us, we consider it the ablest publication of its class and one distinctly worth while. Everyone interested in the price of copper shares should read it, but he should remember while doing so that he is getting but half the story and be on his guard.

Present Day Problems in California Gold Dredging

By Charles Janin

*The first successful bucket-elevator dredge to operate in California was put in commission at Oroville in March 1898. There had been numerous previous attempts at dredging, but none of the earlier boats proved a success. The gold miners in California early conceived the idea of a machine to dig gravel from the beds and bars of auriferous streams that were inaccessible by the methods then employed, and it was only a few months after the discovery of gold in California that such a machine was shipped around Cape Horn from New York to San Francisco. This was, however, but the forerunner of many failures in gold dredging, and was soon at the bottom of the Sacramento river. During succeeding years many other unsuccessful attempts were made, and it was not until 1897 that a dredge of the single-lift bucket-elevator type was floated on the Yuba river. This dredge was built by the Risdon Iron Works for R. H. Postlethwaite, and would probably have been a success if it had been operated on some of the rich Oroville ground instead of in a turbulent stream where the dredge was wrecked during a flood, and was not repaired.



GOLD DREDGING AREAS IN CALIFORNIA.

It is not my intention to narrate in detail the history of the early failures in gold dredging, and the various steps in the development of the modern boat, but merely to touch upon this in a general way, and to call attention to the wide difference in capacity and operating cost between the first successful dredge with an actual capacity of 600 cu. yd. per day—though its rated capacity was in excess of this—and the present modern dredge with 15-cu. ft. buckets, and an average capacity of 250,000 cu. yd. per month. Even this enormous capacity has several times been exceeded on monthly runs. The first successful dredges in California were equipped with open-connected buckets, were operated on headlines, and had short-tray tailing stackers. For a number of years dredges of this type were used with varying success, generally on shallow and easily dug gravel. When attempts were made to work deeper ground and cemented gravel had to be handled it was found that these first boats were too light and it was necessary to install heavier machinery to withstand the increased strain.

The modern California type dredge with close-connected buckets, spuds, and belt-conveyor for stacking tailing was a gradual development through years of experimenting. This dredge embodies the ideas of successful operators and it is generally conceded that dredge construction and operating methods in California are far ahead of those in any other country in the world. The dredges built in California cost from $25,000 to $265,000 each; a standard 8½-cu. ft. boat costing from $150,000 to $175,000 according to conditions to be met in operation. With great improvements made in dredge construction, and corresponding reduction in operating costs, areas that were at first considered too low grade to be equipped with a dredge, are being profitably worked and the gold production from this source according to the United States Geological Survey reports increased from $18,847 in 1898 to $7,550,254 in 1910, being 28.3% of the total gold production of the State from all sources for the last year and 84.9% of the total placer gold for the year. The production for dredging during 1911 is estimated as closely as can be figured at this date at $8,000,000. The following table shows the production by years of gold won from dredging operations in California from 1898 to 1911, being a total of over $40,000,000.

Year.	Amount.	Year.	Amount.
1898	$18,847	1905	$3,276,141
1899	133,812	1906	5,098,354
1900	200,369	1907	5,065,437
1901	471,934	1908	6,536,089
1902	801,295	1909	7,382,950
1903	1,488,556	1910	7,550,254
1904	2,187,038	1911*.........	8,000,000

*Estimated.

California dredges vary in size from 3½ to 15 cu. ft. buckets. In Alaska some dredges are equipped with buckets as small as 1¼ cu. ft. to dig shallow ground, and are reported to be working profitably. A 15-ft. Marion dredge has recently been installed on the Boyle concession in Yukon Territory. The successful operation of this boat will no doubt encourage and be followed by further installations of the larger sized boats where conditions warrant in the Far North. While electricity is the ideal power for operating dredges, steam has been successfully used on a number of installations and experience has proved the merits of the gasoline and distillate engine for this work. There seems little doubt but that the successful development of the gas producer for the generating of electric power will prove an important factor in considering future dredging of gravel areas in districts where electric power or water-power for the installation of hydro-electric plants is not at present available. While it is unnecessary to go into the details of dredge construction in this article, a short description of one of the modern dredges may be profitably given here. A fuller description of a dredge of this character may be seen in the *Mining and Scientific Press* of October 7, and a complete record of dredges constructed in California in Bulletin No. 57, 'Gold Dredging in California,' issued by the State Mining Bureau and written by W. B. Winston and Charles Janin.

Yuba No. 13, one of the largest gold dredges operating in California, was put in commission at Hammonton, in Yuba River basin, August 10, 1911. This dredge was built by the Yuba Construction Co. and is one of five practically similar dredges built by the same company this year. It required 820,000 ft. of lumber for the hull and housing the hull; its dimensions are 150 by 58.5 by 12.5 ft., with an overhang of 3 ft. on each side, making 68½ ft. total width of housing. The digging ladder is of plate girder construction and designed to dig 65 ft. below water level and is equipped with ninety 15-cu. ft. buckets arranged in a close-connected line. The entire weight of the digging ladder and bucket line is approximately 700,000 lb. The washing screen is of the revolving type, roller-driven, and is 9 ft. diam. by 50½ ft. long and weighs 111,721 lb. Two steel spuds are used, each weighing over 44 tons. The ladder hoist winch has a double drum, and weighs 67,016 lb. The swinging winch consists of 8 drums, and weighs 34,193 lb. The stacker hoist winch weighs 3732 lb. The gold-saving tables are of the double bank type and have an approximate riffle area of 8000 sq. ft. The tailing sluices at the stern can be arranged to discharge the sand from the tables either close to the dredge or at some distance behind. The conveyor stacker belt is 42 in. wide and 275 ft. long, on a stacker ladder of the lattice girder type, 142 ft. long. Nine motors are in use on the dredge, with a total rated capacity of 1072 hp. The total weight of hull and equipment is 4,640,862 pounds.

---

*Presented jointly with Francis J. Dennis at the San Francisco Meeting of the Amer. Inst. of Mining Engineers.

Natoma No. 10 dredge, now under construction, is equipped with 15-cu. ft. buckets, and will have a steel hull, being the first dredge operating on a steel hull in California. The hull will be 150 by 56 by 10½ ft. and will have a total weight of 920,000 lb. This will be about one-half the weight of a wooden hull to carry the same machinery, and the draft of the boat will be considerably lighter. This boat will be in operation in April 1912.

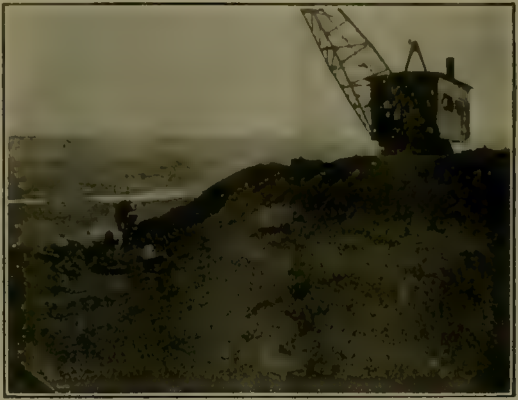
YUBA DREDGE NO. 13.

Owing to the financial success of gold dredging most of the gravel areas of California have been explored. It is hardly to be expected that any new fields as rich as those now being worked will be found, but it is possible that areas considered unprofitable for dredging, even within recent years, will be worked in the future.

The following table gives in a general way the approximate extent of dredging ground in the best known dredging districts in California, the average depth of gravel and the value per cubic yard. Much of this ground has already been dredged, and some areas of lower grade gravels which ultimately may be dredged are not included.

Counties.	Total proved dredging ground, acres.	Av. depth of ground, feet.	Av. value per cu. yd., cents.
Butte	6,600	30	15
Yuba	3,600	65	15
Placer	4,300	38	8
Sacramento	6,000	35	11
Calaveras	850	18	14
Stanislaus	200	22	14
Merced	400	20	13
Shasta	600	22	11
Siskiyou	350	35	14
Trinity	600	25	15

In addition to the lower grade gravel being worked in the future, areas considered too small for the profitable installation of an expensive modern dredge will be equipped with strong, lighter designed, and less expensive boats, and also with rebuilt dredges using machinery from dredges which have worked out the areas for which they were built, or that have been dismantled and replaced by larger boats. The machinery of some of these dismantled, and to be dismantled, dredges is in good condition, fit for many years of working life, and can be refitted on a new hull on nearby property or properties not too difficult of access, and a practically new dredge built in some cases, at less than 50%, of the cost of the original boat. It must be recognized that these rebuilt boats may not always be adapted to handle the gravel with as low operating costs as might otherwise be attained, but the smaller expense of installation will prove a large factor in their selection and use. Dredges that were first constructed in Colorado, but proved unprofitable, were dismantled and their machinery used on hulls in California. The machinery from several California dredges has been moved to other fields, and, in some cases, to Alaska. Recent examples which may be mentioned are the Scott river dredge, formerly at Callahan, Siskiyou county, where it was unprofitable, was dismantled, and the machinery has been moved to Trinity Center, Trinity county. The Butte dredge, having worked out the company's holdings at Oroville, was also dismantled and the machinery is being placed on a new hull near Jenny Lind, Calaveras county. The Scott river dredge was put in commission in August 1908, and was equipped with 7½-cu. ft. buckets. It was not quite two years in operation, being shut down May 30, 1910. It was purchased by the Alta Bert Gold Dredging Co., acting on the advice of H. G. Peake, and was moved to its ground in Trinity county. Estimated cost of building a new hull, installing the machinery on same, including a 28-mile haul, with a freight cost of over 1c. per pound, and building a power transmission line of five miles, is $80,000. The Butte dredge was put in operation during November 1902 and dismantled in July 1910. It was equipped with 3½-cu. ft. buckets. The machinery is being placed on a new hull, and includes a new bucket-line of 4-cu. ft. buckets. The cost of the installation, including the new bucket-line, has been estimated at $30,000. The figures given for moving both of these boats must be considered approximations only, as they are not official.



BUCKET SCRAPER AT WORK.

There also seems to be a field in California and elsewhere for the installation of the bucket scraper on auriferous areas too small or otherwise unsuitable for dredges, but of sufficient gold content to be profitably handled by the scraper. This method of handling gravel is profitably in use in Siberia, in the Kolchan mines at the present time, a plant having been installed by C. W. Purington. In California one has been in successful operation near San Andreas. This machine rests upon rollers by which it is moved on a plank track. It delivers to a set of trommels and gold-saving tables similar to those on a dredge. It has a 60-ft. boom upon which the scraper bucket, weighing 1½ tons and having a capacity of 1½ cu. yd., works. The bucket is raised and lowered by means of a cable working over a sheave at the end of the boom, and is loaded by means of a drag-line traveling between sheaves in front of the floor plate. Dumping is accomplished by means of an equalizing cable attached to the drag-line and on the front of the bucket, which passes over a sheave fastened to the bucket bale. The excavator is turned by a single-drum winding engine, having two cables attached, whereby a complete circle can be made and the scraper bucket operated on all sides. The machine is operated by steam power, wood being used as a fuel. Thus equipped it has excavated gravel to a depth of 35 ft., and, it is claimed, can be worked to a depth of 50 feet.

The material is dumped by the bucket into a hopper 12 by 12 ft., which feeds a trommel screen $4\frac{1}{2}$ by 22 ft., the upper part of which has $\frac{3}{8}$-in. perforations, and the perforations of the lower 18 in. being $\frac{3}{4}$ in. The oversize discharges to a belt-conveyor stacker, the undersize passes over Hungarian riffles, and then to a riffled sluice-box in which quicksilver is deposited, and finally to a 20-ft. sluice-way in which cocoa matting is used. Water is pumped into the hopper to wash the material through the cylinder. The cylinder and stacker are operated by a 15-hp. electric motor, and the whole washing apparatus is mounted on rails. It requires two men on the excavator and one on the washer. Accurate figures of operating costs are not at present available, but are understood to approximate 15c. per cubic yard. At the Kolchan mines it is claimed that exclusive of management charges, which are high, the cost of washing 24,400 cu. yd. for July was 14c. per cubic yard. While these machines cannot be compared with modern dredges in capacity and operating costs, it is claimed by those familiar with the operation, that there is a good field under suitable conditions for their use in places where it is impracticable to install dredges.

The dipper dredge has been successfully operated on small areas at Oroville and elsewhere, but does not meet with approval among dredge operators in general, who contend that the efficiency of these boats, both as to yardage and gold-saving capacity, is not up to that of the standard type. These boats have a low first cost (about $25,000 f.o.b. factory) and are built with buckets from $1\frac{1}{4}$ to $2\frac{1}{2}$ cu. yd. capacity. It is claimed by the dealers and some operators that under the following conditions there is a field for this type of dredge: (1) where the ground is somewhat shallow; (2) where the extent of the ground is not sufficient to warrant the installation of a costly dredge; (3) where the material is of a rough character, boulders, and stumps; (4) where the ground is mixed with more or less clay, as the dipper will clear itself notwithstanding the adhesiveness of the material.

The reported successful operation of a small Risdon dredge on the middle fork of the American river near Loomis, Placer county, under conditions thought by many to be impossible for operation, will undoubtedly encourage other installations in rivers at times torrential. A. A. Tregidgo is now promoting a company for the dredging of gravel some distance below this place. Without attempting to pass on the merits of either of these undertakings, it is interesting to consider them as engineering problems, and their success will draw considerable attention to similar gravel areas in this State and elsewhere. While gold dredging in California has been mainly confined to gravel areas some distance from the main river channels, it is claimed that a small boat, with some modifications in the hull to suit the river conditions, and adapted for work in a swift current with head-line and mooring winches of greatly increased strength, can be profitably operated, even in the winter months, in the California rivers where not in conflict with the present débris laws. In addition to the use of a small dredge, it is proposed by Mr. Tregidgo to operate a hydraulic elevator on the same property, water being available at a head of 1000 ft. This water will first be used at a head of 400 ft. to generate electric power to be transmitted to the dredge. From this point the water will have a head of 600 ft., to be used in the hydraulic elevator. In addition to these enterprises, there are several proposed dredge installations on somewhat similar areas in this State, concerning which definite information is not available at present.

The suction dredge has never been favorably considered in gold dredging, except by the inventors and builders. It is claimed by those interested that one is in successful operation in Shasta county, and another in Siskiyou county, though other information is to the effect that these boats were not a financial success and are no longer operating.

A method closely allied to dredging, which may be termed a hybrid of dredge and hydraulic mining, is attracting much attention in this State. This is the Tarr Mining Co.'s plant at Smartsville, California, which was built to operate the Old Blue Gravel hydraulic mine. This mine was a producer in early days, but was shut down by the Débris Commission. It is believed that the Tarr company will be able to operate in compliance with the present law. From an engineering standpoint, the proposal has some interesting features. Briefly, it consists of hydraulicking the gravel bank to a sump in front of a stationary dredge building of concrete and sheet iron, where a regular steel girder dredge ladder, equipped with fifty-two 7-cu. ft. buckets elevates the gravel to a trommel 45 by 6 ft. with $\frac{1}{2}$-in. holes. From the screen the undersize flows to gold-saving tables with Hungarian riffles having an approximate area of 4000 sq. ft. The oversize passes to a belt-conveyor 570 ft. long, built in two sections, each section being driven by a 50-hp. motor. A 100-hp. motor is used on the digging ladder, and a 30-hp. motor on the revolving screen. At the end of the belt-conveyor stacker two Bleichert tramways are being constructed. These will afford a much larger dumping ground for the tailing.

The fine material, after passing over the gold-saving tables, flows through a bedrock tunnel about $\frac{1}{2}$ mile long and is elevated to a concentrating plant equipped with tables of the Overstrom type. The material first passes through revolving screens, the oversize being carried outside the concentrator, and the undersize to the tables. It is the idea of the management that this plant will save black sand, which is claimed to be valuable, and any gold and platinum that escapes the first tables.

The concentrator stands several hundred feet from the Yuba river, and a concrete dam will be constructed to afford a settling basin for the tailing. This experiment will be watched with interest. Its success will undoubtedly mean that other properties formerly worked as hydraulic mines, which have been shut down by the Anti-Débris Commission, will be operated on somewhat similar lines. The equipment of such a property is no small matter. The operating cost as yet is purely speculative. The management of the Tarr company does not believe that the cost of operating the plant will exceed 8c. per cubic yard.

On Bonanza creek, in the Yukon, a portable bucket elevator arranged to elevate gold-bearing gravel to a system of portable sluices, the position of which can be changed when necessary to obtain a new dump, has been in more or less successful operation by the Yukon Gold Co. for a number of years, but only one attempt, so far as is known, has been made to adjust this method to California gravels. The mode of operation is as follows: A sump of approximately 20 ft. square with a depth of 14 to 16 ft. below bedrock is excavated to receive the lower end of the elevator. A channel or bedrock sluice emptying into the sump with a grade of 5 in. to 12 ft. is excavated in the bedrock and provided with riffles. The gravel bank to be treated is hydraulicked with two 3-in. giants, and a third giant sluices the gravel to the sump from which the buckets elevate it to a riffled sluice about 25 ft. high. The elevator ladder is equipped with buckets of 3-cu. ft. capacity, close-connected and driven by a 50-hp. motor. The water used in the upper sluice is pumped from the sump by one 12-in. centrifugal pump belted to a 100-hp. motor, and one 8-in. pump driven by a 50-hp. motor. A derrick with a long boom is placed in a position convenient for handling any large boulders. Records of operating cost have not been made public by the Yukon Gold Co., and it is understood that the use of these machines will be discontinued or considerable changes made in the method of operating them.

A somewhat similar machine was operated a few months during 1910 at Poker Bar, Trinity county. This was installed by R. E. Whitcomb, at a cost of approximately $15,000. The motive power was steam, wood being used as fuel. The expenses of operation were great, but no accurate data are obtainable at present. It is said that the operation of the machinery thoroughly demonstrated the value of the gravel area, and it is reported that a dredge will be installed this year. The management contemplates moving a Marion dipper dredge, formerly successfully operated at Oroville, and which had turned over the holdings of the original company. It is estimated that this dredge can be put in operation at a cost of $15,000. At the present time there are 62 bucket elevator dredges operating in California, and five under construction. Of the six dredges put in commission in 1911, four have been built by the Yuba Construction Co. and are equipped with 15-cu. ft. buckets, one was built by the Union Iron Works and equipped with $8\frac{1}{2}$-cu. ft. buckets, and one by the Risdon Iron Works with 4-cu. ft. buckets. One of those under construction has buckets of 15-cu. ft. capacity, one $7\frac{1}{2}$-ft. buckets, one 7-ft., one 5-ft., and one 4-cu. ft. buckets.

It is interesting to note that of the 62 dredges which are operated by 28 companies, 30 are operated by three companies controlled by W. P. Hammon and associates, distributed among three counties, as follows: Butte county, 8; Yuba county, 13; Sacramento county, 9. It may here be mentioned that the great progress and improvement is due in a great measure to the enterprise and successful operations of Mr. Hammon and his associates. Couch dredge No. 1, the first successful bucket-elevator dredge put in commission in the State, was financed by Mr. Hammon and the late Thomas Couch, and it seems eminently fitting that Mr. Hammon should be the leading gold dredging operator in California, and in control of the largest dredging companies in America.

What seems to be a record in dredge construction and worthy of mention is the building of the dredge for the Julian Gold Mining & Dredging Co. on Osborn creek, near Nome, Alaska. This dredge was constructed by the Union Construction Co. of San Francisco. The dredge was shipped from San Francisco on June 1, arriving at Nome June 13. On June 17 they commenced hauling material, and on July 22 the dredge was completed and operations started. The dredge hull is 30 by 60 by $6\frac{1}{2}$ ft. It is equipped with 34 open-connected $2\frac{3}{4}$-cu. ft. buckets, and is designed to dig 14 ft. below water-level. Power is furnished by gasoline engines as follows: one 50-hp. for digging ladder, winches, and screen; one 30-hp. for pump; one 7-hp. for lighting apparatus; a total of 87 hp. Distillate costs at Nome 21c. per gallon. Operating expenses at present range from $110 to $125 per day, and the capacity of the dredge is from 1000 to 1300 cu. yd. per day, indicating an operating cost of from 10 to 11c. per cu. yd., exclusive of repairs. The cost of the dredge complete and in operation was $45,000. The Union Construction Co. also built a similar dredge for dredging tin, near Cape York, this latter being the first tin-dredging operation to be carried on in America. Its future will be watched with interest and may be followed by further installations.

With the development of the gold dredge to its present efficiency, the question is often raised as to when the limit in size for economic dredge installation will be reached. Much depends upon the conditions met in operation. There is no question as to the mechanical possibility of larger buckets. In Boston harbor a bucket-elevator dredge equipped with buckets of 2-cu. yd. capacity has been successfully operating for some years on harbor work, and on the Danube river in Germany a bucket-elevator dredge having $2\frac{1}{2}$-cu. yd. buckets is now in operation. While the mechanical possibilities have thus been proved, to apply such radical changes in size to the gold dredge of today would necessitate an entirely different arrangement of the gold-saving tables and would probably result in a general modification of the whole gravel-washing apparatus now in use. Even the most optimistic advocates for increasing the size of the dredge buckets would hesitate at recommending a 2-cu. yd. bucket, which is nearly four times the present size of the buckets on the largest gold dredges in operation, but there are a number of engineers who believe that the bucket-elevator dredge with buckets having a capacity of 1 cu. yd. will be constructed before long. While a dredge of this character would necessarily be equipped with heavier machinery and a larger hull than those on the present 15-cu. ft. boats, it is, as before stated, quite possible that, with modifications of the washing apparatus, the hull of the 1-cu. yd. dredge may not be proportionately larger. The present 15-cu. ft. boats have a hull 60 by 150 by $12\frac{1}{2}$ ft., with a deck overhang of 5 ft. on either side, making a total width of 70 ft. The gold-saving tables are double-bank type and have an approximate area of 7000 to 8000 sq. ft. Without some change in the washing apparatus, it can readily be seen that 14,000 sq. ft. of table area would either necessitate a hull of greatly increased size, or additional tiers of tables for which an increased length of bucket ladder would be required to elevate the gravel to the additional height, or a general change in the design of the boat.

TARR GOLD-WASHING PLANT.

There may be a field for dredges of this size, for instance, in the Oroville and Folsom fields, to re-dredge the tailing piles left from the first dredging operations. After many of the cobbles have been removed for the rock-crushing plants, the ground, if dredged, will, in many cases, yield a fair return. Especially would this be the case in the areas where the early dredges worked, as the gold-saving apparatus of the first successful dredges was not as efficient as those in present use.

In addition to the gold recovered from the gravel, the reclaiming of the land for agricultural purposes might be a considerable factor in estimating the total profit to be won from the installation of a mammoth dredge for this class of work. The first dredges, in turning over the ground, necessarily deposit the top soil on the bottom, and the gravel and boulders from the tailing-stacker on top of this. After much of the coarser gravel is removed for rock-crushing operations, with some such arrangement as that which is being tried out in New Zealand in resoiling experiments, this soil now below the gravel could, in re-dredging, to a great extent be deposited on the top of the coarser material. In reclaiming the dredged land it is, no doubt, a matter worthy of consideration. Any estimate of the operating cost of a dredge of this character is, of course, pure speculation, but there seems every reason to expect that, under favorable conditions, or in re-dredging some of these previously dredged areas, a very low operating cost would be obtained.

The operating cost of dredging is always a matter of interest, but working costs cannot be fairly used in comparison, unless uniform methods of determining them are employed, and also unless operating conditions are somewhat similar. As in other branches of the mining industry, it may also be said that the apparent operating cost is in a great measure a matter of bookkeeping. As the time available for preparing this article was limited, it has been found impossible to prepare new data on working costs of dredges in California, so I have utilized a table prepared last year by me and published in the *Mining and Scientific Press* of July 30, 1910. Under similar conditions, the operating costs are practically the same. The new boats have not been working long enough to make any figures of operating cost of much value, but it is understood that they will under the same conditions appreciably lower the costs obtained by the 13½-ft. boat.

It is interesting to note the following average operating cost per cubic yard of the large companies working in California during 1910: The Yuba Construction Co., for the year ended February 28, 1911, handled 13,970,728 cu. yd. at a total cost of 5.67c. per cubic yard. The Natomas Consolidated handled, for the year ended December 31, 1910, 15,989,525 cu. yd. at a total cost of 4.52c. per cubic yard, and during the six months ended June 30, 1911, 10,793,891 cu. yd. at a total operating cost of 3.77c. per cubic yard. This company has put in commission during this year three dredges with buckets having a capacity of 15 cu. ft., one being in the Feather river division at Thermalito, and two in the Folsom division on Rebel hill. These two boats are now satisfactorily handling ground that for a long time was considered too difficult for economical dredging. The gravel is deeper and more compact than any other in the district, and dredge No. 8 is handling ground containing much stiff clay. The Oroville Dredging, Ltd., for the year ended July 31, 1910, handled 5,661,612 cu. yd. at a total cost of 5.05c. per cubic yard.

Montana Metal Production, 1910

The value of the mine output of gold, silver, copper, lead, and zinc in Montana in 1910, according to V. C. Heikes, of the U. S. Geological Survey, was $48,358,253, against $51,429,694 in 1909, a decrease of $3,071,440, occasioned almost entirely by the lessened output of copper ores. The value of the gold, silver, and copper combined was $4,326,868 less than in 1909, while the value of the lead and zinc yield was $1,255,427 more than in 1909. The value of the production of Silverbow county, which includes the Butte district, was 91% of the total value of the metals from Montana. The decrease in value in this county was $3,108,861, so that the combined production of the other counties in Montana was slightly greater in 1910 than in 1909.

The production of gold in 1910 was only $61,024 less than in 1909. The greater part of the gold, 115,261.06 oz., or 64% of the total, was from silicious ores; and 31,441.93 oz., or 17%, came from copper ores. The placer gold in 1910 amounted to $575,917, of which $473,385 was obtained by dredging. The gold won from placers was $32,545 greater than in 1909, but that taken from lode mines was $93,569 less.

The production of silver in Montana in 1910 was 12,162,857 oz., against 12,378,714 oz. in 1909. Nevada now takes the leading place in silver output in the United States, which Montana held in the years 1909 and 1908. Of Montana's 1910 output of silver, 9,153,590 oz., or 75%, came from copper ores, and 2,139,465 oz., or 17.6%, from silicious ores. Bullion at gold and silver mills produced only 130,900 oz., while concentrate produced 8,208,644 oz., and crude ore shipped to smelters contained 3,766,375 oz. Silverbow county produced 10,400,840 oz., or 85.5% of the State's production, compared with an output of 10,609,328 oz. in 1909.

The production of copper in Montana decreased from 312,058,011 lb. in 1909 to 284,808,553 lb. in 1910, a loss of 22,278,460 lb. The Summit Valley or Butte district contributed all but 581,648 lb. of the total.

The production of lead in Montana increased from 2,983,430 lb. in 1909 to 4,106,292 lb. in 1910. Nearly all the metal-mining counties in Montana made a small yield of lead, but Jefferson county, with a production of 1,975,492 lb. in 1910, against 1,568,696 lb. in 1909, produced nearly half of the output for the whole State of Montana during both years.

Of Montana's zinc output in 1910, which was 31,638,184 lb. (figured as spelter), against 9,359,724 lb. in 1909, the Summit Valley district, in Silverbow county, produced all but 18,000 lb. Nearly all of the zinc ore was sent to concentrating plants, and the concentrate produced contained 31,334,204 lb. of zinc; the crude ore sent to smelters yielded only 303,980 pounds. It will be seen that Montana is rapidly becoming an important zinc producer.

The number of deep mines producing metals in Montana in 1910 was 423, against 448 in 1909, and the number of producing placer mines was 157, against 170. The average total recoverable value per ton of ore produced increased from $9.39 in 1909 to $9.41 in 1910.

MINE PRODUCTION OF GOLD, SILVER, COPPER, LEAD, AND ZINC IN MONTANA IN 1910, BY COUNTIES.

Counties.	Ore treated, Tons.	Gold.*	Silver,* Fine ounces.	Copper, Pounds.	Lead, Pounds.	Zinc, Pounds.	Total value.
Beaverhead	992	$ 57,105	51,649	59,313	273,985	....	$ 104,583
Broadwater	14,883	321,955	21,480	124,938	245,935	....	360,243
Cascade	1,381	2,170	57,060	18,415	298,489	....	48,455
Chouteau, Flathead, and Lincoln	56,656	507,839	45,898	18,301	26,605	....	536,117
Deer Lodge	5,604	136,417	29,602	4,822	....	....	153,014
Fergus	145,747	636,752	9,283	1,167	60,254	18,000	645,536
Granite	6,745	80,443	308,423	18,867	26,321	....	250,545
Jefferson	57,271	133,709	1,029,579	122,109	1,975,492	....	792,111
Lewis and Clark	45,510	190,903	58,993	4,306	196,883	....	231,969
Madison	31,721	810,921	115,745	39,159	243,543	....	889,112
Meagher, Park, Ravalli	260	4,442	4,437	15,789	195,819	....	17,462
Missoula and Sanders	2,184	39,956	13,722	36,738	164,752	....	59,281
Powell	1,063	42,719	16,146	79,767	48,041	....	63,681
Silverbow	4,709,429	765,155	10,400,840	284,264,862	350,173	31,620,184	44,206,144
Total	5,079,446	$3,730,486	12,162,857	284,808,553	4,106,292	31,638,184	$48,358,253

*Includes placer production.

Examination of Dredging Properties

By Francis J. Dennis

*Many factors govern the value of dredging ground, and much capital can be wasted by the mistaken policy of contracting for the purchase of property and the installation of machinery before a thorough examination has been made. To the uninitiated investor the presence of gold is generally the criterion, and very superficial evidence is necessary to satisfy him as to this point. He considers the comprehensive report of a competent engineer as a wasteful extravagance and cannot understand why the engineer requires so much time and money to ascertain the information on which to base his conclusions when the promoter can furnish him such pleasing and satisfactory data with but little expenditure of time and money. The uninitiated investor will often optimistically risk capital for purchase and equipment, and not until the venture comes to grief does he learn that the conditions are wholly unsuited for dredging. In many instances, a short preliminary examination by a competent engineer would have disclosed these facts. The mere presence of gold is by no means sufficient; some of the other factors necessary to be ascertained in determining the value of placer ground for dredging purposes are: (1) character and distribution of gold, and how much can economically be recovered; (2) character of bedding underlying the gravel, its contour, and whether its gold can be recovered by ordinary dredging operations; (3) area and depths of gravel, surface contour, overburden, water-level, proportion of fine and boulders, and the presence of any material which might interfere with dredging operations and recovery of the gold; (4) water supply, power available, labor, transportation, and supplies, and cost of these; (5) climatic conditions; (6) title to property, cost and royalties, and legal obstacles to carrying on dredging operations.

A brief reconnaissance may be sufficient to determine that some of the essential conditions for successful dredging are lacking and no further expense need be incurred. Exposures in the gullies, pits, and shafts often afford considerable evidence of the extent and characteristics of the gravel and contour and character of the bedding, and this may be readily supplemented by sinking a few additional shafts or drilling a few holes. The preliminary report proving satisfactory, arrangements should be made for thoroughly testing the ground. The area should be surveyed and the shafts or drill holes placed according to the sampling scheme adopted. Information obtained during the preliminary examination should be of use in forming this plan. Where the deposit of gravel and occurrence of gold is fairly regular throughout the area, it is generally laid out into squares of from 200 to 500 ft. Where the occurrence is in channels, this method cannot be pursued, and more judgment and ingenuity is called for in placing the holes and in making estimates from the results obtained. Holes may be placed at short distances across the channels in rows at regular intervals, and it is sometimes the practice to arrange the holes so that those of alternate transverse lines form longitudinal lines. Whether shafts shall be sunk or holes drilled is a question of expediency. Shafts afford the most complete information, and where round shafts can be cheaply sunk, this method is advisable. Where expensively timbered shafts are required and water and other features militate against shaft-sinking, the cost is prohibitive and drilling is resorted to. It is by this latter method that most of the dredging ground in California has been prospected, but it must be borne in mind that the prospectors previously had considerable information as to the characteristics of the gravel and bedding.

No. 3 Keystone drills are usually used in making drilling tests, but as the plant is heavy and somewhat difficult of transportation, the development of the hand-drill in recent years has made it an important factor in the prospecting of gravel areas in foreign countries, or in localities difficult of access where the transportation charges are high. Its low first cost—about one-half of that of a steam drill—the great reduction in weight—about one-tenth of a non-traction or one-fifteenth of a traction drill, exclusive of supplies—and the further fact that the whole hand-drill outfit, weighing a little over 1000 lb., can be made up into packs, with a maximum weight of less than 75 lb. each, is of considerable importance in prospecting. A complete and very interesting article on the Empire hand-drill for prospecting work, written by J. Power Hutchins and Norman Stines appeared in the *Mining and Scientific Press* of January 7 and 28, 1911. In new territory it is advisable, even though expensive, to sink a few shafts in the initial stages of the investigation, and the data thus obtained will enable a closer interpretation of the character of the ground passed through in drilling.

It is not intended that this article shall discuss the details of drilling and sampling operations, types of drills, and methods of determining the gold content of samples. But it should be borne in mind that reliable, experienced men should be employed in this work, and that constant vigilance should be exercised. Field and time books should be conscientiously kept, assay values at various depths noted, characteristics of the bedding and gravel, time consumed, difficulties encountered, and features that might militate against dredging recorded. These data should be recorded in the prospecting log-book, which at the finish should contain a summary of all data obtained during the progress of the drilling. From this the engineer should then allocate the results to the proper area, eliminate unprofitable areas where practicable, and summarize the yardage and value of the area that should be worked. In making this estimate there is no fixed formula for discounting the results indicated by the drilling test, but experience has shown that the amount of gold obtained by dredging is generally only from 75 to 80% of that indicated by prospecting. Having ascertained that the conditions are favorable for dredging, it is then incumbent on the engineer to determine on the type and size of dredges, number to be installed, and general campaign to be followed.

Having a given area, the yardage and contents of which can be estimated with considerable certainty, he is called upon to decide what equipment will yield the best economic results. His information of the physical characteristics of the area, together with his general knowledge of what is being accomplished in other fields, should enable him to closely estimate operating costs with dredges of various capacities and construction. A small yardage will evidently not justify a large and expensively constructed dredge, nor would the extra expense of construction necessary in a dredge for heavy ground be justified in building a dredge to work a similar yardage of lighter ground. Amortization of the cost of equipment should be set off against operating costs, and no extra expenditure be incurred that will not be justified by a corresponding reduction in operating costs. For example, assume an area of 100 acres of gravel, 11 yd. deep, and containing 5,000,000 cu. yd. A 13½-ft. boat would cost about $250,000 and would work out the area in less than two years. Assume the operating cost to be 4c. per yard, the amortization of the equipment would be 5c. per yard, making a total of 9c. per yard. A 5-ft. boat would cost about $85,000 and would work out the area in about five years. Assume the operating cost to be 6c., the amortization of the equipment would be 0.566c., a total of 6.566c. per cu. yd. The installation of the smaller capacity boat would be clearly advisable. Assume the acreage to be 300 and the yardage 15,000,000. The operating cost of the large boat would be 4c. and the amortization 1.666c., a total of 5.666c. per yard. Two

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*A paper presented jointly with Charles Janin at the San Francisco Meeting of the Amer. Inst. of Mining Engineers.

1-ft. boats at a total cost of $170,000 would be required to handle this yardage. The operating costs would be 6c. and the amortization 1.132c., a total of 7.132c. per yard. Here the installation of the larger boat is clearly advisable. It is not thought necessary to enter into the refinements of interest calculations in the above examples, but where the operating profits are large, this factor is well worthy of consideration.

The value of the plant as an asset after the area has been exhausted should also be taken into consideration. The engineer is, of course, presumed to have taken cognizance of, and provided for the amortization of the initial investment in presenting his report to his principals. Moreover, he may have been sent to report on the area as a dredging undertaking, and, although he finds that it is not suitable for simple dredging alone, some modified form or some method which is an outgrowth of the industry may be profitably undertaken. It is incumbent upon the engineer to use the greatest care in ascertaining information about the property, and the greater his ability and experience the more valuable will his report be to his principals.

Metal Production in Oregon, 1910

In Oregon, according to Charles G. Yale, of the U. S. Geological Survey, the total value of the mine production of gold, silver, and copper in 1910 was $700,676, against $827,001 in 1909, which, however, also includes the value of the lead produced in that year. The ore treated in 1910 was 82,132 short tons, against 59,281 tons in 1909. The production of gold decreased from $781,964 in 1909 to $679,488 in 1910; that of silver increased from 27,827 oz. valued at $14,470, to 35,978 oz. valued at $19,428; that of copper fell off from 235,000 lb. valued at $30,550, to 13,861 lb. valued at $1760; and that of lead declined from 400 lb. in 1909 to nothing in 1910. Baker county led in gold production with an output of $401,002, mostly from deep mines, followed by Josephine with $150,048 from both placers and deep mines. All of the copper production and 29,835 oz. of the silver output also came from Baker county, whose output of gold, silver, and copper was valued at $418,873 in 1910. The combined gold output from southwestern Oregon in 1910 was $209,324, of which $130,103 was placer gold. The placer gold output of this region decreased $55,149 in 1910. The mines of northeastern Oregon produced $470,164 in gold in 1910, of which the placer yield was $40,822 and the deep-mine yield $429,342. The placers of this region showed an increase of $4756 in 1910 and the deep mines a decrease of $42,311.

Metal Output, New Mexico, 1910

The value of the mine production of gold, silver, copper, lead, and zinc in New Mexico in 1910, according to C. W. Henderson, of the U. S. Geological Survey, was $2,691,080, against $2,070,368 in 1909. The amount of ore treated was 191,865 tons, against 164,156 tons in 1909, and the metal production was $482,424 in gold, against $239,491 in 1909; 843,987 oz. of silver, valued at $455,753, against 397,783 oz., valued at $206,847, in 1909; 4,614,386 lb. of copper, valued at $586,027, against 5,393,146 lb., valued at $701,109; 4,320,841 lb. of lead valued at $190,117, against 5,029,767 lb. valued at $216,280; and 18,088,129 lb. of zinc, figured as spelter, valued at $976,759, against 13,085,945 lb. valued at $706,641. There were 85 deep mines producing in 1910, against 111 in 1909. Of the 1910 producers, 39 were in Grant county, 11 in Socorro county, and 9 in Luna county. The total average recoverable value of ore in New Mexico in 1910 was $13.89 per ton, against $12.48 in 1909. Socorro county led in the production of gold, silver, lead, and zinc, and Grant county (including the important Chino copper mines) led in the output of copper. The mining industry was flourishing in New Mexico in 1910, and further increased production may be looked for.

The number of deep mines producing metals in Colorado in 1910 was 856, against 904 in 1909.

Mineral Deposits of Ducktown, Tennessee

By W. H. Emmons and F. B. Laney

[*]The mineral deposits of Ducktown are situated in the southeast corner of Tennessee, near the North Carolina line, and extend southward into Georgia. The deposits were discovered in the late forties and, except during a brief interval in the early sixties and a longer one from 1877 to 1890, mining operations have been carried on continuously since their discovery. They had produced to the end of 1909 over 190,000,000 lb. of copper, about 1,500,000 tons of iron ore, and a relatively small amount of silver and gold. They yield at present, in addition to the metals, about 650 tons of sulphuric acid daily. Two companies are operating in the district, each having its own smelter, railroad, and acid plant. These are the Tennessee Copper Co., with headquarters at Copperhill, and the Ducktown Copper, Sulphur & Iron Co., with headquarters at Isabella, about 3 miles north of Copperhill. The production of copper in 1909 was 19,207,747 pounds.

The district is included in the mountainous area of the southern Appalachians, and the greater portion of it is a small intermontane plateau about 1600 ft. above sea-level, which is nearly surrounded by mountains that rise from 1000 to 2000 ft. higher. The deposits are included in an area 6 miles long and 4 miles wide, and all are on the dissected peneplain which occupies the central portion of the Ducktown basin. The outcrops are composed of iron oxides and quartz, and contrast strongly with the country rock. All the lodes have a general northeast strike. South of the Culchote mine, which is near the centre of the productive area, they strike more nearly north than east; north of the Culchote they strike more nearly east than north. In general, the lodes dip southeast, but some dip northwest. The deepest development underground is about 800 ft. below the surface. The distribution of the lodes is shown in the illustration on the next page.

In the main, the deposits are roughly tabular. Some of them are lens shaped and most of them are at places curved. All are included in metamorphosed sedimentary rocks and, except where faulting or close folding is apparent, the beds are parallel to the contacts of ore and country rock. The primary ore consists of pyrrhotite, pyrite, chalcopyrite, zincblende, bornite, specularite, magnetite, actinolite, calcite, tremolite, quartz, pyroxene, garnet, zoisite, chlorite, micas, graphite, titanite, and feldspars. The minerals are generally intergrown and of contemporaneous age. Essentially the same minerals are found in all the deposits, but they appear in varying proportions at different places in the lodes. Where the content of copper is above 1.5%, or where sulphur is high, the material is ore, but where the proportion of actinolite and other lime silicates is greater and the sulphides less abundant, the material, though containing copper and sulphur, is unworkable. Along the strike and down the dip the ore grades into this lime-silicate rock, and in some places it grades into marmarized limestone. The ore zones may be considered therefore as tabular bodies composed of ore, of lime-silicate rock, and of marble. As thus defined, these zones vary from a few feet to nearly 200 ft. in width and average probably between 50 and 75 ft. The amount of ore is about equal to that of the lime-silicate rock and marble. At some places the ore, the lime-silicate rock, and the limestones have schistosity or banding which is parallel to the boundaries of the ore zone, and wherever bedding planes have been made out in the marble and in the lime-silicate rocks these are likewise parallel to the boundaries of the ore zone and country rock. Some of the layers of sandy schist included in the ore zone are believed to represent beds that were deposited with the limestones.

The ore minerals are not arranged in layers or crusts one upon another, like the minerals deposited from solutions in an open cavity, but are intergrown and are assumed to have formed at the same time. At some places the silicates inclose the sulphides, at others the sulphides inclose the silicates, and at still others the two are intimately intergrown so that neither set of minerals may be said to inclose the other. The oxides, magnetite and specular hematite, are not abundant, but both have been recognized, and where they are developed they are intergrown with the sulphides and with the lime silicates. Where the purer limestones are recrystallized into marble the bedding is not apparent, but in the aluminous phases it is clearly shown.

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[*] Abstract from 'Contributions to Economic Geology, 1910,' U. S. Geol. Surv. Bull. 470-C.

Veinlets of pyrrhotite and chalcopyrite cut the hornblende and zoisite in some of the ore and fill cracks along the cleavage of the silicates. At many places the sandy schists near the ore zone are heavily impregnated with iron and copper sulphides, but this material is generally not workable. Along fault zones, where drag of ore and schist have been replaced and impregnated, workable ore is locally developed.

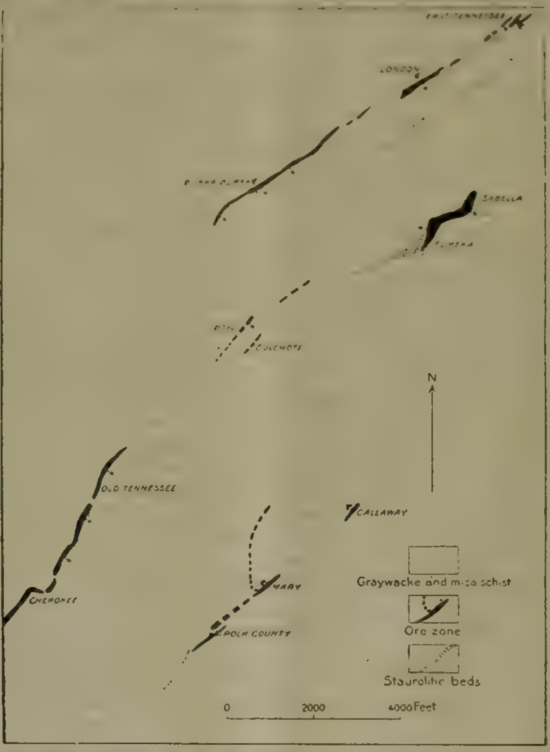
The Ducktown lodes are composed of three kinds of ore. The outcrops consist of hydrous iron oxides with smaller proportions of other minerals, chiefly kaolin and quartz. This ore extends from the surface downward to a maximum depth of about 100 ft. Below the iron ore there is generally a few feet of chalcocite ore, which in most of the deposits lies like a floor below the gossan iron ore. Below the chalcocite zone is the yellow sulphide ore which has already been described. This ore extends downward as far as exploration has gone, and is assumed to be the primary ore from which the chalocite zone and the gossan have been derived. In all the deposits now mined the chalcocite was almost completely exhausted years ago and a large portion of the gossan ores has been shipped to iron furnaces. The opportunities for studying these ores are now meagre. The workings in black ore are accessible in some of the mines, but even where the ores have not been removed, extensive changes have doubtless taken place as a result of leaching after the ground-water level was depressed by mining and pumping in levels below.

The deposits of gossan ore vary in width from a few feet, as shown in the narrow openings along the Cherokee lode, to 250 ft. in the Isabella and Eureka pits. Few of them extend downward from the surface more than 100 ft. The greatest depths are below the hilltops, and where the lodes are crossed by running streams the gossan ores are thin or lacking. The iron ore is porous and earthy. It carries from 40 to 50% of iron, and on account of its low content of phosphorus it is especially desirable for mixing with lower-grade high-phosphorus ores to bring the mixture within the bessemer limit. Silica and alumina together are generally less than 12%, although in some of the ores they are as high as 17%. Copper varies from 0.3 to 0.7 per cent.

Hydrous iron oxides are the most abundant minerals. Silica is present in varying amounts. Some of it is quartz residual from the primary ore, but a red silicious mineral resembling jasper was noted in several of the deposits. Some of this is an intimate mixture of hydrous silica and iron oxide which has formed presumably by the solution and precipitation of silica during weathering of the deposits. A small amount of kaolin is generally present. It is developed by reactions of sulphate water on the aluminous minerals of the ore and wall rock. Cuprite has been noted in the oxidized ores and it is probably the principal copper mineral. Native copper has been reported. A small amount of sulphur, less than 1%, is present. It occurs as native sulphur, in pyrite, and in sulphates.

Below the gossan iron ores is a zone of dark, rich copper ores, consisting of chalcocite and other copper minerals in a gangue of sulphates, quartz, and decomposed silicates. Under the higher portions of the outcrops of the lodes the top of this zone is about 100 ft. below the surface, but the depth decreases down the slopes, and where the lodes are crossed by running streams the secondary copper ores are exposed at the surface. The upper limit of the chalcocite zone follows the level of ground water, which, in turn, follows the contour of the country, but is less accentuated. Occurring below the chalcocite zone is the lower grade primary ore. The rich secondary copper ore is a mixture of the primary minerals and minerals that have been deposited by sulphate waters since the deposits were exposed to weathering.

Weathering and related processes operating on an ore composed of iron and copper sulphides generally result in the enrichment of a certain zone. As a rule, the top of this zone is near the water level, and it extends downward for varying distances below the water level. The waters are sulphate solutions, as shown by analyses, and in the zone above the water level, where air is admitted, acid or ferric sulphates predominate. In such solutions copper is readily dissolved. Below the water table the acid reacts with sulphides that precipitate copper sulphide from sulphate solutions. From the sulphides hydrogen sulphide is formed. The sulphuric acid is used up also by reactions with gangue minerals, some of which result in the production of calcium sulphate, alkali sulphates, and other inert salts. The solutions below the water-level are consequently less acid and probably do not dissolve copper. It is noteworthy that the solution taken 37 ft. below the water-level in the Callaway mine contains less than half the free acid in the analyses of the sample taken at the water-level. The secondary zone in the Ducktown district is less extensive vertically than most chalcocite zones elsewhere. The lodes are comparatively impervious to downward circulation, and it is believed that the reactions were brought near to completion before the descending oxidized solutions had moved downward great distances. It is thought also that the reactions precipitating copper sulphide take place more rapidly with pyrrhotite than with pyrite or chalcopyrite. Experiments planned to show the rate of solution of different minerals in acid-sulphate waters and the rate at which hydrogen sulphide is liberated by these minerals in dilute acid solutions are being made by R. C. Wells, of the Geological Survey. It is hoped that quantitative data may soon be available for the discussion of these reactions.



OUTLINE SKETCH SHOWING POSITION OF PRINCIPAL ORE DEPOSITS IN THE PRODUCING PORTION OF THE DUCKTOWN DISTRICT. THE ARROWS INDICATE THE DIP OF THE LODE.

Estimation of Calcium Oxide in Lime Used in Cyanidation

By LUTHER W. BAHNEY

[*]Lime is the alkali that is almost universally added to the solutions in the cyanide process of gold and silver extraction for maintaining the so-called protective alkalinity. It is produced by the burning of limestone. The value of lime for this purpose depends upon the percentage of calcium oxide contained, which is determined by three factors: (1) purity of the limestone used; (2) degree of the burning temperature and the period of burning; and (3) length of time of storage of burned material and the condition stored, and whether it has been damp or wet during the storage. These three factors render uncertain the quality of lime bought in the open market. In the United States, lime bought from reliable manufacturers, who thoroughly burn a pure limestone and deliver at once to the consumer from the kilns, may be of a fairly high and uniform composition; but in Mexico and Central America, where it is purchased from many small producers, who often start with a poor grade of limestone and burn it in small crude kilns with as little fuel as possible, the quality of the product is quite variable. It is therefore apparent that there is a great need for a rapid technical method for the valuation of the lime to be used in a cyanide plant.

The determination of calcium by the gravimetric method, with the necessity of determining also the proportion of CO_2, SiO_2, and Fe, requires too much time, and is usually out of the question for an isolated plant unprovided with a skilled chemist and the necessary apparatus. The calculation of all the Ca so found to CaO, although sometimes done, is manifestly inaccurate. Several methods of titration by means of a standard acid have been described, and no doubt give results sufficiently accurate for a technical method, but the objections to these methods are that they involve the preparation of a standard solution of some acid, usually decinormal hydrochloric acid, which cannot be weighed out, but must be standardized with some other standard solution. Solutions of the following acids have been used by different operators for standardization: sulphuric, nitric, hydrochloric, and oxalic. Oxalic acid is perhaps the most favorable for this purpose, because a standard solution can be prepared by weighing the solid acid and dissolving in water. The use of the solution employed to determine the alkalinity of the cyanide solutions has also been suggested. While the method of standardization with oxalic acid is open to the objection that the hydration of the acid may vary somewhat, yet it yields a solution sufficiently accurate for technical work, but so far as I am aware its use has not been suggested.

For the purpose of determining the feasibility of using oxalic acid, a solution of oxalic acid was made by dissolving 14.6068 gm. in enough distilled water to make a litre, this strength being recently suggested for determining the protective alkalinity of cyanide solutions. A decinormal solution of pure hydrochloric acid with distilled water was also made, and both were standardized with a solution of chemically-pure sodium carbonate. Pure CaO was prepared by grinding pure white crystals of calcite in an agate mortar and igniting the fine material in a platinum crucible over a strong blast until constant weight was attained. This oxide, cooled in a desiccator, was ground in an agate mortar to pass 200-mesh, and the percentage of CaO determined gravimetrically; the result was 99.98, as compared with the theoretical 100%. The CaO so prepared was used as a standard throughout the succeeding tests. Similar weighed portions were titrated with decinormal hydrochloric acid and oxalic acid, using phenolphthalein as an indicator, requiring 44.2 c.c. of hydrochloric acid or 44.6 c.c. oxalic acid to complete the reaction.

The weight of lime to be taken was calculated so that each cubic centimetre of oxalic acid solution would represent 1% of CaO, as given in the formula:

Lime. Lime. Oxalic. Oxalic.
56.09 : x : : 126.048 : 1.46068, in which $x = 650$.

This weight, 650 mg., was used in all the tests, and the table shows the results, which are sufficiently satisfactory for a technical method. The titrations were made in the cold by introducing 650 mg. of the sample into a 300-c.c. Erlenmeyer flask containing 50 c.c. of distilled water, using phenolphthalein as an indicator.

RESULTS OF TITRATION TESTS FOR CALCIUM OXIDE, USING OXALIC ACID

Calcium carbonate present. %	Calcium oxide present. %	Calcium oxide determined. %
95	5	5.2
90	10	10.3
85	15	15.3
80	15	20.3
75	25	25.0
70	30	30.2
65	35	35.0
60	40	40.0
55	45	45.0
50	50	49.8
45	55	54.5
40	60	59.9
35	65	64.8
30	70	69.6
25	75	74.5
20	80	80.2
15	85	84.8
10	90	90.0
5	95	94.7
0	100	100.0

The results given in the table indicate that calcium oxide in the presence of calcium carbonate can be determined by this method with a fair degree of accuracy. Silica, present in most limes, does not interfere. Magnesia, also present in most limes in greater or lesser amount, is slightly soluble in water, and shows a faint reaction with the indicator; but it is of no value as an alkali in cyanide work and should not be shown in a determination of the available alkali in lime to be used for that purpose. Fortunately, the point where the alkalinity due to calcium oxide stops is readily recognized after a little practice, for the color is a vivid pink, while that of magnesium oxide is faint. Moreover, the color in the titration of magnesium oxide disappears with the addition of only 0.1 or 0.2 c.c. of oxalic acid solution, and returns very slowly and feebly, while that of lime is rapid and sharp. This is illustrated by the fact that a titration of pure calcium oxide requires only 5 min., while the same amount of magnesium oxide requires 3.5 hours. In order to test the oxalic-acid titration in the presence of magnesia, two samples of limestones containing magnesia were ground to 200-mesh, ignited in a platinum crucible to constant weight, and titrated. The results obtained indicate that the magnesia does not interfere. Its presence can be judged by the behavior of the titration, and the approximate amount can be quite accurately estimated by continuing the titration, if one has the time needed.

Iron oxide in considerable amount is sometimes present in impure limes, and it obscures or masks the color of the indicator, but if the precipitate be allowed to subside the titration may be carried out to within 1% of the correct result. The determination of the amount of carbonate present in an imperfectly burned lime may be carried on as follows: Grind the sample to pass 200-mesh, weigh out 650 mg. and make the titration in the usual manner; call this result, available CaO. Ignite 650 mg. of the finely ground sample in a muffle or over a blast-lamp, and make a second determination. Subtract the second result from the first, divide by 1.78, and the result will be the amount of carbonate present.

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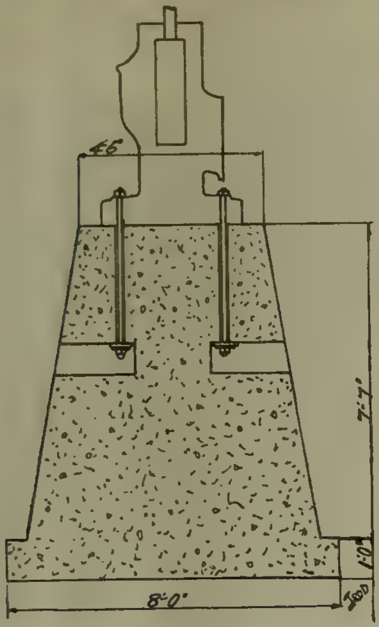
[*] Abstract of a paper presented at the San Francisco Meeting of the American Institute of Mining Engineers.

Battery Foundations

By F. E. Perkins

*The accompanying illustration shows a concrete foundation in connection with a 20-stamp mill in a Mexican mill. In some cases the stamp mortar, instead of being mounted directly upon the concrete block is mounted upon a casting which is called the sub-base. This has the advantage of spreading the mortar and the impact of the stamp over a larger area than is found possible with the standard base cast integral with the stamp mortar.

The accompanying illustration shows the concrete mortar block in connection with stamp mortar mounted directly upon the concrete. It will be noted that the base of mortar is made very heavy and thick; also wider than the base of stamp mortar when used in connection with a wood mortar block. The width of the base of the standard mortar when used in connection with a wood mortar block is usually 2 ft. 4 in., whereas, in the case of the stamp mortar in which the mortar is mounted directly on the concrete mortar block, the width of the base is 3 ft. 4 in. The advantage of the sub-base is in increasing the bearing area on the concrete to a width of 4 ft., and in addition, the added weight of the sub-base makes a heavy mortar with which it becomes possible to greatly increase the crushing capacity due to the greater weight of the anvil. It is customary to place packing rubber about ¼ in. thick between the cast iron base of the mortar and the upper surface of the concrete mortar block, not for the purpose of making a cushion, but rather to correct the irregularities of the surface of the concrete mortar block. The bottom of the mortar, as well as the bottom surface of the sub-base, are both machine-finished, and the top of the concrete mortar block should be made as smooth as possible.



SKETCH SHOWING DETAIL OF HEAVY FOUNDATION.

The proportions of material used in the construction of these concrete mortar blocks is as follows: 1 part by volume portland cement; 3 parts by volume freshly screened sharp sand; 5 parts by volume freshly broken rock, of any suitable character for concrete work, material to pass 3-in. diam. ring. This proportion is continued to a point within 2 ft. of the upper surface of the concrete mortar block, when it will be well to change the proportions of the material as follows: 1 part by volume portland cement; 2 parts by volume freshly screened sharp sand; 4 parts by volume freshly broken rock, passing 1½ in. diam ring. The upper layer of 6 in. from the top surface of the concrete mortar block should be constructed with the following proportions of materials: 1 part by volume portland cement; 1 part by volume freshly screened sharp sand.

The upper surface should be level and finished as smoothly as possible to give a true surface so that the stamp mortar or sub-base may be mounted directly upon this surface, requiring only the ¼-in. rubber packing to make a perfect joint. Grouting should not be used in placing the mortars in position, for such a thin layer of cement would be gradually broken from the impact of the stamps. The foundation rods are shown in the drawing with pockets for removal of the nuts on the lower ends of the rods in case of breakage.

In some cases separate mortar blocks are used for each 10-stamp battery, or in some of the mills a solid concrete block has been built under the entire 100 stamps, or ten batteries of ten stamps each, without any expansion joints whatever, and after several years service the concrete block appears to be in perfect condition.

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*Abstract from *Cement Age.*

Electrolytic Oxygen in Cyanide Solutions

By T. H. Aldrich, Jr.

*There are two conditions generally prevailing upon the earth—those within atmospheric influence, tending toward oxidation, and those away from atmospheric influence, tending toward reduction. Practically all mineral substances from mines of any depth are in a reducing condition. Since the cyanide process, in order to dissolve silver or gold, requires that the prevailing conditions under which it operates shall be oxidizing, and the material usually acted upon being of a reducing character, it becomes necessary to supply oxygen to the solution carrying the cyanide. This oxygen is usually supplied through the medium of dissolved air in the solution, or by the use of one of various chemical compounds, which upon combining with the solution or the ore give off a part of their oxygen. In a dissolving race between the oxygen of the air and the reducing agents from the ore, if the reducing agents predominate, cyanide will not dissolve the gold from the ore. In many cases it will dissolve some of the gold, because in a mass of irregular shape some of the gold particles might be exposed upon the outside surface of a particle of rock; but if the solution had to penetrate through cracks, the side-walls of which were lined with reducing-agent-producing material, before the solution carrying oxygen could reach the gold it would have lost its oxidizing power. For this reason in many cases cyanide solutions will produce only an incomplete extraction of the gold or silver present.

It occurred to me that since water is composed of hydrogen and oxygen, if it be decomposed by the electric current, the hydrogen would bubble away and the oxygen would be carried by the solution. This was tried in December 1908 upon an ore carrying amorphous iron sulphides from which all the gold could not be dissolved by cyanide with simple air-agitation, no matter what the cyanide strength or how great the time. The process was tried first in an inverted bottle with the bottom cut out, the air being forced in through a glass tube in the cork to agitate the pulp. Two lead plates were inserted in the agitated pulp at the top. These plates were about 4 in. long and 0.5 in. wide, and $^1/_{16}$ in. thick. Through them was passed the current of an incandescent lamp, which gave about 0.25 ampere of current. The results were excellent. The value of the ore was $4 per ton. It was ground in a tube-mill so that 60% passed a 200-mesh screen. The value of the tailing, after 48 hr. agitation with air alone, was $1.25; but after agitation for 2.5 hr. with air and electrodes as described, the tailing was reduced to 40c. This typical result was verified many times, with uniformly good results.

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*Abstract of a paper presented at the San Francisco Meeting of the American Institute of Mining Engineers.

In testing the solutions, a 2-lb. solution of cyanide is test 10. The alkali is tested on the basis of ten points over and above the alkali due to the cyanide, test 10 being a 2-lb. solution of caustic soda. The reducing agents were tested with a 1% solution of potassium permanganate, 1 c.c. of which in 10 c.c. of the solution, after acidulating, equals test 10, it being much easier to keep track of these solutions by simple numbers than by keeping the records in pounds per ton.

Numerous tests were made in order to determine a proper electrode. Lead was found to be the best material. Many other substances, such as carbon, worked very well, but with the alternating current, there being no consumption of the lead electrode, lead proved most satisfactory.

The following tests upon the working solution show the effect with iron and lead electrodes. All the tests were made at the same time and with the same solution, using a direct current of 0.25 ampere.

Lead electrode:	KCN.	Alkalinity.	Dbl.	Reduction.
Before	8	+1	5	6
After 4 min.	12	+2	0	4
After 10 min.	12	+3	0	3
Iron electrode:				
Before	8	+1	5	6
After 6 min.	7½	+6½	0	3
After 12 min.	6	+7½	0	2

(Showing destruction of the cyanide.)

There seems to be a regeneration of cyanide, and the process is certainly cheaper than any added oxidizer or even air-agitation of the solution. I found by numerous experiments that an alternating current was as effective as a direct, and had the additional advantage of giving no deposit on the electrodes at lower current-density, and with lead there was no consumption of the electrodes even where the ore-pulp flowed over the electrodes.

As finally used in practice in January 1909, a battery, supplied with alternating current, was placed in the barren sump. This battery consisted of 18 plates in series, each plate 6 by 6 in., with 110 volts between the two. The plates consumed 15 amperes, and produced sufficient oxidizing effect, or whatever other effect it may be, to keep the solution in condition to treat daily 40 tons of this ore. These plates, made of ⅛-in. sheet lead, were built so as to form hollow rectangles in section, the rectangle being 6 in. high, 6 in. long, and 1.25 in. wide inside. The two ends were lapped at the top and holes punched. The plate was bolted to a paraffined plank 1 by 6 in. on the top side; 18 of these plates were connected in series. The distance between any two plates was ⅛ in., and, of course, the current would travel principally across the ⅛-in. gap, instead of around the 1⅜-in. gap, from plate to plate. Lead wires were used from the surface of the solution down to the plates. The ore was ground in the tube-mills so that 60% would pass a 200-mesh sieve. Previous to using the batteries in the sump, the extraction in the tube-mill was 20% during grinding; after the batteries were used, the extraction in the tube-mill was 75%. The effect of the batteries seemed to build up in the solution gradually and to lose from the solution gradually when the operation of the batteries was discontinued.

During two months in the fall of 1910 the mill was working coarsely-ground, partly-oxidized ore carrying considerable sulphides. The water at the hydro-electric plant was low, and the use of the batteries was discontinued because the mill was driven by steam, and no arrangement had been made to supply alternating current from any but the hydro-electric plant. During this time the tailing on $4 ore went up to $1.25 per ton, and immediately after the rains gave sufficient water to drive the hydro-electric plant, the tailing assays diminished until 20c. per ton was reached on identically the same ore with the same head-assay; moreover, the reducing agents dropped from 16 to 4. The time occupied in getting the working solution up to this condition was two weeks. I consider that this process owes its value almost entirely to the presence of oxygen due to electrolysis, putting the solution ahead in the race for the reducing agents and causing the gold and silver to dissolve in spite of the reducing agents. However, it does not stop the reducing agents from dissolving also, and although it produces solution of the gold in spite of the reducing agents, it does not help precipitation, and if the reducing agents are not decomposed by the batteries—and all of them are not—they build up in the solution rapidly to a point where zinc-shavings will not precipitate the gold.

Of course, in practice the cyanide solution contains reducing agents of many kinds. The electrolytic action seems to reduce the influence of some, but not all of them. For example, I experimented on some highly-graphitic ore, and whether the normally-poor extraction was due entirely to the graphite or not, I do not know; but the solution, after electrolyzing, gave a very much better extraction than before electrolyzing. The action seems to decompose the sulphocyanides and the soluble sulphides, but not the alkaline sulphides and all of the many others always present. A test on the electrolyzed solution 18 months after the batteries were installed showed:

	KCN.	Alkalinity.	Dbl.	Reduction.
Before	8	1	0	15
After 10 min. electrolysis	8	1	0	15

showing that the solution remained practically the same, or was electrolyzed as much as was necessary. However, testing some of this same solution further by placing a piece of gold leaf upon its surface and allowing it to float, the gold leaf was dissolved in 71 min. on the working solution and in 50 min. on the re-electrolyzed solution, showing that the additional electrolysis, although it had no apparent effect on the solution, gave an increased dissolving rate. Grease in the ore or on the surface of the barren sump seemed to dissolve very rapidly in the treated solution and slowly in the untreated solution. The tanks were tarred on the inside and coated with black oil outside, and more or less grease was frequently floating upon the surface of the solution where this effect was noticed.

Since the installation of this process it has treated successfully at this plant 25,000 tons of ore of all kinds, oxidized, partly oxidized, and sulphides. Previous to the use of the batteries, in treating sulphide ores, the average cyanide consumption was 1 lb. per ton, in some months running as high as 1.1 lb. After the use of the batteries the average was 0.45 lb., running for some months as low as 0.23 lb. per ton of ore treated. I tried using batteries in the agitated pulp and in the solution, and found the result to be just as good if the plates were inserted in the barren sump as if inserted in the agitated pulp. The original lead plates placed in the barren sump are still there and in operation. They cost about $4 to insert originally, and were inspected after 26 months of practically continuous service, and are today just as good as when they were first put in use. I have applied for no patents on this process and do not expect to, and anyone is free to use it. It should be a cyanide-saver, an accelerator, and a general solution-purifier.

Mine Output in Texas, 1910

The value of the mine production of gold, silver, copper, and lead in Texas in 1910, according to C. W. Henderson, of the U. S. Geological Survey, was $209,061, against $199,446 in 1909. The quantity of ore treated was 21,917 tons, against 21,762 tons in 1909. The production of gold was $423, againt $314 in 1909; that of silver was 380,322 oz. valued at $205,374, against 374,444 oz. valued at $194,711; that of copper was 3157 lb. valued at $401, against 3862 lb. valued at $502; and that of lead was 65,068 lb. valued at $2863, against 91,140 lb. valued at $3919. The metal production of Texas is therefore mainly in silver and lead, and much the greater part of this is from the well known Presidio silver-lead mine, in the Shafter district of Presidio county. The output of gold, silver, copper, and lead in Texas is all from trans-Pecos or far western Texas.

The Ashio Copper Mine

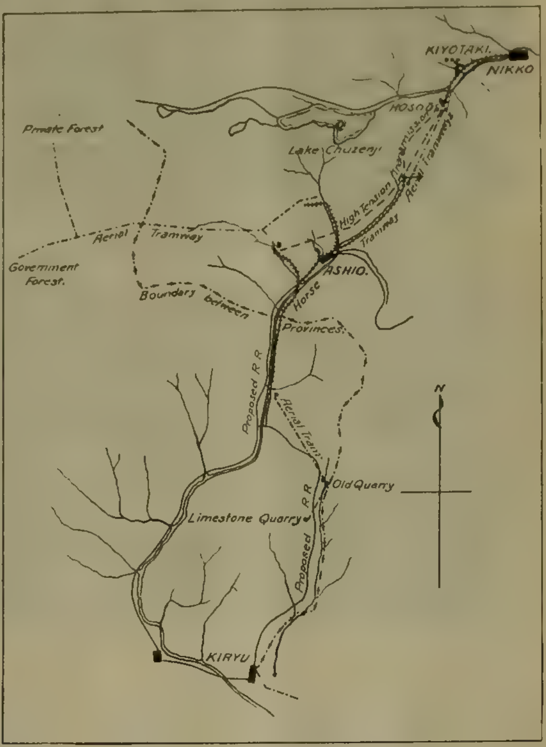
By Thomas T. Read

The Ashio mine, one of the principal objective points of the Japanese excursion of the American Institute of Mining Engineers, is of great interest, because it is the most productive copper mine in Japan, though closely pressed for the leading position by the Besshi mine and the Kosaka mine. The outputs of the three for 1910 are given as 11,843,406, 11,132,371, and 10,500,501 *kin*,[*] respectively. It is the largest of some fifteen copper mines owned by the Furukawa company, the Osarizawa, the Furokura, and the Kune being the most important of the others. The company also owns three silver mines and seven coal mines, and occupies the dominant position in copper mining in Japan, which is the third most important copper producing country of the world. The mine, which is therefore of great relative importance, has further interest in the fact that it is practically privately owned. It was discovered in 1608, but its active development dates from 1877 when Mr. Ichibei Furukawa acquired it and worked it so successfully that he gradually acquired nearly all the more important copper and silver mines in the northeastern part of the main island (Hondo). These later passed into the possession of his son, Jun-Kiche Furukawa. It was my privilege to form the acquaintance of Mr. Toranusuke Furukawa, the present head of the company, some years since, and the following description is based upon a brief visit to the property during the summer of 1910, though I have supplemented my notes by the data given in 'Mining in Japan, Past and Present,' published by the Bureau of Mines of Japan. To those interested in the history of mining in Japan and the primitive methods employed in early times, this volume will prove a veritable mine of interest and information.

MAP OF NIKKO DISTRICT, JAPAN.

The Ashio copper mine is 100 miles north-northwest of Tokio near the headwaters of the Watarose river, in the province of Shimotsuke. The place may be more closely defined by saying that it is fifteen to eighteen miles southwest of Nikko, as that little town, nestling in a deep canyon with majestic cryptomeria trees rising almost to the rim, is known the world over for its beautiful temples and tombs of the Tokugawa shoguns. Thousands of Americans yearly come to see these beautiful examples of ancient art and depart without knowing that, but a few miles beyond, the new Japan is typified by large mines, smelters, and a copper refinery operated with the highest degree of technical skill. The relative position of the mine is shown on the small map, supplemented by the larger ones. A short distance north of the mine is Lake Chuzen-ji, a favorite watering place for the members of the foreign embassies in Tokio, and if a visitor could spend but a day at the Nikko temples, another at the refinery at Kiyotaki and the hydro-electric power house at Hosoö, and two days at the mine, returning by Lake Chuzen-ji and the falls of Kegon-no-taki, this alone, in my opinion, would be well worth the journey to Japan.

The mine can also be reached by the way of Kiryu, but the river is not navigable and at present supplies are brought to Nikko upon the railway, transported to Hosoö in tram-cars drawn by bullocks, and sent across the mountain to a surface tramway which takes them the remaining distance to the mine. The mountain is completely encircled by a tramway since Kotaki and Honzan are connected by a tunnel passing through what are now the upper workings of the mine. Visitors are carried to Ashio in a *kago,* seen in the illustration, a comfortable and convenient method of travel to one of Japanese physique, but not adapted to directors of corporations. The order in which the visitor is likely to see the property is refinery, power-house, tramways, smelter, ore-dressing works, and mine, but it will be more logical to take them up in reverse order.



SURFACE MAP, ASHIO MINE.

The mountain which contains the mine is a volcanic plug or neck of liparite, upthrust through Paleozoic sediments, clayslate, sandstone, and quartzite. This is cut by innumerable almost vertical veins belonging to two series, known as the 60° series and the 100° series, their relations being seen in the accompanying sketch. The veins pass out of the liparite into the surrounding sediments, but quickly thin out and disappear, the whole forming as characteristic an example of fissuring during cooling and subsequent vein filling by the waters of dying vulcanism as could be desired. The order of vein filling has been determined as, (a) quartz, (b) chalcopyrite, associated with some pyrite, (c) pyrite, sphalerite, and galena, (d) quartz. The chalcopyrite occurs in crystals and crystalline masses in the gangue and carries silver in small amount, rarely as much as a couple of ounces per ton, as well as traces of gold. Both the galena and sphalerite, which are constantly present in small amount, carry several ounces of silver. Pyrrhotite and arsenopyrite occur in variable small amounts and in the upper portions of the veins a great variety of minerals occur, native copper, cuprite, bornite, melaconite, and other copper minerals, calcite, vivianite, fluorspar, heulandite, and apatite. A striking feature is the great number of the veins and the narrowness of those worked. It naturally follows that working in, and more especially development in closely faulted ground, can easily become very expensive unless carried on with much care and skill in direction of the work and the employing of contract labor, as far as possible. The low costs actually obtained are due both to the skill in direction of the work and the employing of contract labor, as far as possible. The contract miners are paid a variable sum per 10 ft. advance in driving, the amount being fixed by an involved computation, the cost of powder being deducted and the ore paid for at the rate of 5 *sen* per *kwan*, the contract basis being so arranged that the miners will net an average wage of 80 *sen* per day. Trammers receive 50 *sen* per day; the lowest wage is paid to the women and girls, who do only light surface work, receiving 17 *sen* per day. No women are employed underground. The company also has a supply department and sells its workmen rice at a fixed price which is usually below the cost price. This protects the workmen from sudden variations in the cost of food, and the company regards the cost of this service as a form of wages. Three 8-hr. shifts are employed underground, but only two shifts on surface work.

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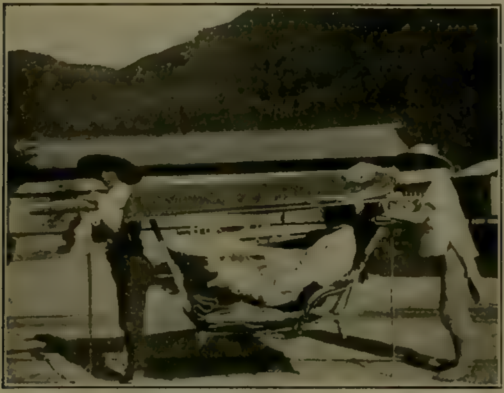
[*] 1 *kin* equals 1⅓ lb.; 1 *kwan* equals 8¼ lb.; 1 *yen* equals 49.8c. gold; 1 *sen* equals 1/100 *yen*; 1 *shako* equals 11.93 in.



TRAVELING IN A *kago*.

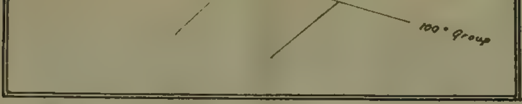


DIAGRAM ILLUSTRATING VEIN STRUCTURE, ASHIO.

Working is carried on through three adits, or more accurately, an adit and a tunnel, as the adits from Honzan and Kotaki connect. The Tsudo adit (see map p. 488) is 450 ft. lower than these; below there are 8 levels, 110 ft. apart. Two winzes connect these with the Tsudo adit-level; one of these has four hoisting compartments, the other being chiefly for pumping and as a man and airway. Workings extend for over 1100 ft. above the Honzan tunnel level, giving a total depth to the mine of about 2500 ft., sinking being still in progress. There are 10 winzes altogether and the total length of the present workings is over 100 miles. The larger part of the work now goes on below the Tsudo level, as the upper workings are gradually becoming exhausted. The total number of veins exposed in the workings is over 300, and on 70 of them some work at least has been done. The veins are very narrow; 5 ft. of ore is considered unusually good, and my impression was that 3 to 5 ft. of vein carrying 9 to 15 in. of ore was the more usual condition. Various types of stoping drills have been experimented with, the final conclusion being that it was cheapest to cut with picks in such narrow stopes, as the cost of labor is low and the vein matter it not hard. In driving the main drifts Leyner drills are used; over 50 of them are employed in the mine and the management reports itself as well pleased with their service, though repairs have been heavy, possibly due to the inexperience of the miners with the drill, as they had not been in use long at the time of my visit.

MOUTH OF ADIT, HONZAN.

The Tsudo adit is double-tracked throughout and equipped with electric haulage, using 15 and 25-ton locomotives, as in the other adits. Wooden cars of one ton capacity are used, as the acid mine-water rapidly destroys iron cars. With so many veins in the moist climate of Japan, it would naturally be expected that the mine would be wet. The water is kept out as much as possible by cementing over the outcrops of the principal veins where they outcrop in gulches on the mountain side. The adits drain the workings above them, some 400 cu. ft. per minute flowing through the Tsudo adit. About 85 cu. ft. per minute of this is pumped from the seventh level below the adit, using Riedel plunger pumps and also an Escher-Wyss turbine pump, both being driven by induction motors, and lifting in three stages. There is also a small Cornish pump to act as a sinking pump in the winze. Altogether some 15 types of pumps have been employed. The main levels are lighted by electricity and equipped with telephones. In order to reduce the cost of piping and line losses, seven electric-driven Leyner air-compressors are distributed throughout the working places.

Ore-dressing plants are near the mouth of each adit, the principal one being at Tsudo, where a branch adit near the mouth connects with a 100-ft. shaft, through which the ore is hoisted to the mill, thus giving the necessary fall. The surface water which percolates through the waste and tailing heap is collected in separate launders in the main adit and run over scrap iron. In this way some 40,000 lb. of copper per month is recovered at a very small cost. Ore-dressing practice is much the same at the three mills, but as the one at Tsudo is the most complete I shall confine my description to that. Some 250 tons per day is handled at this plant, and 350 more at the two mills at Kotaki and Honzan. The mill at Tsudo is a double one, one part for rich ore and the other for the more usual low grade ore. The ore as mined is from 1.5 to 9% copper, averaging about 4%; this is concentrated to about 12% copper. The mine ore is dumped on an 80 mm. grizzly, the oversize being sorted into rich ore, waste, and low-grade ore, which is spalled to pass the grizzly. The undersize goes to bins, whence it is drawn upon a conveyor-belt of Japanese cotton. This does not last long, but is enough cheaper to compensate for the shorter life. This delivers to a belt-conveyor which feeds a set of trommels, 40, 25, 17, 11, 7, 5, and 3 mm., respectively. The 40-mm. stuff is sorted by women into rich ore, poor ore, and waste. The rich ore is sent to the other dressing works, the poor ore is recrushed, first in jaw-crushers and then in rolls. The different sizes of finer material are jigged in 3-sieve jigs, the coarse middling being recrushed. The finest material is classified and treated on Overstrom and Wilfley tables; Cammett tables and Evans slime tables are employed at the other mills. The most notable feature of the milling practice, like the mining, is the low cost at which an involved series of operations, requiring much labor and personal attention, are carried on. The volume previously referred to states that the power used by the three mills is derived from eight motors, yielding a total of 318 hp., and two Pelton water-wheels. As this corresponds to little more than $^6/_{10}$ hp. per ton-day it is remarkable, if true.

It would be interesting to trace the development of the present smelting plant from the *yama-shita* and *mabuki* first employed, especially as the latter presents a curious analogy with the production of blister copper in a converter, but considerations of space forbid. Until recently the fine ore was roasted in McDougall furnaces and many ingenious methods were tried for agglomerating the calcines, the most notable being a device of the superintendent whereby a shell was cast around each bucketful of calcines in an elevator. Blast furnaces have always been used for smelting, and converters for bessemerizing the matte were adopted in 1893, the year after Manhes American patents were issued. Since then all the types of converter except the Stalmann have been tried, and they are now using three 3 ton converters of the Anaconda type and two 5-ton stands of the Bisbee type. Liparite, mixed with clay, is used as a converter lining and as it probably has some such composition as 70 to 75% SiO_2 and 10 to 12% Al_2O_3, it gives a sticky slag. I did not learn whether this was employed because of the lack of pure silicious material, or because the low cost of labor for relining made it advisable to employ what is practically low-grade ore for converter lining. The composition of the matte for the day preceding my visit was:

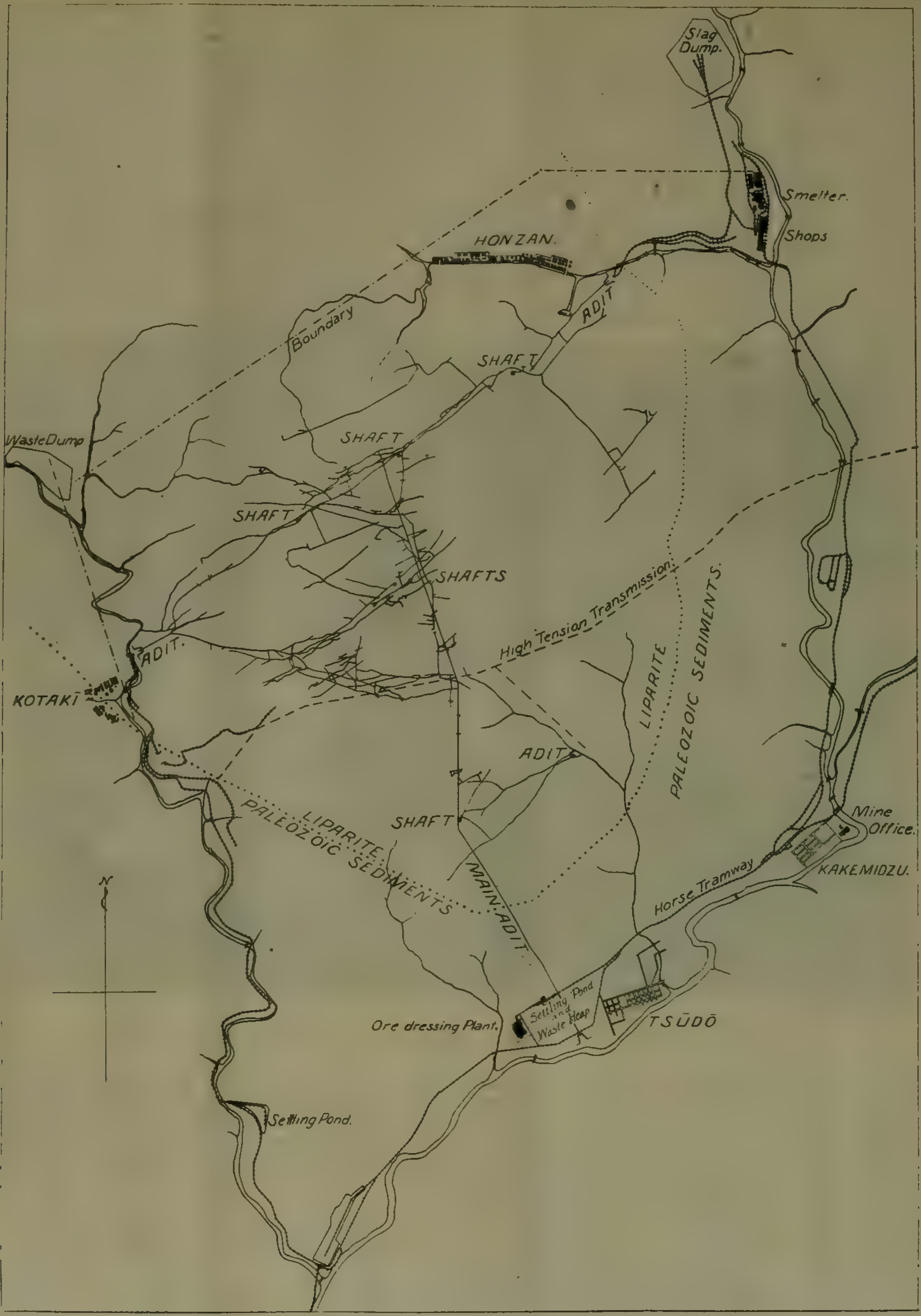
BLAST-FURNACE, ASHIO.
SETTLING-PONDS.

LEYNER DRILLS AT WORK.
ORE-DRESSING PLANT, KOTAKI.

	%
Cu	33.5
S	25.0
Fe	36.6
Pb	1.44
Zn	1.20
As	0.72
Ag	0.03

No effort is made to save the lead and zinc.

The average product to be smelted has approximately this composition: Cu, 12%; Fe, 28%; S, 25%; SiO_2, 32%. The small proportion of lump ore goes directly to the blast-furnace. The fine is pot-roasted, according to a system devised by the resident engineer, in conical pots 8 ft. diam. at the top and 5 ft. at the false bottom, giving a depth of charge of 4½ ft. Nothing is added as a binder, the rate of oxidation being controlled so that the sulphides sinter to just the required degree during the roast. Each pot



GENERAL MAP, ASHIO MINE.

holds 7 tons and burns 12 hr., the combustion being started by the use of a small amount of coal and wood. The blast is furnished by No. 6 Root blowers. The operation of these pots seems to be entirely satisfactory.

Electric elevators lift the charge to the charging-floor. The relative proportions are: ore, 10 parts; limestone, 3 parts; converter slag, 2 parts. Smelting is done in 160 by 42-in. Allis-Chalmers water-jacketed matting-furnaces at the rate of about 2 tons per square foot of hearth per day, only a little over 6% coke being used, and a blast pressure of 22 oz. employed. The slag approximates 40% SiO_2, 30% FeO, 12½% CaO, and 7½% Al_2O_3, and carries 0.21% copper. It is necessary to convey it some distance up the valley where there is space to dump it. I am told that it is now granulated in water as it flows from the forehearth. The blast-furnace gases pass through dust chambers to the main flue, which, as seen in the illustration, contains a series of chambers in which a rain of limewater is kept falling, much in the manner of a scrubber, the resulting sludge being thrown away. In spite of the care taken the escaping gases still do damage, because of the high SO_2 content, the dampness of the climate, and the narrowness of the valleys. Fortunately there is but little nearby agriculture and the damage claims are correspondingly small. The combination of smelter fume and the demand for timber and fuel has resulted in denuding the hills, and the latticework by which erosion is prevented can be seen in the background of the illustration. This, and the necessity for impounding the tailing from the ore dressing, and the neutralizing of the acid waters from the mine before allowing them to escape into the river, are a not inconsiderable addition to the cost of copper production, but a scrupulous performance of these duties is exacted by the Government in order to secure permission to continue working.

SMELTING PLANT, ASHIO.

HEADGATE, HOSOÖ POWER HOUSE.

Over 7000 workmen are employed at the mine, about 3000 being employed underground. The electric power for the mine, mills, and smelter has been obtained from 10 power-stations on the Watarose and Daiya rivers, the turbines having a total of some 5000 hp. The expansion of the work calls for increased power, and the principal station, at Hosoö, has recently been doubled in capacity. The headgate of the penstock for this plant is shown in the illustration. The most improved types of direct-connected generators are employed at this plant, a visit to which is one of the principal features of the trip from Nikko to Ashio. The power is transmitted by high-tension lines to the points desired. As previously mentioned, supplies are brought in from Nikko and the blister copper is sent out by a wire-rope tramway from Hosoö. In addition to this there are several other aerial tramways, one of the most important connecting the mines with the forest reservations from which the supply of timber is derived. The mountain in which the mine is situated is girdled by surface tramway tracks, of which there are many miles. An interesting feature is the numerous types of bridges employed; almost every type of truss is represented, including some original ones. The care with which every detail of the work about the mine and surface plants has been worked out is well worthy of study.

The electrolytic refinery is at Kiyotaki, but a short distance up the Daiya river from Nikko (see map). Here is refined not only the blister copper from Ashio, but from the other mines of the Furukawa company as well. The refinery has its own hydro-electric power-plants with 195 *shako* fall. The ingots from the mines are remelted in a reverberatory furnace, brought to proper pitch, and cast into plates, which are rolled into anode sheets and cut to the proper length. The general features of the plant are seen in the accompanying illustration. Three vats in series, each containing 40 plates, are placed *en cascade*, the electrolyte, after passing out of the lowest vat, is filtered through coke and pumped back to the uppermost tank. The volume previously referred to gives 234 as the total number of vats, but my own notes give double the number. The electrodes are in series, the copper being dissolved from one side and plated on the other. When the operation is finished the electrodes are removed, scrubbed, melted down in a reverberatory furnace, brought to tough pitch, and cast into wire bars, cakes, and ingots. The making of copper wire is an important feature of the work, and is carried on with a high degree of skill. A Bates and Peard annealing furnace is employed. The finished product enjoys a high reputation in Japan, and the Furukawa trademark is widely known. The gold and silver slimes are cupelled in an English cupelling furnace. A great deal of work has been done on the problem of recovering the small amount of lead present in the blister, but I understand that no commercial results have yet been obtained in the experiments.

TANK ROOM, KIYOTAKI REFINERY.

The blister copper has a high tenor, the composition before refining being given as 99.7%. The yearly production of the works is stated at 5000 tons of copper wire, 2000 tons of copper ingots, and 500,000 oz. of refined silver and gold. The latter metals, of course, are chiefly derived from the bullion of other mines owned by the company. In concluding this description a brief reference should be made to the Kune mine in Totomi province, where there are enormous bodies of pyrite associated with chalcopyrite. Unfortunately the mine is distant from transportation facilities, nor will the Government permit the erection of a smelter, so that its development has been hindered.

Metal Production of Colorado in 1910

The total value of the mine output of gold, silver, copper, lead, and zinc in Colorado in 1910, according to Charles W. Henderson, of the U. S. Geological Survey, was $33,673,879, against $33,907,140 in 1909, a decrease in value for 1910 of $233,261.

The production of gold showed a decrease of 71,705.20 oz. and of $1,482,278 in value; the output of silver, a decrease of 393,035 oz. and of $34,186 in value; the production of copper, a decrease of 2,632,511 lb. and of $358,205 in value. The output of lead, however, showed an increase of 3,903,483 lb. and of $243,921 in value; and the production of zinc (figured as spelter), a notable increase of 25,879,388 lb. and of $1,397,487 in value.

Of the gold output, the Cripple Creek district produced $11,002,253 in 1910, or 53.7% of the total gold from all sources in Colorado. This was a decrease of $468,420 from the output for 1909. Most of the Cripple Creek mines were operated with reduced forces, the operators preferring to wait until the mines were fully unwatered rather than maintain a normal output at a heavy cost for pumping. The gold output of Ouray county decreased $848,978 from the heavy output of 1909, which was an increase of $1,016,127 over the yield of 1908. In La Plata county the gold output increased $263,725 in 1910, in San Miguel county there was an increase of $209,742, and in Gunnison county an increase of $125,479. The placer output of gold was $395,465, a decrease of $63,027 from the 1909 production.

In the production of silver in Colorado in 1910, Lake county (Leadville) made 39% of the total State yield. This county showed a decrease in output of 101,627 oz. in 1910, against an increase of over 500,000 oz. in 1909. There was decreased production of silver also in Pitkin, San Miguel, and many other counties. Increased output of silver was credited to Chaffee, La Plata, and Ouray counties in 1910. The chief silver-producing counties in Colorado in 1910 were Lake, San Miguel, San Juan, Mineral, Pitkin, Clear Creek, and Ouray, in the order named; these counties combined furnished nearly 87% of the total State production.

In Colorado lead production in 1910 there were considerable increases in output from San Miguel, San Juan, Summit, Ouray, Chaffee, Eagle, Gunnison, Hinsdale, and Pitkin counties, and decreases in Lake, Clear Creek, Mineral, Boulder, Dolores, and Gilpin counties. Lake county ranked first, and was followed by Pitkin, San Juan, Mineral, and San Miguel in the order named.

Of the Colorado zinc output of 77,089,648 lb., Lake county produced 73%, with an increase in output for the year of 17,730,130 lb. Shipments of the newly discovered zinc carbonates from Leadville were relatively slight in 1910, but the new finds promise larger outputs of both zinc and lead from this famous old district in the future. Increased production of zinc was also made in Eagle, San Juan, San Miguel, Mineral, Clear Creek, and Park counties in 1910. The only material decrease was in Chaffee county. Until 1902 the zinc mining and smelting industries were of slight relative importance in Colorado, but they have been of yearly increasing importance, and in 1910 they surpassed those of lead and of copper.

The amalgamating, cyaniding, and chlorination mills of Colorado produced less bullion in 1910 than in 1909, although a larger tonnage was treated; and despite a considerable increase in tonnage of concentrate from concentrating mills, less silver and copper were produced from concentrates, and there was only a slight increase in gold production, although there was a material increase in the output of lead and zinc. There was a decreased tonnage of ores smelted in Colorado in 1910 and decreased output of metal from smelting ores. The mills treated 79% of the Colorado ores and the remainder was smelted crude in 1910.

MINE PRODUCTION OF GOLD, SILVER, COPPER, LEAD, AND ZINC IN COLORADO IN 1910, BY COUNTIES

Counties	Ore treated. Tons.	Gold.*	Silver.* Fine ounces.	Copper. Pounds.	Lead. Pounds.	Zinc. Pounds.	Total Value.
Boulder	14,083	$ 139,911	46,517	16,772	53,250	....	$ 169,503
Chaffee	12,496	77,152	182,003	226,772	970,523	438,539	270,618
Clear Creek	109,954	522,524	475,174	595,795	2,434,476	1,247,389	1,029,260
Costilla	....	2,318	9	....	....	....	2,323
Custer	7,052	9,839	7,767	3,882	14,796	6,796	15,544
Delta	2	110	139	....	....	....	185
Dolores	2,933	15,327	88,309	97,063	127,909	87,003	85,667
Douglas	....	83	....	....	....	....	83
Eagle	27,761	25,231	88,313	209,551	397,409	4,147,945	341,008
Fremont	29	....	....	....	....	18,072	976
Garfield	92	3,603	113	425	....	....	3,718
Gilpin	83,631	687,902	132,635	534,244	575,477	....	852,695
Grand	1	....	....	56	....	....	7
Gunnison	25,203	233,972	49,189	21,024	581,841	176,815	298,353
Hinsdale	3,468	6,320	54,422	465,472	296,182	....	107,855
Lake	462,033	1,213,134	3,322,015	3,645,157	19,249,503	56,367,445	7,360,777
La Plata	6,350	390,844	141,537	142	273	....	467,304
Mineral	62,956	121,181	773,722	29,031	8,246,000	2,421,926	1,036,286
Montezuma	448	8,764	215	220	....	....	8,908
Ouray	111,245	2,195,847	414,250	620,236	4,004,728	....	2,674,520
Park	12,329	265,547	117,037	88,748	2,041,204	659,796	465,460
Pitkin	89,037	646	477,813	24,843	13,408,250	....	851,783
Rio Grande	12	1,306	61	87	250	....	1,361
Routt	....	6,689	48	....	....	....	6,715
Saguache	296	1,025	4,841	5,362	161,068	....	11,407
San Juan	206,272	710,527	782,250	1,208,496	10,688,386	3,781,259	1,960,898
San Miguel	481,000	2,494,793	1,144,050	544,189	7,791,841	2,193,981	3,643,008
Summit	47,040	368,766	152,250	21,740	5,015,409	5,542,685	973,725
Teller	668,941	11,002,253	54,263	....	....	....	11,031,555
Unapportioned	....	1,444	656	228	12,498	....	2,377
Total	2,434,664	$20,507,058	8,509,598	8,359,535	76,071,273	77,089,648	$33,673,879

*Includes placer production.

Goldfields of Coker Creek, Tennessee

By George H. Ashley

*The following account is the result of two days spent in the Coker Creek goldfield during a rapid reconnaissance of Monroe county, the latter part of July. Coker creek flows in a broad, open valley, two miles wide by ten miles long, just at the western foot of the Unaka mountains, which there separate Tennessee from North Carolina. The upper half is in Monroe county and the lower half in Polk county, the two southeast counties of Tennessee. The presence of gold on Coker creek appears to have been known to the Cherokee Indians, living in that region, in the early part of the last century. From them the white people learned of its occurrence, and as early as 1827, it is stated, Jacob F. Peck and Le Grande Henderson entered the field and did some mining. The first gold reported deposited in the mint from Tennessee was in 1831, when $1000 was sent to Philadelphia. The output of gold from Tennessee from 1831 to 1853 is reported to have amounted to $46,023 by J. M. Safford.[1] He states that the largest piece of native gold found of which he had heard, weighed 12 dwt. In contrast with these figures I was informed that the most active work in this field did not begin until 1856 and continued to 1860. Possibly the most profitable clean-up was that by Thomas Cooper, who, as a result of three weeks' work, took out gold to the value of $39,600. In one case $300 was obtained by re-working an old abandoned pit. All told, Mr. Cooper is said to have taken from a tract of hardly more than one-half acre, $80,000. This included many nuggets, two of which weighed 1¼ lb., valued at $360 each. In 1905, according to 'Mineral Resources,' the Lonsdale Gold Mining Co. was prospecting a gravel deposit 6 ft. thick and 120 ft. wide; the Unaka Mining & Development Co. was building a dredge; and the Coker Creek Mining Co. was doing some prospecting. The Lonsdale company appears to have operated in Lot 4, Section 30. It is reported to have driven into a hill on that lot and to have found enough gold to warrant putting up a 10-stamp mill. The Unaka Mining & Development Co. owns some 360 acres in sections 19 and 20. After doing a small amount of hydraulicking, the company decided it would be better to work out the bottom lands before covering them with the tailing from the sluices. Several experiments were tried which failed and involved the company so heavily in debt that the leaders lost interest. The Coker Creek Mining Co. appears to have done no development work, but is still holding some 120 acres for future exploitation. Besides these companies, none of which are doing any development work today, placer mining by hydraulicking has been carried on, on a small scale, in several places.

In addition to these more or less metamorphosed sandstones and shales, numerous veins of quartz occur, and it is in association with the quartz veins that the gold is found. Though time did not permit a detailed study, enough was seen to convince me that these are true fissure veins. In parts of the field the quartz veins appear to be lacking. In others they are abundant, ranging from a fraction of an inch up to a foot or 18 inches. In one area 10 vertical veins were counted in a width of 10 ft., measured normal to the strike. The quartz veins appear to run in narrow belts, separated by wide areas without veins. The most notable of these belts is known as the Whippoorwill vein; and has been traced for at least five miles, and, judging by other known occurrences, may be traceable for several times that distance. In places this belt consists of one or two distinct quartz veins 3 to 18 in. thick (when 20 to 40 ft. apart), but at other places it is composed of a group of veins, averaging, perhaps, 2 to 3 in. thick. The individual veins are variable in thickness, though often even the very thin veins are traceable long distances on the surface, and the belt as a whole is readily traceable by the line of quartz fragments which strew the surface. In general, the body of the quartz is clear and milky, what the miner commonly calls 'hungry' or barren, but scattered through this are cavities of varying size, often cubical, showing that they formerly contained pyrite, though now containing only a brown or yellow coating of iron oxide. But the contact faces of the veins often appear to be almost entirely covered with a pitted surface of rusty color. From the appearance of the veins at the surface, it would seem evident that the gold will be found associated with pyrite as soon as mining reaches below the effect of surface waters.

Gold also occurs in the country rock. Pannings were made of the shale on either side of the Whippoorwill vein, the samples being taken from just outside of the contact for a distance of 10 ft., and these showed good 'color' and in one case a considerable nugget. A third mode of occurrence is in what Becker calls saprolitic material, that is, the weathered surface rock.

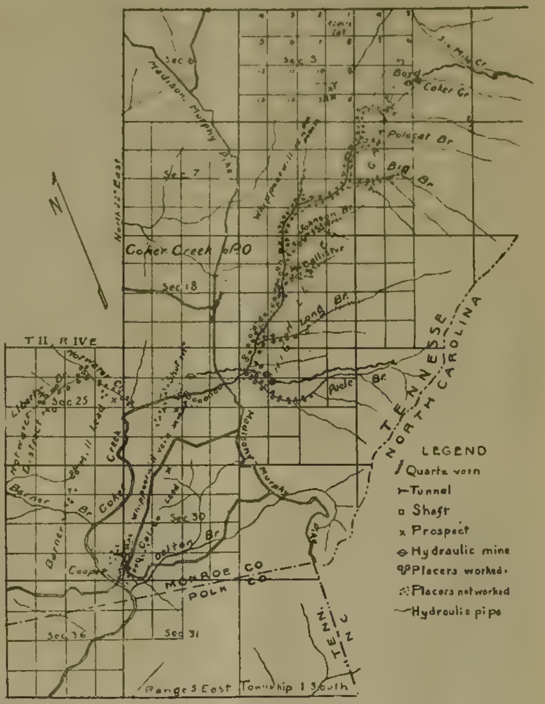


FIG. 1. SKETCH MAP OF PRINCIPAL PART OF COKER CREEK GOLDFIELD

Placer gold is also found in what may be called the high-level gravels. In some cases these correspond to the 'second bottoms'; in others to interstream areas of gentle slope. On the east side of Coker creek the land has an even, gentle slope for some distance to the foot of a sharp ridge of quartzite. The present stream channels are cut from 40 to 70 ft. below the level of this slope, becoming less as Coker creek is approached. A small amount of hydraulicking has been done in these levels, indicating pay-ground. Pannings made from these gravels give abundant 'colors.' The principal source of gold obtained to date is in the gravels of the present stream bottoms. Where the Madisonville-Murphy pike crosses Coker creek the bottoms are about ¼ mile wide, but gradually narrow up-stream. The side tributaries have rather narrow bottoms, ranging from a maximum of 100 to 200 ft. down to a few yards wide, and from a fraction of a mile to a mile long, depending on their size and length. Below the pike mentioned the bottoms on the creek vary according to the rock through which the stream passes. The depth of these stream gravels ranges from 2 to 6

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*Abstract from *The Resources of Tennessee*, September, Pub. by Geol. Surv. Tennessee.

[1] 'Geol. Tennessee,' p. 490.

ft., or more. Very few of the gravels have been worked where the deposit was more than 6 ft. deep. As usual, the gold has been found mainly at the base of the deposit in contact with the underlying bedrock. In the past, the bottom 6 in. alone has been worked. Just below, where Six Mile creek and the head of Coker creek diverge after passing through the quartzite ridge, there is a relatively high slope, into which one or two test-pits have been dug by hydraulicking. These were made by Mr. Boyd, who carried his water from the upper part of Six Mile creek and dug several small pits 10 to 15 ft. deep. These show red dirt with boulders and masses of arkose quartzite, or fine conglomerate, the boulders being up to 2 ft. in diameter. It is reported that he took out of these small holes between $3000 and $4000. Other work on these high gravels has been carried on just north of Big creek, the gravels there being 15 to 20 ft. above the creek bottom, and reported to be 'on the gold streak.' Between Big creek and Johnson creek and 40 or 50 ft. above the creeks, digging has been done to a depth of six or seven feet on this upland slope. Farther southwest, just north of Peele branch, some recent hydraulic work has been done by the company which preceded the Unaka Mining & Development Co. Water was brought from the head of Peele branch through a 6-in. spiral, steel-riveted pipe. The gravel is composed of quartz, coarse conglomerate, and sandstone, in size up to two feet in diameter. It has a thickness of three or four feet. In addition to these areas which have been partly worked, there is a large territory of similar character practically untouched. Polecat creek has been worked for about a quarter of a mile from its mouth. The main valley at the mouth of Polecat creek has a width of about 150 yd. and has already been worked. Big branch has been worked for some distance, as well as Johnson branch. Considerable work has also been done on Long branch. At its mouth the main valley is from two to three hundred yards wide, nearly all of which has been worked. Considerable work has also been done on Peele branch, but in the broad bottom below the mouth of Peele branch on either side of the Murphy pike, practically only the stream channel has been worked, except a channel run by the dredge of the Unaka company. Mining has also been carried on up Hot Water creek bottoms, and Liberty creek.

In conclusion, the examination demonstrated that: (1) the Tennessee gold belt may prove to be an asset of the State, if its development be undertaken by men who know their business, using modern, up-to-date methods and machinery; (2) thorough, systematic prospecting and surveys will be necessary to demonstrate the feasibility of its profitable exploitation at any point, or in any district.

Finally, if anyone feels the lure of gold-mining in the blood, let him get a pan and pick and shovel, and lease the privilege of digging up some 40-acre tract, but don't invest in any mining stock. In the first case the investment is small, the outdoor exercise good for the health, and he may get enough gold to pay railroad fare and expenses. In the second case, the chances are nine out of ten that he will have ample time to reflect on an old adage about 'a fool and his money.' Gold mining in Tennessee, as in the other Appalachian States, has passed the first 'gold rush' stage. If any money is made from it in the future, it must be made as in the neighboring States, by men with abundant capital, thoroughly familiar with the mining business, knowing, or having in their employ, capable, trained mining engineers and metallurgists, and with ample opportunity to give the work their personal supervision and attention.

Metal Production in the Central States, 1910

The value of the mine output of silver, copper, lead, and zinc in the Central States for the calendar year 1910, according to B. S. Butler and J. P. Dunlop, of the United States Geological Survey, was $62,866,732, compared with $63,997,999 in 1909. The decrease in total value was occasioned by the smaller production of copper in Michigan, which yields practically the entire output of that metal in these States. The production of silver, lead, and zinc increased both in quantity and in value.

The output of copper was 11,358,616 lb. less in quantity and $2,144,954 less in value than in 1909. The increase in silver was 64,073 oz., in lead 3005 short tons, and in zinc 3447 short tons. About 90% of the silver, or 330,500 oz., was derived from the electrolytic refining of copper produced from copper ores mined in Michigan; the rest was obtained from lead ore produced in southeastern Missouri, southern Illinois, and Kentucky. Missouri produced over 94% of the lead and nearly 72% of the zinc. Wisconsin produced 2.5% of the lead and 14.5% of the zinc. The total quantity of ore mined in Michigan was 10,869,561 tons, having an average copper content of 1.025%, compared with 11,429,394 tons, averaging 1.06%, in 1909. The crude ore treated and the lead and zinc concentrate recovered in 1910, in short tons, were as follows:

		Concentrate	
	Crude ore.	Lead.	Zinc.
Arkansas	35,000	80	1,857
Illinois (northern)	111,078	126	9,871
Kansas	704,046	3,034	27,240
Missouri	12,742,420	248,058	256,167
Oklahoma	223,212	3,638	14,256
Wisconsin	1,032,052	5,608	94,502

The table below shows the output of silver, copper, lead, and zinc in the Central States in 1910, by States, and the totals for each mineral and each State in 1909 and 1910. Copies of the report, which is now in press, can be had on application to the Director of the Survey, Washington, District of Columbia.

PRODUCTION OF SILVER, COPPER, LEAD, AND ZINC IN THE CENTRAL STATES IN 1910

State.	Silver. Fine ounces.	Copper. Pounds.	Lead. Short tons.	Zinc. Short tons.	Total value.
Arkansas	....	....	63	994	$112,896
Illinois	2,022	....	373	3,549	417,208
Iowa	....	....	20	96	12,128
Kansas	....	....	2,412	13,229	1,640,988
Kentucky	84	....	41	6	4,301
Michigan	330,500	222,683,461	....	....	28,459,270
Missouri	33,096	94,452	161,016	128,589	28,086,887
Oklahoma	....	....	2,888	6,394	944,696
Wisconsin	....	....	4,413	25,927	3,188,460
Total quantity, 1910	365,702	222,777,913	171,226	178,784	....
Value, 1910	$197,479	$28,292,795	$15,067,888	$19,308,672	$62,866,732
Total quantity, 1909	301,629	234,136,529	168,221	175,337	....
Value, 1909	$156,848	$30,437,749	$14,467,006	$18,936,396	$63,997,999

San Francisco Meeting, American Institute of Mining Engineers

The San Francisco meeting of the American Institute of Mining Engineers was opened Tuesday morning, October 10, with an informal reception to the visiting delegates in the Red room of the St. Francis hotel. The morning hours were spent by the members in meeting their friends who were in San Francisco to attend the sessions of the Institute. One of the chief topics of conversation was the delightful reception extended by the Los Angeles members when the delegates' special stopped at the southern California city on the trip to San Francisco. They were met at the station on October 5 by a committee, who escorted them to the headquarters at the Alexandria hotel in trolley cars specially reserved for the delegates. All preliminary details were cared for by a committee which had boarded the train at San Bernardino several hours before. At the Alexandria the ladies' committee held an informal reception for the ladies of the party in the mezzanine parlors. In the evening the Sierra Madre Club members were hosts at a cleverly appointed dinner in their club-rooms at 313 West Third street. The spirit of the occasion was well borne out by the invitation cards, a reproduction of a placard announcing, in straggling letters,

"NOTICE.

"This is the Camp of The Sierra Madre Club. It is Open to all Mining Men & Prospectors. The Flour and Bacon are cached on the Roof and the Water Hole is just back of the Cabin. Let Those who pass on this Trail help themselves."

Below was inscribed a further greeting and welcome to the members of the Institute by the Sierra Madre Club.

The evening, however, was not wholly devoted to merely lighter matters, and a lecture on the Los Angeles aqueduct by William Mulholland, chief engineer in charge of the project, was both interesting and instructive. The lecture was illustrated with many lantern slides showing different features of the work.

On Friday, October 6, the delegates were guests on an extended trip to points of interest near Los Angeles. The oilfields, the Soldiers' Home, the Redondo power house of the Pacific Light & Power Co., and the pleasure resorts at the famous beaches clustering about the city were some of the places visited. The trip was in charge of B. L. Dowell, traveling passenger agent of the Pacific Electric Railway company. The dinner was served in the unique 'fish restaurant' of Hepburn & Terry at Redondo.

The first business session of the San Francisco meeting was called to order Tuesday afternoon, October 10. W. C. Ralston, as chairman of the local committee, in a few well chosen words welcomed the visitors, for whom Robert W. Hunt, vice-president of the Institute, responded happily in a short speech. The first official act of the delegates was the despatch of a telegram to President Kirchhoff expressing their regret at his absense, and their sympathy in his trouble, with their hopes for the prompt recovery of his mother, whose illness prevented Mr. Kirchhoff from attending the meeting.

The first paper read at the meeting, presented by E. B. Durham, was a well-prepared description of the electrolytic refining methods used in the United States Mint at San Francisco. This was followed by a paper by Bernard McDonald, who in his account of the 'Parral Tank System of Agitation,' gave a particularly interesting description of the improvements in practice he had worked out in the Mexican mills recently erected under his direction.

The geology, equipment, and method of working at Newport iron mine, Ironwood, Michigan, was described by B. W. Vallat. At this mine the sub-slicing system of mining is employed and in 307 working days in 1910 a total of 1,074,800 tons was hoisted through one shaft, an average of 3500 tons per day. The highest record was 6652 tons in one day, the average hoisting distance being 2150 ft., the maximum hoisting speed being 2200 ft. per minute, and the production was secured from four different levels. In discussion of this paper Gardner F. Williams called attention to the similarity of the mining system to that adopted at the Kimberley mine in South Africa in 1887, though at the latter no timber is used to form the top mat. The upper slice is caved as at the Newport mine, but the waste follows the ore directly. At Kimberley the hoisting is all done from one level, the material being dropped through winzes as much as 500 ft. to reach that level. There are two 10-ton skips for hoisting, these being run in balance. In separate compartments are cages for handling the 1000 natives employed. On August 4, 8514 tons was hoisted in 12 hours from the 100 ft. level, and August 11, 9098 tons. The highest previous record was 8433. In six days 48,000 tons has been hoisted. Material is brought to the loading station in one-ton cars hauled by an electric locomotive. The cars are dumped by the natives and trains of 32 cars have been handled without stopping the train which moves slowly over the bin.

In his treatise on the 'Electro Deposition of Gold and Silver from Cyanide Solution,' S. B. Christy gave a scholarly review of the work of the last dozen years on this highly technical subject. The paper contained much interesting material, but too complex to be summarized in the space available in this issue.

The technical session on Wednesday morning was opened by an intensely interesting paper on 'California Oil,' by Mark L. Requa, to which the secretary emeritus, Dr. Raymond, added pertinent and interesting discussion in which several other members joined. A representative of the Panama-Pacific Exposition welcomed the members of the Institute to San Francisco and requested their aid in making the forthcoming exposition a success. The papers on dredging by Messrs. Charles Janin and Francis J. Dennis were read by Mr. Dennis in the absence of Mr. Janin, and a brief discussion of dredging problems followed. This was followed by an interesting paper on the gold production of California, by Charles G. Yale, who has been so closely identified with the development of the mineral industry of California, and many of the members joined in the discussion which followed.

The secretary read a telegram announcing that a research scholarship would be established at Columbia University as a memorial to Samuel Franklin Emmons, as noted in the editorial pages of this issue. E. H. Benjamin announced that A. D. Foote, whom it was hoped would be present at the meeting, was undergoing a serious operation, and a resolution expressing the hopes of the members present for his safe and speedy recovery was unanimously carried. The morning session was brought to a close by an informal talk by Thomas T. Read on the mineral industry of China, illustrated by lantern slides, which aroused much interest.

At 2 p.m. Wednesday afternoon the party left the City by special train for a trip down the peninsula and a visit to Stanford University. At Palo Alto they were met by the Stanford members of the Institute and the students in mining, and taken by special cars and autos across the beautiful campus of the University. The shops, laboratories, libraries, and museums were inspected, after which on the roomy porches of the Delta Upsilon house the visitors were served light refreshment and informally met the men of the departments related to mining. The return to the City was uneventful and the party scattered for the evening with grateful memories of a memorable afternoon among the tall trees and in the quadrangles.

In a paper on the 'Fritz Engineering and the Coxe Mining Laboratories of Lehigh University,' Joseph Daniels, associate professor of mining engineering in that institution, on Thursday morning told of the founding and equipment of the two laboratories. He remarked that the new ore-dressing laboratories of Lehigh are in the nature of a new departure, as, on account of its proximity to the Pennsylvania coalfields, the principal interest of the university has been in coal mining. With the new facilities it has been found that in spite of the fact that 90% of the students are drawn from coal-mining districts, only 10% of the students after graduation return to the coal-mining industry, the majority preferring metalliferous mining. R. W. Hunt, who was chairman, spoke at the dedication of the Fritz laboratory, remarked Mr. Daniels. In this laboratory, tests were made of concrete material, for the city of Scranton, and it is proposed to provide facilities for testing road material.

In a technical but intensely interesting paper on 'Slime-Filtration' George J. Young, professor of mining and metallurgy in the Mackay School of Mines, which will be presented in abstract in next week's issue, told of the data he had collected.

Reiji Kanda, a consulting engineer of Tokyo, a member of the American Institute of Mining Engineers, arrived on the *Chiyo Maru* on Thursday and spoke at the session as a representative of the Mine Owners' Association of Japan. He bespoke a warm welcome for the American engineers on their coming trip, in which he will act as escort.

A paper by H. Foster Bain, in which he advocated the leasing system of the Alaska coal-lands, and the opening of one mine by the Government, aroused some of the keenest discussion of the Institute. J. W. Malcolmson asked why it would not be advisable to permit the development of Alaska on the individualistic lines which existed during the development of the West. Mr. Bain pointed out some differences in the two problems and asserted that the men most interested in the coal-lands of Alaska were not residents there throughout the year. Edward W. Parker gave some interesting statistics regarding the consumption of coal in the United States and the production of coal in Alaska.

Dr. R. W. Raymond, who was acting as chairman, strongly disapproved of the course advocated by Mr. Bain. He affirmed that the United States Government is not capable of conducting the fuel business with the same certainty of method as private individuals, and said that the Government has no maps which show the mineral land still the property of the United States. The aim of the Government, he continued, has been to give every man a chance to own 160 acres of coal land, and not to interfere with his disposal of the land. But the Government lately has undertaken to add commandments to the decalogue, and to create crimes for which none need blush because denounced by some demagogic reformer. The United States, he asserted, in regard to the Cunningham claims, failed in its trust in not granting title to the claims. The main feature of the new law, he said, had been disregarded, in that stockholders in one coal company could not hold stock in a rival company. In the future some 'Glavis Junior' might discover such ownership and associated stockholders would lose without appeal title in the lands. Federal taxation of any natural resources would subject citizens utilizing the resources to a handicap not experienced by the citizens of Texas, where the State of Texas and not the United States has control of natural resources. The people of the United States are drifting into a policy of opportunism, and the multiplicity of laws has made it impossible for industrious and ambitious citizens to know whether or not they are criminals under the law. We now have a lot of impossible cures for imaginary evils through recent legislation in individual States, but such legislation at least indicates that individual States can be persuaded to remedy evils, while it would be impossible to get a majority of the States to agree on any change in the Federal policy. Mr. Raymond's speech was interspersed with witty stories, and was greeted with applause.

Thursday afternoon the delegates visited the University of California. Dr. Raymond gave in the Greek theatre some 'Reminiscences of the Beginning of the Institute,' and G. T. Becker gave a biographical notice of S. F. Emmons.

On Friday many of the delegates went on an excursion to the gold dredges at Natoma. There they were entertained at a pleasant luncheon by the Natomas Consolidated company. After luncheon the dredges were visited and the rock-crushing plant at Fair Oaks inspected. On the return the delegates were guests at dinner of the San Francisco committee in the dining-car. Many of the ladies and delegates as well were visitors to many factories about the bay, where a cordial welcome was given them.

On Saturday afternoon the delegates will leave the St. Francis hotel at 1:30 p.m. in special sightseeing automobiles for a three-hour trip, stopping at Golden Gate Park to witness the ground-breaking ceremonies for the Panama-Pacific International Exposition in 1915. A number of tickets for grandstand seats have been obtained by E. H. Benjamin for distribution to the visiting delegates.

On Sunday the delegates will visit the Bohemian grove. They will have luncheon at Bohemia, and there will be a concert in the grove under the direction of Wallace A. Sabin. The party will leave the Sausalito ferry at the foot of Market street at 7:45 a.m., and will arrive at Bohemia at 11 o'clock. The return will be made at 3:15.

The following members have registered as present at the meeting at San Francisco: R. M. Atwater, Jr., W. S. Ayres, H. F. Bain, A. S. E. Beall, H. P. Bellinger, E. H. Benjamin, G. B. Berger, F. W. Bradley, S. K. Bradford, S. E. Bretherton, R. A. Bryce, Albert Burch, A. P. Busey, S. J. Cheney, S. B. Christy, W. B. Clark, Newton Cleaveland, F. G. Cottrell, J. J. Crawford, J. B. Cullan, E. S. Cunningham, F. H. Dakin, Jr., Joseph Daniels, G. M. Davidson, W. J. Davis, Jr., Courtenay De Kalb, F. J. Dennis, Francis Drake, E. T. Dumble, E. B. Durham, C. E. Dutton, H. L. Eaton, L. H. Eddy, J. B. Farish, H. C. Farnum, D. M. Folsom, D. L. H. Forbes, E. L. Foucar, G. H. Garrey, G. H. Garthwaite, J. N. Garvin, C. W. Goodale, Meade Goodloe, F. W. Griffin, C. E. Grunsky, W. R. Hamilton, A. A. Hanks, E. A. Hersam, L. Holbrook, R. W. Hunt, D. B. Huntley, J. Hutchinson, W. R. Ingalls, J. W. Ingersol, Murray Innes, Reiji Kanda, M. B. Kerr, E. B. Kimball, S. A. Knapp, J. B. Landfield, Willis Lawrence, Clement Le Boutillier, C. A. Liddell, J. J. Lincoln, Lycurgus Lindsay, Bernard MacDonald, J. W. Malcolmson, F. O. Martin, N. J. Martin, W. R. McIlvain, J. H. Means, W. W. Mein, C. W. Merrill, F. J. H. Merrill, George Mesta, R. B. Moran, F. H. Morley, T. K. Muir, W. S. Noyes, Carl Otto, T. H. Oxnam, E. W. Parker, J. B. Pierce, R. H. Postelthwaite, J. W. Pott, B. R. Putnam, R. S. Rainsford, W. C. Ralston, R. W. Raymond, T. T. Read, M. L. Requa, D. M. Riordan, G. W. Riter, Milnor Roberts, G. McM. Ross, W. L. Saunders, Gustave Schrader, H. J. Sheafe, J. M. Sherrard, L. A. Sisley, F. L. Sizer, H. P. Stow, A. M. Strong, Joseph Struthers, Edwin Thomas, F. F. Thomas, S. Tuelmin, R. C. Turner, B. W. Vallat, A. E. Vaughan, E. C. Voorheis, J. H. Weddle, J. C. West, W. H. Wiley, G. F. Williams, A. W. G. Wilson, J. S. Wilson, N. R. Wilson, W. A. Wilson, O. C. Wolf, William Wood, W. M. H. Woodward, C. G. Yale, G. J. Young.

Copper Producers Association Statement

The Copper Producers' Association September statement shows an increase during the month in accumulation in this country of 7,453,355 lb. The details are as follows.

	Pounds.
Stock of marketable copper of all kinds on hand at all points in the United States September 1, 1911	133,441,501
Stock of marketable copper of all kinds on hand and at all points in the United States October 1	140,894,856

The changes in surplus since January 1, 1911, have been as follows, in pounds:

	Increase.	Decrease.
January	20,409,295	....
February	14,198,280	....
March	5,370,164	....
April	3,547,974	....
May	440,024	....
June	....	8,561,768
July	....	19,695,306
August	....	4,297,357
September	7,453,355	....

There were 2,434,664 short tons of crude ore from Colorado sold or treated in 1910.

Discussion

Readers of the Mining and Scientific Press are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Historical Notes on the Air-Lift Agitator

The Editor:

Sir—In my article entitled, 'Historical Notes on the Air-Lift Agitator,' through an error in typewriting, the cyanide consumption for electrolytic precipitation is given as $7\frac{1}{2}$ lb. This should have been $1\frac{1}{2}$ lb. The consumption now on the same slime is between $\frac{1}{2}$ and $\frac{3}{4}$ lb., the greater portion of which is mechanical loss due to crushing in water. Were the crushing done in solution, the loss would probably be between $\frac{1}{4}$ and $\frac{1}{2}$ lb., so that a consumption of $1\frac{1}{2}$ lb. without mechanical loss is obviously too high.

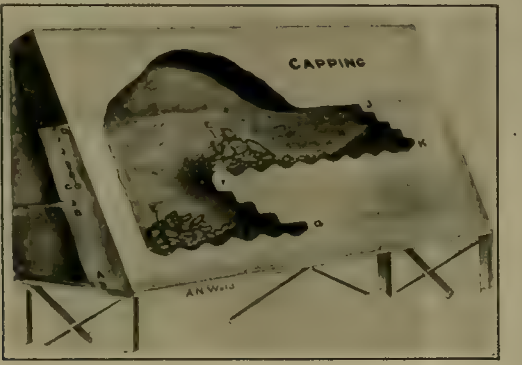
J. W. Swaren.

San Francisco, October 3.

Block-Caving and Sub-Stoping

The Editor:

Sir—Referring to Fred C. Roberts' paper on 'Block-Caving and Sub-Stoping' in the *Mining and Scientific Press* of September 2, I would say that I have observed these two methods in use on the Menominee Range for a number of years, and that they are safe and highly economical methods where the conditions are suitable for their application. The block-caving method can be applied to any orebody over 100 ft. in width and with sufficiently steep enclosing walls, so that the broken ore will not 'hang up' on the foot-wall. For the application of the sub-stoping method, the orebody should be, say, from 12 to 100 ft. in width; should have steep enclosing walls; should not be too soft or 'blocky', so that the benches will not break down of their own weakness; and the ore should not be too hard or the cost of driving the subs will be excessive.



MODEL OF BLOCK-CAVING AND SUB-STOPING.

I have thought so well of these methods that I have had models made to illustrate them to my classes in the Michigan College of Mines. I enclose a sketch of the model of the sub-stoping method. A ladder-way between the subs is shown from *A* to *B*, and another from *D* to *C*, on the model. From *J* to *K* the first-level subs are shown; and from *F* to *G*, the second-level subs. *H* and *H* are piles of ore lying upon the funnel-shaped chutes through which the ore is drawn off to the levels at *A* and *B*. At *E* and *E* is shown what would happen if the capping should break into the stopes. Provision could be made to take care of such falls of capping without losing much ore, either by allowing the rock to follow the ore down, or by leaving small pillars of ore to support the broken rock. In the Hiawatha mine, in the same district, pillars are left transversely across the orebody at intervals to support the capping and the hanging wall. The pillars will be mined out after the stopes are finished.

F. W. Sperr.

Houghton, Michigan, September 13.

Inadequacy of Language

The Editor:

Sir—I have read the letter from Mr. E. A. Smith appearing in your issue of August 26. Of course, I sympathize with him, for those who make the most frequent use of written language as a vehicle of thought are the most likely to appreciate the inadequacy of their medium. He quotes the sentence: "From this point to the end of the level the values are low and would not pay to treat unless the mill capacity is increased," and suggests that the word 'values' is correctly employed; then he gives two alternative versions of the above sentence with a view to proving that an academic use of terms would not be advantageous. The idea to be expressed is that the ore exposed in the level is not rich enough to yield a profit now, but that it would be profitable on a larger scale of operations. Mr. Smith insists, most properly, that the term 'ore' should be applied only to metal-bearing rock that will yield a profit at a given time and place. It appears to me, however, that the definition of 'ore' is fulfilled by the reference to the future enlargement of the mill, and that therefore it will be proper to say: "From this point to the end of the level the ore is low grade and cannot be profitable unless the cost is decreased by enlarging the capacity of the mill."

When Mr. Smith, in Mexico, was protesting against the editorial objection to a convenient colloquial term, another gentleman, Mr. W. R. Rumbold, in Northern Nigeria, was seconding the motion in the September issue of *The Mining Magazine*. To the busy man the refinements of language are a nuisance; if he can express what he means, that suffices. But the weakness of the implied argument in favor of colloquial terms is that such terms do *not* express the meaning intended, because they represent the ill-disciplined use of an instrument of precision. If 'values', as applied to ore, always meant the same thing, we who are editors would welcome a term that expressed an idea recurrent in mining affairs. But this is exactly what 'values' fails to do. At Johannesburg the managers speak of a banket seam having a 'value' of, say, 28 shillings per ton, and if the mine contains 1,000,000 tons the shareholders are apt to believe that they have assets worth £1,400,000. The 'value' of the ore, of course, is its assay-value, namely, 28s., less the cost of extraction and realization, 18s., leaving 10s. Ten shillings per ton is the value of the ore. This case is simple. Now suppose the ore to assay in gold 18s. per ton, then, with an identical cost of operation and administration, the ore would have no present value, although it contains 18s. worth of gold per ton. When 'value' is employed in a colloquial way as meaning assay-contents, it soon loses any precise significance. Thus Mr. H. A. Piper, an engineer of the highest reputation, in Rhodesia, wrote in a report that a cross-cut had "come into values, as follows: The west side assays 3.2 dwt., whereas the east side gave only 1.9 dwt., and there is practically no copper." Obviously, a small width of ore assaying from 1.9 to 3.2 dwt. per ton in gold, with traces of copper, in Rhodesia, in 1911, is worthless. The copper is enough to hinder cyanidation. The average cost of operating mines in Rhodesia at the present moment is several times greater than the assay-value of the material mentioned by Mr. Piper. The question then arises how to describe such material. We venture to suggest that Mr. Piper might have said: "The cross-cut has penetrated a lode assaying 3.2 dwt. gold on the west side and 1.9 dwt. on the east side, with traces of copper" or "The cross-cut has passed through the lode at a point where it assays 3.2 dwt. gold on one side and 1.9 dwt. on the other, but without copper." Of course, a very little copper might be a nuisance in the cyanide plant, although itself of no commercial 'value'; on the other hand, the proportion of copper required to attain 'value' would be at least several per cent, in Rhodesia, in 1911. Just as Mr. Piper's phraseology tends to exaggerate the worth of two or three pennyweights of gold, so also his "practically no copper" may fail to indicate the presence of enough of that metal to drive a cyanider to bad language of another sort. The trouble with such terms as 'values' is that they defeat the whole purpose of language. Inadequacy will surely be the mark of technical speech if we adopt slipshod colloquialisms.

Mr. Smith, in his temperate and reasonable protest, says that 'values' "conveys its meaning to the reader"; but this is what it often fails to do, not in his hands, perhaps, but assuredly in the hands of others less careful. As a loose equivalent for the assay contents of metal-bearing rock it serves no duty that cannot be better done by other terms. Surely it is of the essence of mining to distinguish between that which yields a profit and that which does not. He suggests that 'values' should be accepted as referring to "the worth of the marketable contents for a given weight or measurement of an ore deposit, without consideration of the possible profit or loss resulting from mining, treatment, or shipping costs." He means the market price of the extractable metals, without regard to the cost entailed, but he introduces the idea of worth, which is the proper abstract idea signified by 'value.' His definition is easily proved impracticable. Take such an ore as is found in the San Francisco del Oro mine, containing gold, silver, lead, copper, and zinc, in which the presence of some of the metals detracts from the value of the others to such a degree as to reduce the marketable worth of the ore to zero. The 'value,' according to Mr. Smith, might be $35 per ton, but the amount of money realizable therefrom would be nothing in Mexico in 1911.

It will have been noticed that the plural form is generally employed. Messrs. Smith and Rumbold, for example, would say that "the values are low," that 'they' disappear as the level goes northward or southward, that 'they' increase as the winze is sunk or the rise is extended to the next level, and so forth. Why not the 'value'? Because indefiniteness and comfortable vagueness is obtained by pluralizing. If several metals existed in the ore, say, both gold and silver, or copper associated with the two precious metals, it might be inferred that the reference was to the multiplicity of valuable contents; but that is not the case. 'Values' may refer to 2 dwt. of gold where the operating cost is $4, or it may suggest several conflicting metals, so that the metallurgical extraction of one or more of them is obstructed by the presence of one or more of the remainder.

Thus we come to the fundamental fact that 'value' connotes an abstract idea and that it is applied by careless writers to signify a concrete idea. Mr. Piper says that "the values appear to jump from foot-wall to the hanging-wall side," and Mr. Smith says that "the values would not pay to treat" in a mill of small capacity. It would be as intelligible to pursue a quadratic equation in an aeroplane as to "treat" 'values' that jump from one wall to another. Confusion of ideas necessarily leads to inadequacy of language.

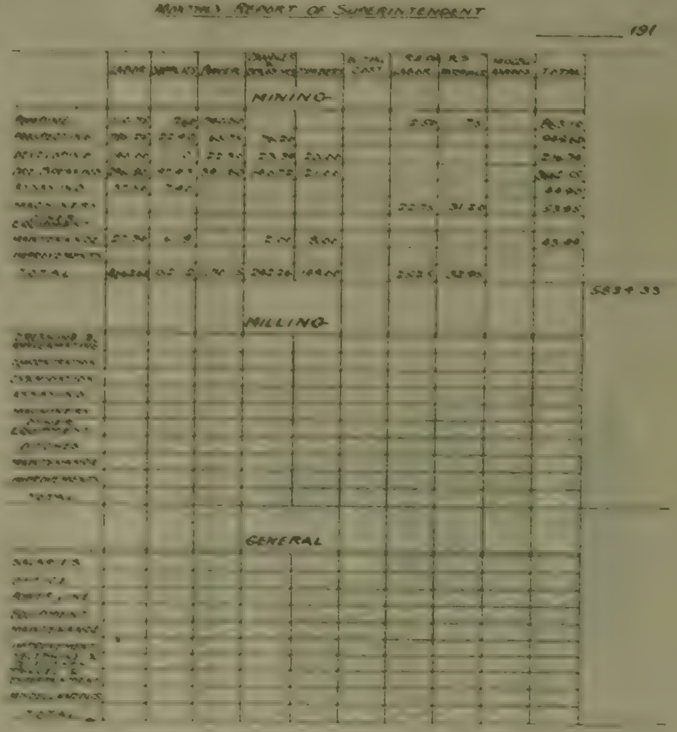
T. A. Rickard.

London, September 18.

Simple Methods of Mine Bookkeeping

The Editor:

Sir—The accompanying tabulated monthly statement has been worked out and is in use at the Gold Hill & Iowa mines. It may be of interest in connection with the discussion on mine accounts appearing from time to time in the Mining and Scientific Press. As used, it is partly of the nature of a financial report, the 'Labor' totals plus the 'Repairs-Labor' totals check with the payroll, and the grand total of the report checks with the sum of the entries on the credit side of the cash book. The expenses apportioned to mining for one month are given as an example of the working of the system. Added horizontally, the costs of the different mining operations are obtained; added vertically, the totals show the expense of labor, supplies, and power. Of course, the sum of the totals of the vertical columns checks with the sum of the totals of the horizontal columns, which in this case is $5834.33.


MONTHLY REPORT OF SUPERINTENDENT
191
MINING
TOTAL
5834 33
MILLING
GENERAL

With the expenditures thus concisely tabulated, the working out of the cost per foot of prospecting and development, and the cost per ton of mining and milling, is an easy matter, as is also the segregation of these costs. Daily record is kept of the work of each employee, and this is apportioned under 'Labor' or 'Repairs-Labor.' All bills are apportioned to the month during which they are incurred, although there are two objections to this: (1) in laying in large quantities of supplies, certain costs will appear abnormally high; (2) it is not always possible to know where the supplies will eventually be used, whether in prospecting, ore-breaking, or development. A yearly report, made up of the sum of the monthly reports, and applied to the total work done during the year, arrives at a close approximation of actual costs. By apportioning the supplies and materials actually used during the month for which the report is made, more definite data can be obtained, but with considerably more work. The only books used are the cash book and expense book. In the latter all bills are copied in full, the details being carefully noted. This enables one to look up quickly any detail of price or dimension of supplies or materials, making it easy to duplicate orders, particularly for machinery parts and extras. This system of keeping accounts has proved simple and adequate.

W. L. Bowron.

Quartzburg, Idaho, August 25.

There were 5,079,446 short tons of ore from Montana sold or treated in 1910, a decrease of 341,739 tons, or about 6%. The production of copper ores, which amounted to nearly 90% of the total tonnage treated, declined 448,684 tons. Only 266,689 tons were treated in gold and silver mills, and 616,596 tons were shipped crude to smelters, but 4,170,124 tons, or 82% of all ore treated, were sent to concentrating mills.

Concentrates

Most of these are in reply to questions received by mail Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

BORAX GLASS is ordinary borax which has been fused to drive off its water of crystallization It is much used as a flux in assaying.

ALUNOGEN is hydrous sulphate of aluminum formed in nature by the action of the sulphuric acid of decomposing sulphides upon aluminous shales. It differs from ordinary alum, which it resembles, in containing no potassium.

POLYBASITE is a soft, iron black silver mineral of the composition $(Ag, Cu)_9SbS_6$. It frequently occurs in six sided tabular prisms and before the blowpipe fuses with spirting, giving off heavy white fumes, sometimes of a garlic odor, and yielding a silver-copper button.

TONOPAH is the Indian name for a species of grass often found growing near water holes in the desert regions of the Rocky Mountain States, and, like many other Indian names, has been adopted as the name of a place which in this case later became a noted silver-mining camp.

ELECTRIC induction furnaces for steel production have the disadvantage of not melting the slag thoroughly, as they generate their heat within the metal and the slag is always cooler than the metal, instead of hotter, as it should be. Induction furnaces are not well suited to melting down cold charges, as it is only in a molten charge that the current is readily induced.

TALC quarries are as profitable as gold mines when the product is of good quality and is found in ample supply. In 1909 about 130,000 tons of talc and soapstone were produced in the United States, having an approximate value of $10 per ton. For profitable operation a talc quarry must have excellent transportation facilities, but if on a railway line near a large city is likely to be a steady source of revenue.

QUICKSILVER production is not an especially profitable industry, though an important one. Most of the large mines in the United States treat ore of which the quicksilver content averages less than 1%. The larger part of the production comes from California, with Texas as second, and the total annual production for the United States has had a value of a little less than a million dollars per year during recent years.

SHASTA COUNTY, California, has sent out much good ore, but never furnished a 'single $3,000,000 shipment.' The story to that effect doubtless originated from the fact that during the first year of operation of the Bully Hill C. M. & S. Co., the copper made was held at the mine pending completion of the Delamar refinery at New York. When the refinery was ready the copper was shipped East as fast as cars could be obtained.

SHOSHONE COUNTY, Idaho, furnishes 99% of the lead production of that State. Practically all this lead is derived from argentiferous galena ore from the Coeur d'Alene district, occurring in fissure veins and zones in pre-Cambrian quartzite. Most of the ore is concentrated to a content of 45 to 60% lead. Idaho produces one-third of the total lead of the United States, and, with its silver production, holds an important place in the mining industry.

CRUDE PETROLEUM varies in specific gravity. In Ritchie county, West Virginia, the Prunty pool, Big Injun sand, yields an oil of 0.7701 sp. gr. A sample from the Sun pool, Hardin county, Texas, collected by David T. Day, showed a specific gravity of 0.9352. This corresponds to a variation of nearly 60 lb. in the weight of a barrel of oil. The average specific gravity of Russian crude petroleum, as taken from official reports, is 0.86, approximately, or 301 lb. per barrel.

BARREL is a term of varying significance, as it is used both as a measure of capacity and of weight. The standard oil barrel is 42 U. S. gallons, the standard beer barrel 36 gal., and the standard wine barrel $31\frac{1}{2}$ gal. When used for solid substances a barrel is a measure of weight; for example, a barrel of flour is 196 lb., and a barrel of fish, beef, or pork, 200 lb. The standards differ in some States, and it should be remembered that from their nature it is not possible to construct barrels with mathematical accuracy.

GOLD can be freed from lead in smelting zinc-box precipitate by the use of a flux containing 60% borax, 19% nitre, $11\frac{1}{2}\%$ sand, and 7% soda. Manganese dioxide is said to be more efficient than nitre in oxidizing the lead, and for fusing 100 parts of slime a flux composed of 20 to 35 parts of borax, 20 to 40 parts of manganese dioxide, and 15 to 40 parts of sand, is highly recommended. Gold recovered from alluvial work is usually nearly free from base impurities and can be melted down with a little borax glass and nitre. Fluorspar, when available, is a good flux, as it is very liquid when molten.

SULPHUR production in the United States has increased greatly during the last decade. The production in 1900 was valued at less than $100,000; the present production is over $5,000,000 worth per year. Most of this comes from Louisiana, though there are important producers in Nevada, Texas, Utah, and Wyoming, and sells for about $22 per ton. Considerable amounts of crude sulphur were formerly imported from Italy and Japan, the former country supplying the Eastern United States and the latter the Western States, but by a recent ruling of the customs authorities Japanese sulphur has been classed as a refined product and required to pay a duty of $4 per ton. Domestic production on the Pacific Coast thus will be stimulated.

CRYOLITE is one of the comparatively few useful minerals which has not yet been discovered in commercial deposits in the United States, at least not in deposits such as can compete with those furnishing the imported product. In fact, there is but one important known deposit in the world, namely, at Ivigtut, an Eskimo hamlet on the southern coast of Greenland. Even this deposit is only about three acres in extent. Cryolite is used principally in the manufacture of opaque glass, for enameling iron ware, in the metallurgy of aluminum, and as a flux in the manufacture of white portland cement. According to the U. S. Geological Survey, the imports of cryolite into the United States in 1910 amounted to 36 long tons, valued at $2343. Refined cryolite is relatively high priced, selling in carload lots at about $140 per ton.

A HALF part per million of iron in water is detectable by taste and more than 4 to 5 parts make a water unpalatable. In some mineral springs iron is the constituent which imparts a medicinal value to the water but ordinarily it is undesirable. More than 2.5 parts per million in water used for laundering makes a stain on clothes. Iron must be removed from water from which ice is made or a cloudy discolored product will result. An iron content of over 2 or 3 parts per million in water used in the manufacture of paper will stain the paper. Iron is harmful in water used for steaming, for it is in equilibrium with acids which inside the boiler become dissociated, with the result that the free acids corrode the boiler plates; but the amount of iron carried in solution by most waters is so small that the damage it does to steam boilers generally amounts to little.

Special Correspondence

DENVER, COLORADO

Pumping Project at Leadville.—Method of Finance.—Placers at Newlin Gulch.—Uranium and Vanadium in Colorado.

Leadville is taking another active step in the work of rejuvenating herself. A project has been started by operators which, if successfully consummated, as now seems likely, will render large bodies of ore now under water available for mining. This enterprise has in view the unwatering of the entire 'downtown' sections; also Fryer and Carbonate hills, by means of large-capacity pumping plants. The down-town mines in Leadville were closed late in 1907, when the low metal prices and high pumping costs made mining operations practically unprofitable. Until recently little attempt was made to reopen them. The present agitation for unwatering the properties seems to have been started by officials of the Central Colorado Power Co. The enterprise is backed, however, by the foremost operators and business men of the city; there probably will be no trouble in raising the necessary funds for the project.

The scheme embraces plans for the installation of two pumping plants, one to be a permanent one and the other a sinking plant. A stock company is to be formed, the major portion of the stock of which will likely be subscribed for by the power company. Shares will be sold to mine operators and other business men. It will be the aim of the pumping company to make a reasonable profit from its operations from which to pay interest to the stockholders. For draining the town section and lower Fryer hill, a pumping-plant will be installed in the Penrose shaft, according to the plans. This is the deepest shaft, being down 930 ft., and is believed to be the key to the situation. Carbonate hill will be drained by another pumping-plant, to be placed either in the Greenback or Pyrenees shaft. A huge granite dike between Carbonate hill and the town area prevents the draining of both sections from the Penrose shaft. J. W. Finch and C. S. Thomas, Jr., have examined the enterprise and think it entirely feasible. Their report further states that there are unquestionably large bodies of ore now under water.

The town area alone is said to be capable of producing 1000 tons of good ore per day and giving employment to 500 or 600 men. This estimate is based on what was being produced at the time of closing four years ago. The pumping expenses will be paid for by a tax based on net smelter returns on all ore coming from the mines benefited. This matter is to be determined by mutual agreement among the operators affected. Among the properties which will be drained in this way are the Penrose, Bon Air, Coronado, Midas, Grey Eagle, and the Nicholson mines. The finding of good carbonate of zinc ore on the dump of the Penrose and others of these mines lately has added further inducement to the putting of this project under way at an early date.

A company composed of Denver men has been formed to exploit the old Newlin Gulch placers, 35 miles southeast of Denver. These placers were the scene of the first gold discoveries in Colorado, and have been worked intermittently in a small way since their discovery in 1858. The company controls 300 acres of ground by lease and ownership, and engineers have spent some time in exploration. The yardage of pay-dirt is claimed to be sufficient to warrant the installation of a steam-shovel, or possibly a dredge, which it is expected will be on the ground early in the spring. Near the head of Newlin gulch a porphyry dike has been traced across the country, and this is believed to be the source of the gold which has been found in Newlin gulch and Cherry creek. In places the gravel runs unusually high, assays running anywhere from 40c. to $54 per yard; according to estimates of the engineers the average is over $1 per yard. The average depth of the pay-streak is estimated at 6 ft. for the entire area.

It is reported that vanadium and uranium have been found in Montrose and Rio Blanco counties. Regular shipments of carnotite ore, containing uranium, vanadium, and gold, are being made from San Miguel county to Liverpool and other foreign centres, but the companies now operating give out no information. In 1910 vanadium to the value of $630,000 was produced in San Miguel county, and this year reliable operators say the production will amount to $2,000,000. The Western Chemical Co. of Buffalo, N. Y., and the Crucible Steel Co. have purchased and are developing vanadium claims in this section. The Primos Chemical Co. is enlarging its plant at Newmire and is shipping vanadium concentrate to Primos, Pennsylvania.

Mine operators at Creede, after persistent efforts, have secured substantial reductions in ore-treatment rates from the American Smelting & Refining Co. and similar concessions in freight rates from the Denver & Rio Grande railroad. As a consequence, work in old properties there has been greatly stimulated. The Creede Local Leasing Co. has been formed, backed by Denver and Creede capitalists, and has taken leases on the Creede United, Park Regent, and other properties, which are again being actively developed. The same concern has leased the 250-ton milling plant of the Creede United company for ten years, paying a royalty of 40c. per ton for its use. The Amethyst mine is now solely in the hands of lessees. The Commodore is shipping 1000 tons per month, and the entire dump of the Last Chance mine is being milled.

KETCHIKAN, ALASKA

Renewed Confidence in Government Administration.—Reconstruction of Hedley Smelter.—Development at Jumbo.—Progress at Dolomi.

With the advent of the winter rains work at a number of mines in the Ketchikan district has been somewhat curtailed, though the visit of the Secretary of the Interior and the Director of the Bureau of Mines to Alaska is expected to pave the way for legislation which will result in a more liberal interpretation of the law by both the Forest Service and the General Land Office, and the consequent restoration of public confidence necessary to provide capital for the future industries of the country. Interests said to be those in control of the Granby, B. C., smelter have secured the plant at Hedley, on the east coast of Prince of Wales island, and are rebuilding the dock preparatory to remodeling the smelter in the spring. There is an abundance of water-power in the Ketchikan district, and the present plans contemplate the development of this to smelt by electricity. Bodies of high-grade magnetite ore have been opened in a number of the mines that would be tributary to this plant.

The Alaska Industrial Co., operating the Jumbo mine on the west coast of Prince of Wales island, is driving a cross-cut to the main haulage-adit that will bring the cars directly to the bunkers at mine end of the aerial tram. A station will be cut near the entrance to contain the blacksmith-shop and compressor, which will prevent the recurrence of the damage done to the plant by a heavy snowslide last spring. The company is making regular shipments of chalcopyrite ore to the Tacoma smelter.

On Kasaan bay development is being carried forward on the Rush and Brown, It, and Mt. Andrew properties, though the death of Samuel Lichtenstadter, president of the Mt. Andrew Iron & Copper Mining Co., has somewhat unsettled the policy at the latter. The Princeton Mining & Milling Co. is developing its property at Dolomi from which a number of shipments of high-grade gold ore have been made, and the Lon De Van on Georges inlet is driving a cross-cut adit to open several veins which are exposed on the surface of the property. The assessment work on several of the claims near Hollis will be carried on this winter in order that the ore may be sledded to tidewater over the snow. After a short time now the winter trails will be open, and as in the case just mentioned, the winter snows make interior points easier of access, instead of more difficult.

NEW YORK

REACTIONARY ATTITUDE OF WALL STREET. COPPER SITUATION. TENNESSEE COPPER AND GIROUX. PROGRESS AT GRANBY. REPORT ON RAY CENTRAL.

Wall Street is going through an unusual experience, feeling somewhat uncertainly for solid ground. The fiercest of the storm which broke upon the Street some three weeks ago, seems to have been weathered and the natural lull has come, but does not bring with it any noticeable return of confidence. Wall Street, in many ways, much resembles the late Billy Baxter, whose letters were widely read a few years since. Billy was lamenting his inability to keep abreast of events, and as an illustration declared that "when fifteen thousand people know something about a married lady my number is 14,999 and the injured husband 15,000." Wall Street has never really believed that genuine corporate regulation could be brought about, and its number is now 14,999 as to what is in the mind of the American public, and particularly as to the uncompromising attitude which that public has taken. Wall Street is now the only place in the country that holds high finance in any esteem, and it stubbornly refuses to accept as real the revolution through which the country is passing. There must ensue a period of readjustment in which material progress will be slow and sure and during which, unless cause and effect sever their usual relations, Wall Street's influence will be a diminished factor.

Copper is affected more by the conditions prevailing than any other branch of the mining industry and the dominant factor for the time is the German financial outlook. The Fatherland has been riding on the crest of the wave of industrial expansion, and its position is especially precarious in view of the disturbed conditions prevailing abroad. Germany has been using 33,000,000 lb. of copper per month, an amount nearly equivalent to 30% of our own output. It is not hard to realize therefore that copper producers are much interested in Germany's continued progress. Any industrial smash in that country would allow the surplus to accumulate rapidly, for a time at least. September's production is not expected to reach a high figure, but buying has been slow and prices depressed. Some copper has been offered as low as $12\frac{1}{4}$c., and the increase in surplus, nearly 7,500,000 lb., was much greater than had been expected. The complete domination of the porphyries becomes continually more apparent. At the Ray Consolidated, estimated costs are already being attained and lowered. The concentrator is now handling 3200 tons per day, the product going to Aguascalientes for treatment. The cost-sheet demonstrates that when the plant at Hayden is completed and all the sections of the concentrator in operation, copper can be produced well under 9c., the figure which has been used in all estimates. This will mean some 70,000,000 lb. of copper or more that can, if necessary, be sold considerably below present low prices and show a respectable profit.

While Tennessee Copper officially mentions its output of sulphuric acid as a by-product, it is nearly true that the metal is the by-product rather than the acid. The sulphuric acid plant is now turning out 500 tons per day and, with the advent of winter weather with lower temperatures, the full capacity of 650 tons per day will be reached. The copper output is about 1,000,000 lb. per month, and prospects have so far improved, by reason of the success of the acid plant, that it is expected that there will be an extra dividend in the near future and that regular quarterly dividends of $1 will be paid next year. Among the developing coppers, Giroux remains a vexatious riddle; equipped with what is said to be one of the finest 5-compartment shafts in the world, with stations built of concrete and roofed with steel beams; it is impossible to get any details as to ore development wholly or in part. It is now said that the porphyry ground has proved a disappointment. Some nine million tons of ore has been proved by drill work, but it is so scattered that it is doubtful whether it can be worked at any profit. Giroux has a large public, and the management would do much to allay the uncertainty of the shareholders if the reticent attitude were dropped and a frank detailed statement of underground conditions made.

Tuolumne, which stands out in the list of Butte copper mines as turning out the richest ore in the district, at the quarterly meeting, October 2, passed its November dividend. Market movements showed that the action was anticipated and there was a quick break in the stock. Later in the week there was a quite evident attempt to drive in a supposed short interest and the stock was bid up to $3\frac{7}{8}$, against a ruling price of $3\frac{3}{8}$ prevailing for some weeks before there was any talk of non-payment of the November dividend. The activity in Tuolumne was the feature of the copper list in the open market. The reorganization plans of the Arizona Commercial are being carried along slowly. The joint meeting of the shareholders and the bondholders held this week in Boston ratified the plan for independent reorganization in the form of a new corporation with 300,000 shares of stock, with an assessment of $3 per share. The plan as authorized is to go into effect when three-quarters of the outstanding bonds are deposited and underwriters shall have been found for the assessment.

At the annual meeting of the stockholders of the Granby Consolidated Mining, Smelting & Power Co., Ltd., held this week, E. T. Earle, A. C. Flumerfield, and William A. Payne were elected directors to succeed William A. Nash, Edward R. Nichols, and William Hamlin. The manager's report presented at the meeting had a decidedly hopeful tone. The strike in the coalfields is preventing any production, but the cost-sheet is said to show material reductions, while the purchase and development of the Hidden Creek property is stated to practically double the company's ore reserves. The expenditure of one million dollars for smelter, docks, and other equipment is said to be necessary to bring this mine to the point of profitable production, but an output of 2000 tons per day is possible before the end of 1912 if ample financing can be provided. As yet nothing definite has been determined upon in this direction. The Granby is reaching out for other new mines and bonded the Copper Queen mine, in Stevens county, Washington, near Chewalah. The property consists of six claims and the ores are said to be particularly useful as fluxes.

HIDDEN CREEK MINE.

Ray Central, one of the properties at Kelvin, Arizona, and formerly known as the Kelvin-Calumet is to be equipped with a mill. The property was at one time under option to the General Development Co. and was made one of the features of the copper list in New York. There was a great deal of adverse comment when the Development company, acting upon the recommendation of J. Parke Channing, announced that it would not exercise its option. Marketwise, the issue has never recovered. Frank H. Probert has recently made a report covering the work done up to September 1 last. Developed ore is estimated 7,848,000 tons, averaging 2.51% copper, of which there is something over half a million tons of high-grade ore of 5.83% copper. It is now proposed to expend $1,500,000 in preparing the ground for extraction and in erecting a mill with other necessary equipment.

Aside from the copper shares, the re-awakening of Tonopah is the centre of much interest, especially in Philadelphia, where Tonopah issues are much more largely held than in New York. The transferring of the leadership of the camp from the old Tonopah Mining Co. to the Tonopah Belmont and the evident possibilities of some of the developed properties of the camp has brought back into the market a considerable number of the former multitude that were interested in Tonopah and Goldfield issues. So far as public interest is concerned Porcupine seems to have passed into history as another exploded Canadian gold excitement. The Hollinger is promising to erect a mill and to be producing by July 1912. The Porcupine Gold Mines Co. is ordering a 100-ton mill. There are occasional desultory reports of rich veins, or surface finds, but as a whole the district appears to be decidedly on the wane. The Mines Company of America, which operates the Dolores, the La Dura, the Creston-Colorada, and the El Rayo mines in Mexico, cut its dividend rate from 9 to 6% at its last quarterly meeting. The disbursements were absorbing nearly the whole of the net earnings.

LONDON

Electric Smelting in Sweden.—Treatment of Complex Sulphides.—Results of Operations.—Anchor Tin Mine.—Government Aid for Mine.

One of the most interesting new ventures undertaken in England recently is a company called the Hydraulic Power & Smelting Co. that has been formed to acquire processes and works in Norway and Sweden in connection with the electric smelting of complex ores. These countries have unrivaled sources of water power. Their high waterfalls, and their low waterfalls with tremendous volumes of current, are equally applicable to the production of hydro-electric power on a large scale and at a low cost. Many of these falls are used in providing electric light, heat, and telephone current, and these modern facilities are in wide use on the Scandinavian peninsula. The power is also used in connection with steel-making. During the last two or three years the falls at Sarpsborg and Trollhättan have been employed in connection with the treatment of complex sulphides of zinc, lead, and copper. At both of these installations the electric current is bought from supply companies that have generating stations at low falls. Sarpsborg is at the south of Norway, not far from the Swedish border, and the power station is near the mouth of the Glommen river, which rises in the Dovre Fjeld not far from Trondhjem. Thollhättan is on the river Göta, which runs from Venern lake to the sea at Göteborg. At these two smelting works much experimenting has been done, but many and extensive improvements have yet to be made, for not only are the works badly laid out, but the furnaces themselves are not built of the right material. In addition to these mechanical details, the metallurgical operations require much close study before real efficiency can be claimed. The cost of the electric power is still too high, being from 30 to 40 shillings per horse-power-year.

The English company has also taken over the water rights at Tysse near Odde on the Hardanger Fjord. Here the water-power will be obtained at high head from lakes far above in the mountains. Already one of the carbide companies has a large installation here. It is estimated that the electric power will be obtainable for the extraordinarily low cost of 14 shillings per horse-power-year. The Swedish owners of the Sarpsborg and Trollhättan works have been experimenting on local ores containing finely intermixed sulphides that could not possibly be separated by water or oil, and have also tried similar ores from the San Francisco del Oro at Parral, Mexico, the Terra Nova, in Newfoundland, and slime from Broken Hill. The list of supporters of the London scheme contains many well-known names. Many of the Broken Hill people, such as the Sulphide Corporation and the North and South Mines, the Consolidated Gold Fields of South Africa, the Exploration Company, Percy Tarbutt & Co., the Rothschilds, and hosts of other important people, are in it, and capital has been subscribed on a large scale. Up to now no public issue has been made and practically nothing has been written on the subject. F. W. Harbord, the authority on steel and electric smelting, spent two months recently on the spot investigating the furnaces and the process.

The Trollhättan works are more modern than the Sarpsborg, and they contain 11 furnaces, each capable of treating nearly 3 tons of roasted sulphide per 24 hours. The horse-power used for each furnace is 350, and the energy used per ton of roasted ore is about 2000 kilowatt-hours. The heat is generated by resistance. Most of the zinc and some of the lead is distilled off, and of this about two-thirds is condensed as a crude zinc with high lead content, and the rest forms metallic powder and oxide. The crude zinc is refined in another electric furnace and an unusually pure zinc is produced assaying 99.9% and commanding a premium price. The fume and oxide goes back to a subsequent charge. Most of the lead and silver of the ore is reduced to metal and is tapped, while any copper and iron present forms a matte which carries some lead, zinc, and silver. Some lead is lost in the slag. Skimmings are also obtained containing zinc, lead, and silver. One of the curious points about the process is that the furnace is built of porous brick, evidently of texture similar to the old-fashioned zinc retorts, so that lead and silver oozes through and has to be caught in special vessels or dug out of the ground. Some modification of this structure will have to be introduced to prevent this leakage. The recovery of all the metals from these various products is a task of no great simplicity, and up to the present time the total recovery on Broken Hill slime is less than 70%. The formation of so much powder is a decided drawback. There are, however, a great many improvements already obvious, and the eminent and powerful men at the back of the scheme may be depended on to bring the process to eventual success.

I have written a great deal about Cornish tin recently, but this week I wish to draw attention to a Tasmania venture, financed in London, that is notable because it manages to keep going on extraordinarily low-grade tin ore. This is the Anchor company, which has been working a granite stockwork at Lottah in the northeast corner of the island since 1895. The extraction is about 3⅓ lb. of black tin per ton, averaging 70% metal, and the cost of mining, concentrating, and smelting is about 3s. 6d. per ton. The smelting is done by the Mount Bischoff company at the Launceston smelting works. The company has 100 stamps, the capacity of which is 4 tons per day, so that the normal output of ore is about 150,000 tons per year. During recent years, the work has been greatly impeded by drought, and for the past two years the average number of stamps running has been from 60 to 70. At times the mill has been entirely idle for months on end, and then the men would drift away to other centres. Consequently, when the water-supply became normal once more, the labor was not at hand, so the mine and mill had to work short. The yearly output during the last two years has been just over 100,000 tons, and the production about 155 tons of concentrate. Two years ago a contract was made to work the Australian property three miles away on a profit-sharing basis. Communications between this mine and the Anchor mill were impracticable, and the company had no money wherewith to improve matters. It was impossible to raise any more capital in England, for the shareholders have never yet received any dividends, the capital has been written down, and there are as many debentures as could be floated. Eventually the Tasmanian Government came to the rescue by lending £25,000 for the purpose of building an aerial ropeway. This was completed early this year, and the ore is now being transported to the mill. Writing about the scarcity of labor reminds me that this is becoming a serious question throughout Australasia. In many centres of mining, such as Broken Hill, and Mount Lyell, the position is verging on the acute, and during the next few years general conditions are bound to change greatly from this cause.

TORONTO, CANADA

Reconstruction at Porcupine. Report on the Scottish Ontario. Financial Status of Northern Ontario Exploration Co. Nipissing Dividends. Exploration in Crown Reserve.

Work is in active progress at Porcupine, despite much delay in the forwarding of machinery and material. At the Dome the work of reconstruction is being hastened by a force of 200 men. It was anticipated that the stamp-mill would be in operation by January next, but as orders for steel cannot be filled for some time, the winter will probably be pretty well over before it is in working order. Diamond drilling to the depth of 600 ft. has shown good gold contents. The plant of the Dome Extension is being rapidly set up and will shortly be in operation. The West Dome has been working for the past fortnight, and prospecting work is being vigorously undertaken. The Rea mine has the deepest shaft in camp, being down 260 ft., which is connected at the 200 ft. level with No. 2 shaft, 175 ft. distant. Underground work is being carried on steadily with a 12-drill compressor. The Scottish-Ontario has completed 800 ft. of underground work. Messrs. Dempster and Thornton, of the Forest-McArthur Engineering Co., have just completed a voluminous report on the mine which has been sent to the headquarters of the syndicate in Glasgow. Should it be regarded as satisfactory, $500,000 will be expended. The McIntyre wil shortly install a mill. The number of stamps has not as yet been decided on. Five shafts are going down, and good ore is being mined on the 100-ft. level of No. 4, where the vein has been opened up for 200 feet.

At the Plenaurum, formerly the Armstrong-Booth, the main shaft has reached a depth of 50 ft. A compressor plant has been ordered. Diamond-drilling at the Pearl Lake has proved the continuance of the vein at 925 ft. Important discoveries have been made in the sulphides with high gold content. The Three Nations Mining Co., operating eight claims, is installing a 4-drill compressor plant and boiler. The Swastika's new plant has been installed, including a 12-drill compressor. John Reddington is in charge. At the Miller, west of the Scottish-Ontario, where a vein has been found at 48 ft., core-drilling is being undertaken. In response to numerous requests for information, the Northern Ontario Exploration Co., a Bewick-Moreing flotation, has made an official statement to the effect that there have been issued 119,425 shares of £1 each of the company's capital, with options outstanding on the remaining 280,575 shares. The company still owns 6000 shares of Hollinger stock, together with 165,908 shares of Ontario Porcupine Development fully paid, with smaller amounts partly paid for, and has cash in hand approximately amounting to $425,000.

The Nipissing has declared its usual quarterly dividend of 5% and 2½% bonus. The report showed that on September 16 the company had a total of cash in hand, ore in transit, and ore ready for shipment of $1,250,000. In pursuance of the policy of determining the value at depth, a winze has been put down 346 ft. from the 275-ft. level on vein No. 64, but further progress has been delayed by water, rendering it necessary to order a battery of pumps to keep the workings dry. The orebody continues to show good silver contents at the depth reached. The Crown Reserve has also started to prove the mine at depth and has put a winze down from the 300-ft. level, which is down 165 ft. farther. It will be sunk for another 100 ft. and driving started at that level. A discouraging report has been presented by the Kerr Lake Mining Co. showing a deficit of $400,621 for the fiscal year ended August 30. The cash on hand amounted to $400,621, mining property $55,000, and total assets over liabilities $588,978. John Seward, the manager, stated that he did not feel warranted in presenting an estimate of the ore developed on account of the irregularity of the deposits. Portions of the mine formerly regarded as ore bearing had proved practically barren, whereas other areas from which nothing was expected had yielded well.

SALT LAKE CITY, UTAH

Decline of Consolidated Mercur. Some Mining History. Bingham & Garfield Railroad in Operation. Results at Ohio Copper.—Merger of Ontario and Daly Mining Company.

The prospective passing of one of the most interesting gold mines in the world is brought out in the annual report of the Consolidated Mercur. This famous old producer is evidently on its last legs, and unless the prospecting work results in some unexpected developments in the near future, the property will undoubtedly be closed down. The mine has paid $3,330,000 in dividends, and has written important chapters in the history of cyaniding, but the report for the fiscal year ended June 30 shows that only by a scratch were operations saved from a net loss, the profits for the year, with a gross output of $550,695 gold, amounted to only $496.13. This is on a total tonnage for the year of 239,190. The ores have been steadily diminishing in quantity and quality, and the average value for the year was only $3.21, although this was brought down slightly by the mixture of 12% of old tailing. The recovery was $2.32 per ton. The expense of operation included 5558 ft. of prospecting work, at a cost of $24,484, but the results were not encouraging. For some time the mine has been operated at a close margin, because the management did not wish to throw several hundred men out of work, and was continually hoping that new ore might be developed. Efforts were made to find and purchase another mine, but nothing which was submitted came up to requirements. Consequently, the president, John Dern, says in his report that as soon as future operations begin to show a loss the property will be closed down permanently. There was a balance on hand June 30 of $84,952. This is exclusive of real estate, plant, construction accounts, and supplies in use. The Mercur mine is now a little over 25 years old, the original Mercur Gold Mining & Milling Co. having been incorporated June 7, 1890, and it has had a history fraught with romance and with important developments in the science of metallurgy. The ore was supposed to be free milling, but when it was found that it would not yield to that method of treatment, the owners at that time thought themselves lucky to 'unload' on some Easterners. The new owners, after much experimenting, scored a success. In 1900 the Consolidated Mercur was organized, taking in the Mercur and J. R. DeLamar's Golden Gate and the Brickyard properties. The ore treatmen has presented many problems, among them handling the base ores and the slime, but all of these have been worked out so that a profit would have been shown had not the grade diminished while costs of mining increased. It is still possible that new discoveries of ore may be made, but those most familiar with the property have little hope of any radical change for the better in conditions.

With its new Bingham & Garfield railroad in operation and with the Denver & Rio Grande handling its old tonnage, the Utah Copper Co. is sending more ore from mine to mill than ever before in its history. An unofficial statement is that the company's own road recently has been handling 11,000 tons per dey, while the Rio Grande has been taking care of 7500 tons. Statements emanating from officials sources place the tonnage a little less, at around 15,000 per day, but even this means a big output of copper, which will show in future statements. F. August Heinze has been spending some time in Utah recently, going over Ohio Copper affairs. It is stated that the property is now earning around $20,000 per month net and that the amount will be increased when the new crushing equipment is installed.

The stockholders of the Daly Mining Co., at an adjourned meeting, voted to ratify the proposed merger with the Ontario, a 300,000-share corporation being formed to take over both of these Park City properties. The Daly stockholders are to receive one share in the new company for two in the old, a total of 75,000 shares out of the 300,000. Ontario stockholders are to receive share for share. This will leave in the treasury of the consolidated company 75,000 shares of stock, and about $135,000 in cash.

General Mining News

ALASKA

Prince William Sound

B. F. Millard has taken an option on a group of claims near the Valdez glacier, state reports from Valdez, and will start development work at once.

The Tanana

Much land in the Kantishna district has been staked out. John Lee and Andrew Ness recently filed 64 association claims covering 160 acres each.

Paul Polson, state reports from Fairbanks, on his return from the Kuskokwim, said that ore had been found in that district which paid $35 'to the shovel.' About 50 men were working there.

Walter Fisher and Collon McGillivrey have obtained a 5-year lease on the extension of the Newsboy vein, owned jointly by the Newsboy company and Stiepovich & Baker.

Fourteen miners were entombed at a depth of 170 ft. by a cave-in in the shaft of the Shakespeare claim on Dome creek. The accident occurred September 27.

ARIZONA

Cochise County

The report of the Shattuck-Arizona Copper Co. for the year ended August 1 shows that the company produced in 1911 up to the time in June when smelter shipments were suspended, 4,111,000 lb. of copper, which was sold for an average price of 12.51c. per pound. The output for the calendar year 1910 was 14,751,000 lb. of copper. The company is spending about $5000 per month in development work and probably will not resume shipments until the price of copper advances, excepting for ore removed in connection with the development work. It is believed that this ore will pay for the work. The net profit for the year was $396,687, against $757,782 for the period May 1, 1909, to July 31, 1910. The company will build a $450,000 smelter with two furnaces, each of 400 tons per day. The smelter is to be built at Douglas. The discovery of 17c. copper ore on the 500-ft. level, toward the extreme east end of the property has caused satisfaction among the stockholders.

Gila County

(Special Correspondence.)—W. H. Aldridge, managing director for the Inspiration Copper Co., said recently: "We have decided that before beginning the construction of the mill of 5000 tons daily capacity we will try out in the experimental mill the new flow-sheet proposed by Mr. Callow. This will be on a scale equivalent to one-sixth of a section of the proposed new mill, or about 150 tons daily capacity. During this time work will continue on the plans and specifications of the large mill and other surface equipment." In accordance with the above policy, the experimental mill is now being altered and enlarged. The gauge of the track in the main adit is being changed from 18 to 30 in. preparatory to ore extraction. It is estimated that 4,500,000 tons of ore can be mined through this adit. A tank for the treatment of mine timbers with zinc chloride is being erected at the mouth of the adit. Surveys for pumping stations, reservoirs, and pipe-lines are in progress at Wheatfields and at the Inspiration ranch.

The Keystone Copper Co., whose property lies between Inspiration on the east and Live Oak on the west, is operating one churn-drill on hole No. 38, about 500 ft. west and north of the shaft. This is the only work going on at present. When questioned as to the future policy of the Keystone, J. Parke Channing said recently: "There is no intention to do any mining at the present price of copper. Exploration work will go on and plans for the future development and mining of the ore will be worked out, but it would be suicidal to attempt it now." The last report gave 2,000,000 tons of developed ore averaging 2.25% copper.

The mine of the Arizona Com. Copper Co. at Copper Hill, three miles east of Globe, is still idle, pending acceptance by the Arizona Commercial stockholders of the plan of consolidation recently proposed by the Superior & Boston, or, should this fail, pending the reorganization of the company. The mine is being kept free of water.

Globe, October 6.

At a meeting of the committees representing the security-holders of the Arizona Commercial Copper Co. it was finally decided to reorganize on the plan outlined at a meeting some time ago, with the added provision that the 120,000 shares to be offered to the Arizona Commercial stockholders should be underwritten.

Mohave County

(Special Correspondence.)—Interest is growing in the Secret Pass district, in the northwestern part of the county, lying along the Colorado river. While prospecting for veins the first-comers found the dikes containing free gold. These rhyolite and porphyry dikes are from 80 to 150 ft. wide, and can be traced for about six miles. On the west, or river slope of the dikes is a cement limestone which seems almost impenetrable to any mineral. The east side is called the valley slope. There are three prominent dikes of about equal size, lying parallel to each other. The Gold Road and Tom Reed mines are successful producers.

Kingman, October 7.

Pima County

Gold ore assaying from $87 to $116 per ton has been discovered on the Southern Cross claim, in the Arivaca district, owned by H. R. Bacon and A. T. Luques, according to reports from Tucson.

Pinal County

Immediate steps will be taken for the construction of a 1500-ton mill on the property of the Ray Central Copper M. Co. The mill, according to the estimate of Weed & Probert, consulting engineers to the company, will cost about $1,500,000. It is proposed to mine the rich ore first while preparing the lower-grade ore for caving, states the engineers' report on mine conditions, recently sent to stockholders.

Yuma County

John Martin and associates, owners of the Harqua Hala mine, south of Salome, hae ordered the machinery for a large cyanide plant, state press reports, to treat the tailing in the dump of the old stamp-mill. The tailing is said to average in assay $3 per ton.

CALIFORNIA

Amador County

(Special Correspondence.)—The new 500-hp. Westinghouse motor has been installed at the Argonaut, together with the attendant rope-transmission system. Hitherto water-power has been used for motive purposes, but the hoist will in future be actuated electrically. The Argonaut shaft has a depth of over 3700 ft., including the sump. The mill has forty 950-lb. stamps, crushing 200 tons per day. The stamps are divided into eight batteries, with five stamps to a battery. The ore is broken in a rock crusher before passing to the mill. From the plates the product goes to sixteen 8-ft. Frue vanners. It is rumored that the South Amador company has obtained an option on the adjoining Champion claim. The Kennedy Extension has suspended operations. This property adjoins the Argonaut on the south and a suit has been pending between the two companies over a disputed piece of territory. Rumors of a compromise are in circulation. R. S. Rainsford is manager for the Argonaut.

Jackson, October 7.

Calaveras County

(Special Correspondence.)—A bond and lease has been taken by O. Bergstrom on the Old Homestead mine, which was operated five or six years ago by the Wilbur Womble M. Co., but which closed down on account of the financial difficulties of the latter company. The mine is about three miles from Copperopolis, and Mr. Bergstrom will proceed to drive a 300-ft. adit below the old workings, which should give about a 200-ft. back of ore. The old company had about 3 ft. of $9 ore in its stopes, and if the results of the present prospecting are satisfactory, steps will be taken to construct a mill. At the Lightner pyrite mine, near Copperopolis, Messrs. Mudd, Peyton, and Elsasser are engaged in diamond drilling to explore the orebody, which is a large mass of heavy pyrite, locally containing fair amounts of chalcopyrite. It is expected that the ore will prove valuable for burning in the production of sulphuric acid.

Copperopolis, October 6.

Eldorado County

The John A. Sowell M. Co. has bought the Mt. Gregory Con. gravel mine of Porter Phillips and his associates, according to reports from Georgetown. The mine contains 120 acres of placer ground.

Plumas County

The Neocene M. Co. has decided not to resume operations at the Scales Diggings gravel mine for some time, according to despatches from Quincy, as it will be impossible to finish the restraining dam in time for the rainy season.

COPPEROPOLIS, LOOKING SOUTHEAST.

Siskiyou County

(Special Correspondence.)—C. L. Mattfeldt of San Francisco, and Lee W. Foster, of Trail creek, have taken a bond on the Beaudry-Heinzey quartz property, Fox Creek district. The option was taken on behalf of San Francisco capitalists. Edward C. Reed has concluded an examination of the Big Cliff group, on South Russian creek. The property is owned by Wintering & Osgood of Seattle, but it is understood that a strong Eastern company is planning the acquisition of the mine. The main orebody is an immense vein of low-grade ore. It is announced that operations are to be resumed at the McKein, situated near Callahan. The 100-ft. shaft will be sent 200 ft. deeper, in the hope of striking the old vein below water-level. The Michigan Salmon River Co. is arranging for a busy season. The big hydraulic elevator successfully handled the ground last season, and operations will be conducted along broader lines. At present the company is mining on Hookerfield bar. A small cyanide plant has been installed at the Orfield & Frainer property, on Somes bar. A small vein of rich quartz has been intersected. The Bonally company is reported to have entered the old channel on the Pollaz bar section of the Salmon river. The gravel is said to contain much gold. Milling ore is being stoped on two levels at the Sherwood mine, Blue Lake district. A 5-stamp mill has been installed; also a Frue vanner. About 160 tons of ore is on the dump, with a similar amount blocked out in the mine. At the Highland, near Etna, rich ore continues to be opened. Two shifts are at work.

Etna, October 7.

Tuolumne County

(Special Correspondence.) A cave in the north drift on the 400 ft. level of the Providence mine has exposed a vein of rich ore from 2 to 5 ft. wide. A body of good ore was also found on the 200-ft. level. The shaft has been cleared of obstructions and retimbered to the fourth station. This work will continue to the bottom, and at the same time preparations will be made for the extraction and milling of ore from the new rich vein. The property is owned and worked by the New Providence Gold Mining Co., John F. Bluett, of Oakland, being the president and general manager. J. Chapman is superintendent.

The Carlotta-Pennsylvania mine, one mile north of Tuolumne, was bonded this week to a new company and preparations were at once started for commencing operations. A new head-frame is being erected, and the company also will sink the Carlotta shaft 300 ft. deeper. From the bottom, 500 ft. below surface, a drift will be driven about 400 ft. to the Pennsylvania shaft, which in the meantime will be sunk to 500 feet.

The adit being driven at the Italian Camp mine, near the old Belleview, is in 250 ft., exposing an immense vein containing a large percentage of high-grade sulphide and some free gold. There is a 4-stamp prospecting mill on the property. It is reported that the gravel mining property of Messrs. Keeler, Bennett, and Bates, at Red Mountain bar, on the Tuolumne river, will shortly pass under bond to mining men operating on the Merced river. It is understood that a suction dredge will be used. The Clio mine has been unwatered and development is now in progress. The mill at the Crystalline was started October 1. A large crew of men is employed. Near Camp Relief, which is several miles from the nearest mine of note, a promising quartz claim is being developed. It is owned by J. B. Bovey, of Oakdale, and is called Good Fortune. A shaft has been sunk 47 ft., showing a strong vein of ore 4 ft. wide which assays from $2.50 to $61 per ton. Of the numerous assays made in different parts of the State the majority showed between $40 and $50 per ton. A hoist for next year's work is planned. The vein outcrops in many places within a distance of three miles.

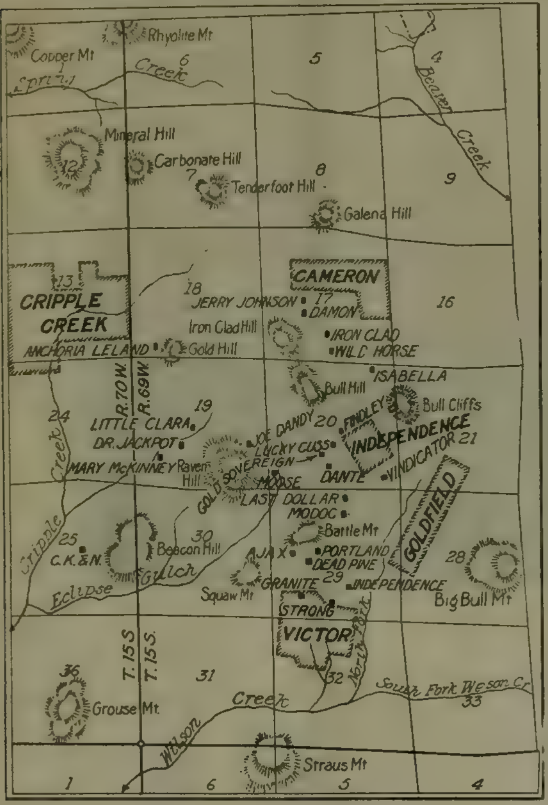
At the New Albany, one of the group owned by the United Mines Corporation, large bodies of high-grade ore are being opened and the outlook is growing better day by day. On the 925-ft. level the vein is 5 ft. wide, some of the ore going as high as $100 per ton.

Tuolumne, October 7.

COLORADO

Clear Creek County

(Special Correspondence.)—It is reported that W. E. Renshaw, representing Eastern capitalists, is negotiating the purchase of the Centennial mine on Leavenworth mountain for $125,000. A 6-in. streak of ore is reported to have been found on the New York property of the Crown Prince Con. M. Co. at Williams Forks. Frank Brady, of Empire, is manager of the mine. An 8-in. streak of heavy lead ore assaying 42% lead and 37 oz. silver per ton has been found in the breast of the Zalmingo adit on Lincoln mountain. The lower adit of Bard Creek M. Co., now in 800 ft., has intersected a vein assaying $67 per ton in gold, silver, and lead. A pipe-line has been laid from the Terrible compressor-plant on Brown mountain to the Smuggler mine to furnish air. B. C. Catren will award a contract in a few days for extending the west drift from the fourth level another 500 ft. The Dives-Pelican & Seven-Thirty M. Co. has obtained a lease on the Mendota power plant to furnish air to the Seven-Thirty and Zero mines. G. W. Tarkington is manager for the company.



MAP OF CRIPPLE CREEK DISTRICT.

Georgetown, October 9.

Gilpin County

(Special Correspondence.)—The Tucker mill has been leased to C. A. Jackson & Co. The capacity is 60 tons per day. Custom ore is being treated. Work is to be resumed on the Sleepy Hollow mine. The workings are clear of water down to the 600-ft. level. J. Tuckfield has put work under way on the Castle Rock property in Quartz Valley district. The shaft is down to a depth of 250 ft. Sinking and driving will be done.

Central City, October 7.

Gunnison County

It is reported in Crested Butte that a mill may be built by the Italian Mt. M. Co. to handle the large amount of low-grade ore already on hand. The officers of the company will visit the property in the near future. They reside in Paris, France.

Ouray County

A. Thompson, receiver for the Red Mountain Railroad M. & S. Co. has announced that work will be done on the Gold Lion and other properties.

Teller County

The Empire State claim near Cripple Creek has been blocked out and will be leased in blocks. Already eight leases have been granted.

A. J. Dell and J. Hammond, operators of the Ocean Wave claim on Battle mountain, have secured a lease on the Corolanus dump, which is said to be rich in silver.

The dumps on the Cresson property, Cripple Creek, have been leased to Denver people who will erect a 100-ton mill. The ore is said to assay from $3 to $5 per ton.

IDAHO

Idaho County

The owners of the Last Chance mine, state reports from Elk City, have purchased the Fudge 2-stamp mill at Newsome, and will erect it on their property. James P. Larsen, one of the owners, is superintendent of the property.

MONTANA

Silverbow County

(Special Correspondence.)—The official figures of the copper production of the Anaconda Copper M. Co. for the month of September shows a decrease of 1,200,000 lb. as compared with August. The figures for the past month are: Washoe smelter, 15,900,000 lb.; Great Falls smelter, 5,400,000 lb. The figures for August were: Washoe smelter, 16,000,000 lb.; Great Falls smelter, 6,500,000 lb. In these figures are included the output each month of the North Butte and Tuolumne mines. During the past month the North Butte company produced 2,100,000 lb. and the Tuolumne 500,000 lb., which would bring the actual amount of copper turned out by the Anaconda company down to 18,700,000 pounds.

It is now definitely stated that work on the Butte & Superior concentrator on the company's property will be commenced within a few weeks.

The Tuolumne company has passed its dividend on account of the heavy expense incurred in building a spur from the mine to the Butte, Anaconda & Pacific railway tracks to do away with the wagon hauling of ore and the expenditure in connection with the installation of the new surface plant. At present sinking and development work are going on on the 1000, 1200, 1400, and 1600-ft. levels and a large quantity of ore is being blocked out. On the lower level the ore will average 10% copper; the body is a large one. When sinking of the shaft was stopped several months ago a depth of 1650 ft. had been reached. It was resumed a month ago and now a depth of about 1750 ft. has been attained. When the 1800-ft. depth is reached a station will be cut and then sinking will be resumed and the shaft carried to a depth of 2000 ft., where another station will be cut. There is no decision yet as to going any deeper at the present time, although there is no doubt that early next year the shaft will be deepened by several hundred feet.

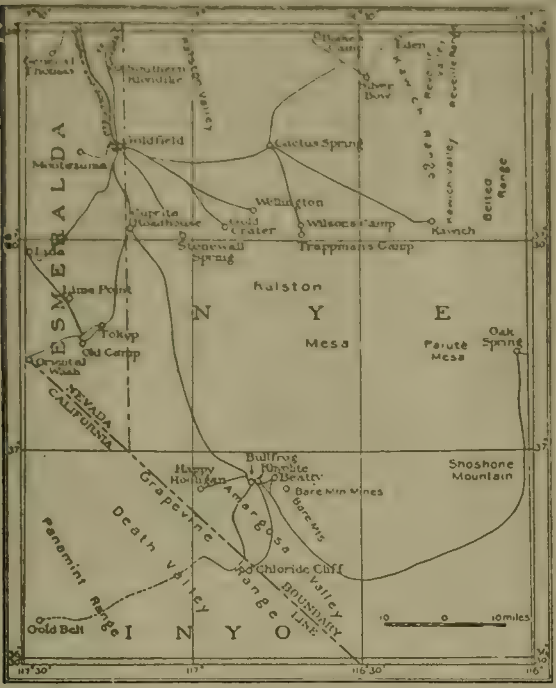
A story published in some Eastern papers to the effect that the North Butte company in cross-cutting on the vein from the 2800-ft. level had struck the Jessie vein, is absolutely without foundation. It will be in the vicinity of a week yet before the station is completed on the 2800-ft. level, and those who are figuring closely on the subject estimate that it will be at least a week and possibly two weeks after the cross-cutting is started before the vein is found.

Butte, October 9.

NEVADA

Esmeralda County

(Special Correspondence.) — Announcement was made Friday evening by J. Ross Clark, president of the Goldfield Deep Mines Co. and of the Las Vegas & Tonopah railroad, at a banquet tendered him at the Goldfield hotel by business and mining men of the district, that operations will start at once on the ground of the Goldfield Merger Mines Co., control of which has been acquired by the Deep Mines Co. L. H. Metzger, for three years past foreman of the Clermont, Red Top, and Laguna mines of the Consolidated, has been appointed general manager for the Merger Mines Co. and for the past month or more has been at Butte, Montana, making a study of hoisting equipment. He will erect a temporary hoist with sinking capacity of 350 to 400 ft., and when this depth is attained the large plant, one of the most complete and powerful in the country and with a capacity of sinking 2000 to 2400 ft., will be installed, together with compressor plant and necessary buildings to house all equipment and a monster steel head-frame. J. B. Fleming, who erected the Consolidated mill and Nevada Hills mill at Fairview, is preparing the plans for the construction of the large surface plant. Mr. Clark stated that it will probably require four months at least to complete the larger plant, but that sinking will begin at once. Mr. Metzger, the manager, has already engaged the greater part of his working force, and the work of preparation for active sinking is now in progress. A four-compartment shaft, 1500 or 2000 ft. deep, is planned. At a meeting of the Merger Mines Co. directors here it was decided to effect, arbitrarily if necessary, the final exchange of St. Ives Mining stock for that of the Merger Mines Co., of which the former is one of the components. November 6 was named as the last day upon which the St. Ives stock will be received in exchange.



MAP OF SOUTHWESTERN NEVADA.

The Florence Goldfield continues its established production of 170 tons per day, and is making a satisfactory recovery of gold from a comparatively low-grade ore.

Preliminary estimates of production by the Consolidated Mines Co. in September place the gross recovery from 26,766 dry tons at $650,000, total costs at $225,000, and net profits at $425,000. The preliminary estimates have almost invariably been well below the final returns. At the Vernal, driving is in progress at a depth of 115 ft. on the vein from which the adjoining Goldfield Belmont is extracting and shipping ore of excellent quality on its 300-ft. level.

Goldfield, October 7.

Nye County

(Special Correspondence.)—The Mineral Hill Consolidated is now in complete control of the Mineral Hill, St Paul, and Minneapolis properties, comprising nine full claims. The company will operate the leases formerly controlled by the East Side M. & L. Co., and is the only owning concern in Manhattan to operate on its own acount. The new company is controlled by San Francisco people. Alexander Hamilton, of Baker & Hamilton, is president.

Manhattan, October 7.

Storey County

The north end of the Comstock district in September produced ore valued at more than $160,000, of which the Ophir produced $94,562 and the Mexican $66,895.

C. & C. SHAFT, VIRGINIA CITY.

Washoe County

(Special Correspondence.)—The Trojan M. & M. Co. has taken a lease on the Bargo M. & M. Co.'s property and mills at Jumbo. Unwatering the mine is under way and active operation will be started in the near future. W. E. Turley, of Reno, is superintendent of the property. The post-office address of the company is Washoe.

Washoe, October 9.

White Pine County

The settling of the labor strike at the Veteran mine will not make possible the immediate resumption of work there, acording to a statement by C. B. Lakenan, general manager for the Nevada Con. Copper Co. Timbers and supplies will have to be obtained, and it will not be until the latter part of this month that ore shipments will be commenced.

NEW MEXICO

Socorro County

(Special Correspondence.)—A considerable flow of water was found in the face of the main drainage and transportation adit of the Oaks Co., and it is now thought that this bore will furnish more than sufficient water to supply the central milling plant to be built near the portal. Arrangements have been completed for the operation of the Pacific mine, adjoining the Confidence on the north.

Another contract for 2500 cords of wood was recently let by the Socorro mines to fortify against possible shortage prior to the completion of their high-compression oil-engine plant, work on which is under way. The final equipment for the latter will not be received until February.

A contract has been let to drive 300 ft. south on the 300-ft. level of the Deadwood mines, in the face of which a fine grade of milling ore is exposed. The mill is running steadily.

Mogollon, October 7.

OREGON

Baker County

The Ben Harrison M. Co. has made its second payment of $10,000 on the Ben Harrison mine. The price is $40,000, of which half has been paid. Further sinking will be done to a depth of 300 ft., when a mill will be erected.

Curry County

A No. 3 giant and 10-in. pipe have been ordered by the Winkle Bar M. & D. Co. A 4-ft. ditch, about one and half miles long, has been completed and it is believed that this will give plenty of water for mining from January to the end of May. The property is on Rogue river and is reached by going over a mountain trail. It is twenty miles from Dotham. R. G. McDonald, of Seattle, is secretary and treasurer of the company.

JOSEPHINE COUNTY

George E. Sanders, manager for the Chicago-Rogue River company, has purchased the Old Channel mine in the Galice district. The Old Channel mine is a large low-grade placer property with valuable water-rights and many miles of ditches and flumes, according to press reports, and when in operation employs a large force nine months of the year. Mr. Sanders will start work in the near future. He is now in Chicago.

UTAH

JUAB COUNTY

The Centennial-Eureka M. Co. paid a dividend of $3 per share on September 30. A similar dividend was paid last April. The United States S. R. & M. Co. owns 99,864 of the 100,000 shares of the Centennial-Eureka company, which since its organization in 1906, has paid dividends amounting to $33 per share. Two $3 dividends were paid last year.

The Opex Con. M. Co.'s report for the year ended September 30 shows that $254,449 was spent during the year. Part of the expenditure was on cross-cuts driven for neighboring companies, on contract, for which $33,667 was received. Five assessments were made during the year, from which $132,000 was received. Thus far the prospecting done has not found the vein within the Opex limits, although hopes are held that more efforts may be successful. While there was an overdraft of $5251, it is believed that if the balance of the assessment is paid there will be about $1500 in the treasury. The salary of the general manager is reported to be $15,000. At the annual meeting in Provo, Jesse Knight was re-elected president.

The Gemini M. Co. has paid a dividend of $6 per share, its first since August 1907. The present payment makes a total of over $2,000,000 paid in dividends. The company is planning to buy a new pumping plant, preparatory to deep mining.

SALT LAKE COUNTY

The Utah Con. M. Co. has declared a dividend of 50c. per share payable November 14 to stockholders of record October 21. This is the first dividend since January 1910, when decreased reserves and earnings stopped returns to stockholders. Roscoe H. Channing, consulting engineer for the company, was elected president. The company ships its copper ores to the International S. & R. plant at Tooele, and when the latter company is prepared to do lead smelting, will ship from the lead ore already already developed on the property. The annual meeting of the company was held October 7.

TOOELE COUNTY

The gross value of the gold produced by the Con. Mercur G. M. Co. in the year ended June 30, acording to the annual report recently issued, was $550,695. With dividends from the Gold Water Belt Co., ground rent, sale of base bullion, and money from other sources, the gross receipts of the company were $558,629. Operating expenses amounted to $558,133, the net profit being $496. The total assets are $85,112. The Mercur mine, originally operated by the Mercur G. M. & M. Co., organized in 1890, is about exhausted. In accordance with a plan formed a year ago to find a new mine so that the company need not go out of existence, several properties have been inspected, but none hsa been purchased.

WASHINGTON

FERRY COUNTY

(Special Correspondence.)—The Ben Hur Leasing Co. has sunk the Ben Hur shaft 74 ft. below the 300-ft. level and plans to have it down and timbered to the 400-ft. level by September 12.

On the 400-ft. level of the Quilp mine a stope 9 ft. wide is yielding ore that assays about $45 per ton. From the vein on the 500-ft. level the ore during the past week has not been as good as usual, the shipments having averaged only about $40 per ton.

The Republic Mines Corporation has been mining ore on the 300-ft. level of the Surprise mine the past week that averaged about $22 per ton in the south drift and raise and better than $80 per ton in the north drift.

The Imperator-Quilp M. Co. is building a new blacksmith and machine-shop; the one formerly used is to be made into the miners' changing room.

Republic, October 7.

H. J. Lefevre of Spokane acquired the Keller & Indiana smelter and sawmill at Keller, for $2686.60 at a sheriff's sale recently. The property has been valued at $250,000. The smelter, which is of 150 tons, and the water-power available, will be of advantage to the Keller mines, of which Mr. Lefevre is one of the owners. Mr. Lefevre also secured several hundred tons of ore and 60 tons of coke now at the smelter. Repairs on the plant will be made at once.

STEVENS COUNTY

The Granby Con. M. S. & P. Co. has bonded the Copper Queen mine, in Chewelah camp, for $400,000 and will erect bunk and boarding-houses and office rooms and will employ a large force of men on the property.

A contract has been let to drive 200 ft. of the lower adit on the Chickamun group, in Orient district, owned by the Michigan M. Co. Work has been suspended on the Alice E. mine.

CANADA

ONTARIO

(Special Correspondence.)—A meeting of the directors of the Porcupine Gold Mines Company was held in New York yesterday. The secretary of the company announced that sufficient treasury stock had been sold to provide ample funds for thorough mine development and the construction of a 100-ton mill.

The manager of the company was instructed by wire to rush the delivery and construction of the mill. The secretary also stated that all outstanding indebtedness of the company had been fully paid.

John M. Godfrey of Toronto, who represents the original owners of the Vipond mine, was elected to the Board.

Porcupine, October 4.

The Pearl Lake M. Co. is planning to sink a 3-compartment shaft to a depth of 600 ft., according to late reports. Four mineralized zones were discovered in a 900-ft. hole made with a diamond-drill. At the 400-ft. level dark schist mixed with quartz, assaying $21 per ton, was found. Above that level ore assaying as high as $58 per ton was found with the diamond-drill.

MEXICO

CHIHUAHUA

The Tajo mine will be reopened October 15 by the Arizona-Parral M. Co., state reports from Parral. H. H. Utely is manager of the property.

An electric hoist is to be erected at the Eureka mine, near Parral, and other improvements will be made. Development will be rushed in the Providencia mine, where high-grade ore recently was found. Work also will be resumed on the 23rd of July property. Edmund Putnam, of Parral, is in charge of the mines.

Work will be resumed in the near future at the Iberia mine, according to reports following a meeting of the company in charge at Jiminez recently. The mine has not been operated for some time.

(Special Correspondence.)—The Rio Plata M. Co. in August received a net return on shipments of $38,714. The stamp-mill crushed 1110 tons of ore, from which 43,636 oz. of silver was obtained, and 14 tons of concentrate. The cyanide plant treated 1783 tons of tailing, which contained 62,087 oz. of silver. The operating profit was $23,560. Expenditures on development amount to $834.

Chihuahua, October 5.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS

POWER OF MINING CORPORATION TO GIVE MORTGAGE

The statute of California prohibits the directors of any mining corporation from mortgaging any mining ground unless ratified by the holders of two-thirds of the outstanding stock. The ratification contemplated by the statute may be made either in writing or by resolution. The want of authority of the directors of a mining corporation to mortgage mining ground without the consent or ratification of the stockholders, may be raised by anyone who connects himself with the title of the corporation, as well as by any stockholder. This ratification or consent of the stockholders cannot be presumed from the mere fact of the conveyance made by the corporation, as the ratification contemplated by the statute is made after the mortgage is executed. And a mortgagee who accepts a mortgage from a mining corporation and who does not show a ratification by the stockholders, cannot question the validity of another mortgage on the ground that the stockholders did not consent to it.

Bennett *v.* Red Cloud Mining Co., (Cal.) 113 Pacific, 109. Jan. 1911.

INJURY TO MINER—ASSUMPTION OF RISK

A mucker in a mine in a gravel formation discovered a crack in the top of a drift or tunnel running lengthwise of the tunnel. This crack was some five or six feet in length and large enough for the miner to put his fingers in. The attention of the mine-owner was called to the crack, who examined it and said that it looked bad. He then picked at the crack with the miner's pick and afterward said to the mucker: "It is all right. You must shift all loose dirt. You keep working until six. When you quit I will put props under it and hold it up." The miner continued work and in a few minutes a chunk of hard gravel fell from the roof of the tunnel and injured the miner. On appeal from a judgment in favor of the injured miner, it was insisted he had assumed the risk of the danger by continuing the work in a dangerous place. In answer to this the Supreme Court of Washington says that where a question of danger arises and there is a difference of judgment between the master and the servant, and the master assures the servant that it is safe to proceed with the work, the servant proceeds at the risk of the master, and the servant in such case does not assume the risk, unless it appears that there is a new condition following the assurance of the master. The rule of law on this subject is that "where the menace is so uncertain as to cause discussion between the employees and the employer, with the result that the employer dissuades the employee from his apprehension," then the employer is not exempt from liability for injuries to an employee. The miner in this case also had a right to rely upon the promise to repair. The rule on this subject is that where an employer's promise to repair is an inducement to the employee to continue work, he can do so without assuming the risk, unless the danger is sufficient to deter a man of ordinary prudence from continuing the work.

Beseloff *v.* Strandberg, (Washington) 113 Pacific, 250. February, 1911.

LOCATION OF MINING CLAIM—MARKING OF BOUNDARY LINES

The United States statute provides that a mining claim located on the public land shall not exceed 1500 ft. in length alongside the vein or lode, and shall not be more than 300 ft. on each side of the centre of the vein on the surface. Another section provides that locators of mining claims, so long as they comply with the law and local regulations, shall have the exclusive right of possession and enjoyment of all the surface included within the lines of their location, of all veins, lodes, and ledges throughout their entire depth, the top or apex of which lies inside of such surface lines extended downward vertically. Another section requires the locations to be distinctly marked on the ground so that the boundaries can be readily traced. The statute also provides that the owner may obtain a patent from United States by procuring the Surveyor General to survey and plat the same, filing his application in the proper land office and giving the required notice. Under these statutes the grant of the exclusive right to possession on the ground included within the lines of a location is a present grant, and takes effect from the date of the location, and the locator who has established his side lines in good faith is protected against subsequent locators on the land included within the lines as originally located, though it may subsequently develop that by reason of an inaccuracy in the location of the vein or lode, the side lines at the end were more than 300 ft. distant from the centre of the vein. The rule preventing a locator from claiming the excess as against a subsequent locator of adjoining ground, where the side lines are more than 300 ft. from the apex of the vein, does not apply where a claim of the statutory size is originally located in good faith, but through a mistake as to the actual location of the vein as discovered by subsequent exploration, the side lines are in fact more than 300 ft. from the centre.

Harper *v.* Hill, (Cal.) 113 Pacific, 162. Jan. 1911.

Book Reviews

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

PRECIOUS STONES. By John Mastin. Pp. 114. Index, pocket size, flexible back. E. & F. N. Spon, London, 1911. Price $1. For sale by the *Mining and Scientific Press.*

This little booklet treats in simple language of the chemistry, properties, and tests of precious stones. The tables of hardness and specific gravity are full and convenient, and to those outside the trade the discussion of imitations and their detection will be of particular interest. The book is un-illustrated and not comparable to the well known work of G. F. Kunz—occupying, indeed, quite a different field. Exception will probably be taken by geologists to Mr. Mastin's conclusions regarding the origin of precious stones. We believe that, while it is true there is room for difference of opinion, investigators generally consider them related to deep-seated igneous and metamorphic agencies rather than to surface waters, even allowing that the latter have penetrated deep into the earth's crust.

THE COPPER HANDBOOK, Vol. X, 1910-1911. By Horace J. Stevens. Houghton, 1911. 1897 pp. + index. Price $5. For sale by the *Mining and Scientific Press.*

The 'Copper Handbook' is so well known as to merit a welcome rather than a review. The tenth volume differs from the ninth chiefly in the additions and alterations made in the descriptions of the copper mines and copper mining companies throughout the world, 8130 in number, which are treated at length in the case of important producers, or dismissed with few lines in the case of dead companies. In this field it is a standard of reference. The first twenty-three chapters, dealing in an admirable way with the history of copper production, the geology, chemistry, and mineralogy of the metal, mining, milling, and smelting, the mechanical technology of copper, and the occurrence and distribution of copper deposits throughout the world, are identical with those of the preceding volume. The technology of the milling and smelting of copper ores has made such rapid progress of recent years that a description prepared two years ago is likely to be *passé,* and it is a tribute to the care with which the volume has been prepared that this is not markedly the case. Much of the general information contained in the volume is not easily available elsewhere, and in the field of detailed information regarding companies engaged in the production of copper, this publication is without a rival. The policy of publishers in sending the volume on approval is an excellent one, and the latest volume deserves and is likely to receive the welcome accorded its predecessors.

Personal

Professional men are invited to send news of their engagements and travels. This news is interesting to friends.

F. J. H. Merrill is in [illegible].

F. [illegible] is in San Francisco.

[illegible] Moore has returned to Los Angeles.

George H. [illegible] has returned to San Francisco.

G. [illegible] was in San Francisco last Saturday.

[illegible] has returned from Austin, Nevada.

F. M. [illegible], of Virginia City, is in San Francisco.

W. G. [illegible], of Los Angeles, is in San Francisco.

H. A. [illegible] has been examining mines in California.

[illegible] has been examining properties in Tuolumne county, California.

[illegible] T. [illegible] has moved his office from Denver to 42 Broadway, New York City.

T. [illegible] recently examined some properties in the Tombstone, Arizona, district.

Sumner S. Smith was at Ketchikan recently, and will spend this month in the vicinity of Juneau.

B. R. Bayne is now manager for the [illegible] Extension Syndicate, Ltd., at Guadalupe y Calvo, Chihuahua.

Victor G. Hills is on his way to Colorado to make an examination there and will return to the [illegible] Mining Co., Nova Scotia, about October 20.

J. Malcolm Maclaren and W. J. Loring were in San Francisco last week and have gone to the Mother Lode region for an extensive tour of inspection.

Gelasio Caetani and Robert MacBoyle went to Humboldt county, Nevada, on Monday. Mr. Caetani will go on to Colorado, and Mr. MacBoyle will remain in Nevada for three or four weeks.

South Dakota's Metal Output, 1910

The mine production of gold, silver, and lead in South Dakota in 1910, according to C. W. Henderson, of the U. S. Geological Survey, was valued at $5,467,[illegible], against $[illegible],319, which included also the value of the copper output in 1909. The gold production decreased from $[illegible] to $5,402,557; the silver production from 144,273 oz., valued at $[illegible], to [illegible] oz., valued at $[illegible]; and the copper output from [illegible] lb., valued at $[illegible], to nothing; but the lead output increased from 1512 lb. in 1909 to 14,[illegible] lb. in 1910. The amount of ore sold or treated decreased from 1,794,141 short tons in 1909 to 1,[illegible] tons in 1910. Of the total State output in 1910, Lawrence county produced all but a small part of the gold and silver, and all of the lead. The famous Homestake mine alone produced over 75% of the precious-metal output. Labor conditions in the Black Hills in the early part of 1910 were the cause of the decreased production, and an increased output may be expected for 1911. The total production of gold in South Dakota since the discovery in 1877 and to the close of 1910 has been $[illegible].

Gold, Silver, and Copper in Wyoming, 1910

The total value of the production of gold, silver, and copper in Wyoming in 1910, according to C. W. Henderson, of the United States Geological Survey, was $[illegible], against $[illegible] in 1909. The gold yield was $[illegible], against $[illegible] in 1909; silver 1478 oz., valued at $[illegible], against 1767 oz., valued at $[illegible]; and copper 222,[illegible] lb., valued at $[illegible], against [illegible] lb., valued at $[illegible]. The amount of ore sold or treated was [illegible] tons, against [illegible] tons in 1909. There were 12 producing mines in Wyoming in 1910, of which 4 were gold placer mines. Copper has been the most important metal produced in Wyoming, and the State is to be credited with a total output of [illegible] lb. of copper from 1881 to 1910, inclusive.

Market Reports

LOCAL METAL PRICES

San Francisco, October 11.

Antimony	[illegible]	Quicksilver (flask)	[illegible]
Electrolytic copper	[illegible]	Tin	[illegible]
Pig lead	[illegible]	Spelter	[illegible]

Zinc dust, 100 lb. casks, per 100 lb. [illegible]

METAL PRICES

(By wire from New York.)

Average daily prices in cents per pound.

Date	Electrolytic copper	Lead	Spelter	Silver, per oz.
Oct. 5	[illegible]	[illegible]	[illegible]	[illegible]
" 6	[illegible]	[illegible]	[illegible]	[illegible]
" 7	[illegible]	[illegible]	[illegible]	[illegible]
" 8	Sunday	No market		
" 9	[illegible]	[illegible]	[illegible]	[illegible]
" 10	[illegible]	[illegible]	[illegible]	[illegible]
" 11	[illegible]	[illegible]	[illegible]	[illegible]

ANGLO-AMERICAN SHARES

(Quoted from London.)

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

	Oct. 4 £ s. d.	Oct. 11 £ s. d.
Camp Bird	[illegible]	[illegible]
El Oro	[illegible]	[illegible]
Esperanza	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible] Dredging	[illegible]	[illegible]
Mexico Mines	[illegible]	[illegible]
Tomboy	[illegible]	[illegible]

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing Prices Oct. 11.		Closing Prices Oct. 11.
Amalgamated Copper	$ [illegible]	La Rose	$ [illegible]
[illegible]	[illegible]	Mason Valley	[illegible]
Braden Copper	[illegible]	Miami Copper	[illegible]
B. C. Copper Co.	[illegible]	Mines Co. of America	[illegible]
Butte Coalition	[illegible]	Nevada Con.	[illegible]
Chino	[illegible]	Nevada Utah	[illegible]
Davis Daly	[illegible]	Nipissing	[illegible]
Dome	[illegible]	Ohio Copper	[illegible]
Dolores	[illegible]	Ray Central	[illegible]
First National	[illegible]	Ray Con.	[illegible]
[illegible]	[illegible]	South Utah	[illegible]
[illegible]	[illegible]	Superior & Pittsburg	[illegible]
Goldfield Con.	[illegible]	Tenn. Copper	[illegible]
Greene-Cananea	[illegible]	Trinity	[illegible]
[illegible]	[illegible]	Tuolumne Copper	[illegible]
Hollinger	[illegible]	United Copper	[illegible]
Inspiration	[illegible]	Utah Copper	[illegible]
Kerr Lake	[illegible]	Yukon Gold	[illegible]

COPPER SHARES—BOSTON.

(By courtesy of J. C. Wilson, Mills Building.)

	Closing prices Oct. 11.		Closing Prices Oct. 11.
Adventure	[illegible]	Mohawk	$ [illegible]
Allouez	[illegible]	North Butte	[illegible]
Calumet & Arizona	[illegible]	Old Dominion	[illegible]
Calumet & Hecla	[illegible]	Osceola	[illegible]
Centennial	[illegible]	Parrot	[illegible]
Copper Range	—	Shannon	[illegible]
Daly West	—	Superior & Boston	[illegible]
Franklin	[illegible]	Tamarack	[illegible]
Granby	[illegible]	Trinity	[illegible]
Greene-Cananea Cal.	[illegible]	Utah Con.	[illegible]
Isle Royale	[illegible]	Victoria	[illegible]
La Salle	[illegible]	Winona	[illegible]
Mass Copper	[illegible]	Wolverine	[illegible]

NEVADA STOCKS

(By courtesy of San Francisco Stock Exchange.)

San Francisco, October 11.

Atlanta	$ [illegible]	[illegible]	$ [illegible]
Belmont	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	Montana-Tonopah	[illegible]
[illegible]	[illegible]	Nevada Hills	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Combination Fraction	[illegible]	Pittsburg Silver Peak	[illegible]
[illegible]	[illegible]	Round Mountain	[illegible]
Florence	[illegible]	Sandstorm Kendall	[illegible]
Goldfield Con.	[illegible]	Silver Pick	[illegible]
[illegible]	[illegible]	Tonopah Extension	[illegible]
Jim Butler	[illegible]	Tonopah of Nevada	[illegible]
Jumbo Extension	[illegible]	[illegible]	[illegible]
MacNamara	[illegible]	West End	[illegible]

Company Reports

ALASKA TREADWELL GOLD MINING COMPANY

The twenty-first annual report, for the year ended May 31, of the Alaska Treadwell G. M. Co., which has mines and works on Douglas island, Alaska, shows a net profit for the year of $710,312. Operating costs amounted to $1,177,253, of which $857,813 was paid for mine development, $157,263 in milling expenses, and $88,777 for treatment of sulphides by the Tacoma Smelting Co. and in the cyanide plant. Construction and repair costs amounted to $18,696. After deducting the Alaska United G. M. Co. gross returns from the 700 Ft. Claim, ore crushed in Treadwell mills, the company received by bullion account $1,811,285. It received in interest $8405, and in commercial profits from supplies, foundry, butcher-shop, boarding-house, and coal, $86,572, making total receipts for the year of $1,906,262. No sulphides are on hand. A surplus of $86,294 was carried over. No work was done in the open pits, but in the eight levels of the mine a total of 9150 ft. of development and exploration work was done, divided as follows: drifts, 1287; cross-cuts, 2249; raises, 3261; intermediate drifts, 1167; and stations, 1186 ft. The year before the company did 13,011 ft. of development work. In addition to this work, the company, during the year just closed, did 590 ft. of development work in the Alaska United G. M. Co.'s 700 Ft. Claim mine, against 979 ft. the previous year. A total of 770,084 tons of ore was sent to the mills, the figures including 600 tons of ore from the 700 Ft. Claim mine. The ore broken in both mines amounted to 996,368 tons, and the waste to 25,722, making a net increase in ore broken of 226,284 tons. The ore reserves, above the 1600-ft. level on May 15 were as follows: ore in place, 5,408,960; broken ore in stopes, 1,228,410; making a total of 6,637,370 tons. The ore above the 1750-ft. level is not sufficiently developed to estimate. The estimated ore reserve for the previous year was 744,226 tons. The ore sent to the mill the previous year amounted to 744,226 tons and had an average assay value of $2.95 per ton, including the value of the tailing. The ore for the year just closed had an average assay value of $2.53 per ton. The total number of feet drilled in the mine for the year was 920,545, and the number of tons broken, 1,021,765, making an average of one ton broken per 0.9 ft. drilled. The average costs were: for labor drilling, $6.86; explosives, $2.62; supplies, power, and repair, $4.02. The figures are for both the Treadwell and the 700 Ft. Claim mine of the Alaska United. An average, in both mines, of 43.87 machines per shift of 10 hours was used during the year. The average drilling of one machine per shift was 29.4 ft., and the average amount of ore broken per machine per shift was 32.74 tons. The average assay value of 3444 samples taken in the Treadwell mine during the year was $3.04. The mill-record of the 240-stamp mill shows that it was operated about 182 days on steam-power, 168 on water-power, and was idle 15 days. The ore crushed amounted to 395,332 tons, an average of 4.71 tons per stamp per 24 hours, from which 7339 tons of sulphides was saved. The quicksilver used amounted to 75,345 oz. The free-gold output in value was $566,639, and concentrate output was $371,377. The total value of tailing was $86,391. The gross output was $1,024,407. The quicksilver lost in the retort and mill was 27,188 oz., or 36.08%. The 300-stamp mill worked about 210 days on water-power, and 17 days on electricity, and lost 138 days, crushing 374,752 tons of ore, an average of 5.5 tons per stamp per 24 hours, from which 6607 tons of sulphides was saved. The quicksilver used amounted to 83,234 oz. The free-gold output was $510,255, and the concentrate output was $352,859 in value. The value of the tailing was $61,858, making a total gross output of $924,971. The quicksilver lost in retort and mill was 30,956 oz., or 37.19%. All dies for this mill were cast in the Treadwell foundry, but some of those used in the 240-stamp mill were chrome-steel, and some were from the Treadwell foundry. The stock of chrome-steel dies, which had been in stock for several years, is now exhausted. The Westinghouse-Parsons steam-turbine plant, and the hydro-electric plant on Sheep creek have been completed and are in use. A water-power site on Nugget creek, about 14 miles from Treadwell, has been purchased. The company's share in the above power properties is $147,841. After three years experimenting, a cyanide plant with a capacity of 100 tons per day has been built. With it the treatment of concentrate is cheaper than by shipping to the Tacoma smelter. The company's total expense to date for this is $123,333, of which $78,369 was spent last year. Owing to the press of the company's work, a large amount of outside business has been turned away from the machine shop. In the office-building a reinforced concrete, 2-story vault was constructed at a cost of $1398. A wharf for receiving explosives and other merchandise cost $6783. A 10,000-bbl. salt-water tank and pipe-line, for supply during the winter water shortage, cost $7236. Profit on merchandise sales amounted to $51,788. For the Treadwell club-house a tank and baths were built. During the year there were 19 accidents, of which 11 were fatal, giving a fatal-accident rate of 5.69 per 1000 for the 1935 employees exposed to risk. There has been a satisfactory labor supply for all departments. Wages range from $3 per day for mine laborers and blacksmiths' helpers to $120 per month for amalgamators; the average wage for the 740 men per day employed being $3.39 per day. The property and plant of the company, after writing off $100,000 for depreciation, are valued at $4,706,818.

WAIHI GOLD MINING COMPANY, LTD.

This company, which is capitalized at 500,000 shares of £1 each, owns 915 acres at Waihi in the Thames district, New Zealand. Three stamp-mills are in operation, the Victoria of 200 stamps, the Waihi of 90 stamps, and the Union of 40 stamps, a total of 330 stamps and 15 tube-mills. The report for the year ended December 31, 1910, shows that during the year 442,020 tons of ore was treated, yielding £926,100. The operating costs were as follows:

Mining	£142,776
Development work	20,071
Tramming ore to mills	5,609
Milling	55,146
Cyaniding ore and concentrate	78,947
Repairs to plants	10,510
Export duty on gold and rent to Government	19,162
Other expenses	47,556
Total	£379,777
Operating profit	£559,192

For depreciation on plant and machinery, £36,761, corresponding to 10%, was written off; £30,730 was expended on the construction of a hydro-electric plant; £18,474 was expended on capital account; £44,281 was paid as income tax; £10,000 was transferred to the reserve fund; four dividends of 4s. each, amounting to £396,725, were paid; a bonus of 2s. per share was paid on June 1, or a total of 18s. per £1 share, and £57,700 was carried forward. In its balance-sheet the company has an investment account of £242,195, chiefly in Government bonds. Since the formation of the company, 71 dividends have been paid, a total of £4,251,554. As the progress of development in the deep levels indicates that some of the veins are becoming impoverished in depth, and as the development work was not adding to the reserve an amount of ore equal to that being extracted, upon the recommendation of R. E. Williams, who was engaged to make a special report upon this question, the rate of milling will be reduced to 1000 tons per day until development work shows the necessary increase in ore reserve, which now amounts to 1,063,000 tons, not including a possible 600,000 tons in pillars. A hydro-electric power-plant is in course of construction at Hora Hora on the Waikato river, to utilize a fall of 24 ft. The power station will contain 6 turbines of 1500 hp. each, and the current, at 50,000 volts, will be transmitted 49 miles to the mine at Waihi.

Recent Publications

LEVANT TRADE REVIEW, published by the American Chamber of Commerce for Turkey. Vol. 1. No. 1. pp. 128. XX. illustrated.

REPORT ON MINING OPERATIONS IN THE PROVINCE OF QUEBEC, DURING 1910. Dept. Col. Mines & Fish., Mines Branch. Pamphlet. 104 pp. Quebec, 1911. A general report on mines and mining prepared by the Provincial Bureau.

STRUCTURAL MATERIALS. By Charles Butts, T. N. Dale, G. B. Richardson, E. W. Shaw, Alexander Deussen, and E. F. Burchard. Bull. 470-G., advance chapter from Contributions to Economic Geology, 1910. Pp. 134, index, maps, ill. Washington, 1911.

PROCEEDINGS OF THE SYDNEY ENGINEERING SOCIETY, Vol. XIV, 1909. Vol. XV, 1910. These two volumes contain a series of papers by well known engineers associated with Sydney University, most of which deal chiefly with mechanical or civil engineering topics, but those on 'The Coal Industry of New South Wales,' by F. Danvers Power, and on 'The Crushing Strength of Mine Pillars,' by Arthur Jarman, are of much interest to mining engineers.

THE UNITED STATES GEOLOGICAL SURVEY has recently distributed the following new publications: Geology and Ore Deposits of the Breckenridge District, Colorado, by F. L. Ransome, Prof. Paper 75, pp. 187, ill., maps, index; Coals of the State of Washington, by E. Eggleston Smith, Bull. 474, pp. 206, ill., maps, index; The Geochemical Interpretation of Water Analysis, by Chase Palmer, Bull. 479, pp. 31, tables; Results of Spirit Leveling in Montana, 1896 to 1910, inclusive, by R. B. Marshall, Bull. 482, pp. 154, index; Results of Spirit Leveling in Idaho, 1896 to 1909, inclusive, by R. B. Marshall, Bull. 487, pp. 46, index; The Production of Mineral Waters in 1910, by G. C. Matson, Advance Chapter from 'Mineral Resources,' pp. 40; The Gypsum Industry in 1910, by Ernest F. Burchard, Advance Chapter from 'Mineral Resources,' pp. 19, map; the Production of Quicksilver in 1910, by H. D. McCaskey, Advance Chapter from 'Mineral Resources,' pp. 20; The Production of Abrasive Materials in 1910, by W. C. Phalen, pp. 17.

Steel Corporation Pacific Coast Department

The United States Steel Products Co., which handles the export trade of the United States Steel Corporation subsidiaries, has organized a Pacific Coast department, which will have charge of selling and distributing its products on the Pacific Coast. The enlargement of the corporation's operations in that territory and the carrying of much larger stocks of finished material than heretofore were indicated some time ago by the acquisition of the Risdon Iron Works, with their extensive water frontage. It was then stated that the building of large warehouses was contemplated, particularly stocks of sheets and tin plates, pipe and tubes, wire products, structural steel and bars. The new department will not only sell from warehouse stock but for direct shipment from mill the product manufactured by the American Bridge Co., the American Sheet & Tin Plate Co., the American Steel & Wire Co., the Carnegie Steel Co., the Illinois Steel Co., the Lorain Steel Co., the National Tube Co., the Shelby Tube Co., and the Tennessee Coal, Iron & Railroad Company.

The warehouse business of the corporation on the Pacific Coast will also be consolidated under the jurisdiction of the new department, which will take over, carry, and handle the stocks of the subsidiary companies at the established distributing points in that territory. These offices and warehouses are at San Francisco and Los Angeles, California, Portland, Oregon, and Seattle, Washington. The executive officers of the United States Steel Products Co. in charge of the new department are: A. T. De Forest, vice-president; W. A. Ross, assistant treasurer; H. F. Wilson, auditor and assistant secretary. The headquarters will be in the Rialto building, San Francisco.

Commercial Paragraphs

The PACIFIC FOUNDRY CO., San Francisco, has recently shipped two Kilker matte tapping cars to the Mason Valley Mining Co. in Nevada, and three to Chile.

The LALLIE SURVEYING INSTRUMENT & SUPPLY CO., of Denver, has moved to larger offices at 1710 Champa St., and is in better shape to handle its increasing business.

T. D. SMITH, formerly with the Commercial Electrical Co. of St. Louis, Mo., is now with the electrical department of the Mexico Mine & Smelter Supply Co., at Mexico City.

HENRY R. WORTHINGTON, 115 Broadway, New York, announces the opening of a district office and warehouse at Eighteenth and Blake streets, Denver, Colorado. C. L. Newcomb, Jr., is in charge.

The LUNKENHEIMER CO., of Cincinnati, Ohio, entertained the delegates and visitors to the National Association of Stationary Engineers which recently met in that city, with a river ride and outing. Nearly 3000 guests enjoyed the company's hospitality.

'The Labor Saver' is published monthly by STEPHENS-ADAMSON MFG. CO., Aurora, Ill. The September issue contains, among other things, an interesting article on a 'Conveyor System for a Modern Stamp-Mill,' and describes the equipment furnished by Stephens-Adamson Mfg. Co. for the Goldfield Consolidated mill.

The GOULDS MANUFACTURING CO., Seneca Falls, N. Y., has just placed a new high-pressure Triplex power pump on the market. This pump, known as Fig. 1585, is similar to the Fig. 1283 type, which is in general use in mines, water-works, and with hydraulic elevators, fire-protection systems, hydraulic presses, oil pipe-lines, etc. The chief difference is in the gearing. The new pump has only one gear and pinion, which are located between the standards. Fig. 1283 has two sets, one on either side of the standards. Placing the gearing between the standards necessarily lengthens one side of the pump somewhat, and increases the distance between the two valve-boxes on that side. Instead of lengthening the pipe connection between the valve-boxes on one set and making each set of a different shape as they are in many pumps, a distance piece is put in. In this way the three sets of valve-boxes are kept identical in form and interchangeable. This duplication of parts is a feature of Goulds pumps which is greatly appreciated by the purchaser, and one that saves valuable time when repairs are needed. It also reduces the number of parts kept in stock by the large user who may be located at a great distance from the factory.

Catalogues Received

COCHISE MACHINE CO., Los Angeles. Bulletin C. S. 1, 'Cochise Stoping Machines.' 8 pages. Illustrated. 7 by 10 inches.

THE MORAN CO., Seattle, Wash. 'The Little Giant Stamp Mill and the Christensen Concentrator and Slimer.' 40 pages. Illustrated. 6 by 3½ inches.

THE GOULDS MFG. CO., Seneca Falls, New York. Bulletin No. 102. 'Single-Acting Triplex Plunger Pumps.' 12 pages. Illustrated. 8 by 10 inches.

TRENT ENGINEERING & MACHINERY CO., Salt Lake City, Utah. Catalog No. 6, 'The Monadnock and Other Chilean Mills.' 36 pages. Illustrated. 8½ by 11 inches.

ALLIS-CHALMERS CO., Milwaukee, Wis. Bulletin No. 1068 (Reprint). 'Direct Connected Corliss Engines.' 8 pages.

Bulletin No. 1074. 'Direct Current Motors and Generators.' Types 'H' and 'H-I.' 12 pages.

Bulletin No. 1083. 'Direct Current Motors and Generators.' Type 'K.' 20 pages. All illustrated. 8 by 10½ inches.

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EDITORIAL

BUSINESS transactions are often an index of political conditions, and the confidence in the government established in Mexico under the newly elected president, Francisco I. Madero, Jr., is exhibited by a recent transfer of some 50,000 acres of land in Sonora to American interests.

MASSACHUSETTS Institute of Technology will remove to Cambridge. Like Columbia University when at Forty-ninth street, New York, it has found its situation in the heart of the city too circumscribed and must seek larger space for growth. And at Cambridge it will have the best of neighbors.

MANY members of the American Institute of Mining Engineers sailed for Japan on Tuesday, the party numbering about eighty. While in Japan they will be the guests of the Japanese Mine Owners Association, and, having experienced Japanese hospitality, we can predict for them a most delightful experience. H. Foster Bain is a member of the party, and will return to San Francisco with them early in December.

ONE of the effects of smelter fume is seen in the closing of the post-office at Coram, Shasta county, California. This was an important town when the nearby smelter was in operation, but since the local agriculturalists secured the shutting down of the smelter hardly anything is left of the once prosperous community, and even the farmers can scarcely claim that the increase in agriculture counterbalances the loss to the commonwealth by the abolition of a town and the cessation of the production of a useful metal.

BANKING and currency reform are issues of such vital importance as to warrant even more widespread interest and discussion than they now receive. Mr. James J. Hill has recently traversed the views of Mr. Nelson Aldrich in an address before the Illinois Bankers' Association, asserting that centralization can be better attained through the initiative of the bankers, rather than by Federal enactment. The readjustment of a system that extends throughout the body politic offers so much difficulty that many will re-echo the utterance of Mr. J. P. Morgan: "How can you unscramble scrambled eggs?"

TONOPAH geology has been the subject of much discussion and even more study, the final views on the structure of that district put forth by Mr. J. E. Spurr being the result of protracted investigation underground. At the San Francisco meeting of the American Institute of Mining Engineers Mr. Augustus Locke presented a paper, of which we give an abstract this week, reviewing the conclusions of Spurr and Burgess. Having the benefit of the large amount of previous work by other investigators, Mr. Locke's conclusions are of much interest, but in fairness to himself it would perhaps have been wiser to have presented more evidence rather than conclusions. The question of persistence of the orebodies in depth is so largely bound up with a correct interpretation of the geologic structure of this interesting area, that we need offer no apology for reopening its discussion.

REBELLION is rife in China and it appears not unlikely that the Manchu dynasty will be overthrown, the seriousness of the situation being evidenced by the masterly way in which international complications are being avoided by the revolutionary leaders as well as by the success which has so far attended their arms. Meanwhile the daily journals, which struggled manfully with the difficulties imposed upon them by the Turkish-Italian war, have met their Waterloo in the Orient. Even the well informed and accurate *Chicago Tribune*, publishes a supposed photograph of the Emperor Hsuen Tung, showing a boy of three times his age, and another of some unrecognizable person as Prince Ching, whom it designates as the Prince Regent. Other journals take seriously the schoolboy talk of a republic put forth by the Young China Association, and the bombast of that erstwhile reformer, Sun Yat-sen, but cablegrams direct from Peking are usually reliable, being sent by reliable correspondents.

AMONG the many interesting and valuable exchanges which come to our desk, *The National Review* of Shanghai is one of the most appreciated. Published in a country where the journals are notoriously ill informed, and partisanship and bias, both national and individual, are rampant, it shows itself in possession of the essential facts and discusses them with commendable fairness. It also furnishes us a convenient way of keeping track of the mails between San Francisco and Shanghai by observing the time which elapses after the publication of an issue of the *Mining and Scientific Press* before material taken from it appears without credit in *The National Review*. 'Lifting' of material from our columns is so common an experience that it does not greatly disturb us, and affords, indeed, a convenient way of securing the opinions of our contemporaries as to what is most valuable and interesting in our columns. But in its issue of September 9 *The National Review* 'lifts' one of our editorials of the early summer, and by a slight change in the opening sentence and the addition of another at the end, converts it into an argument for its own purposes. Ethics, both social and journalistic, are lax in the Orient. In this respect, Mexico also appears to be an Oriental country, and *The Mexican Herald* has the habit of reprinting signed articles taken from the columns of the *Mining and Scientific Press* in such a way as to lead its readers to believe them original contributions to its own columns.

CYANIDATION offers problems as many faced as a diamond, and one of the sides that recently have been to the fore presents the questions involved in the cyanidation of concentrate. In his well written and interesting paper, which we print in abstract this week, Mr. W. P. Lass describes the careful experimental investigations carried on at the Alaska Treadwell and the final successful carrying out of the operation, and the many ingenious modifications introduced to meet the special conditions there existing will be of much interest to our readers. It is interesting to note further that in the beginning of the cyanide process the development of the chemical theory was far in advance of its mechanical development. But in recent years the many and varied mechanical problems have been attacked with so much energy and ingenuity that there is now more likelihood of the mechanical equipment being in advance of the chemical development of the process. The chemical side has recently been touched upon by Mr. J. E. Rothwell, who calls attention to the fact that the process is essentially a chemical one, and that mechanical equipment, though enormously important, is in reality subordinate to the chemical reactions involved. It is safe to predict that the most notable steps in the advance of the application of the cyanide process during the next few years are likely to be chemical rather than mechanical. We are accustomed to look to the technical schools and universities for the theoretical development of technical subjects, but in this respect the results have of late been singularly disappointing. One of the exceptions is a notable paper of slime filtration by Mr. G. J. Young, which we will present in abstract next week.

Pragmatism

The necessary adjustment of means to ends is clearly recognized in philosophy, but in its pragmatic application does not always receive the careful attention it deserves. In a broad way the principle is recognized, of course; no one employs a locomotive to propel a baby-carriage, nor attempts to move freight trains by muscular power. But where the incongruity is less obvious, and especially in the manifold applications of physical and mathematical formulae and constants to the affairs of everyday experience, intelligent insight and nice discrimination are more infrequent. Even engineers can at times be detected in dividing a number, known to be accurate only to the first decimal place, by another equally inaccurate, and carrying the quotient out to several places of decimals. Estimates of ore reserves carried out to the first or second decimal place of tonnage and to the last cent of value, appear so frequently in reports that the critical reader is driven to wonder whether it is possible to pass the mathematics courses of our universities without acquiring the fundamental concepts of mathematics. In the case, for example, of determining the extent and value of a nearly horizontal orebody of fairly uniform character by churn-drilling it is easily apparent that under ordinary circumstances it will not be practicable to measure the depth of ore found in the hole more closely than to the nearest tenth of a foot. This error, distributed over a block of ground, corresponds to a necessary plus or minus error in estimates of several tons. The two distinct steps in estimating the tonnage should be clearly distinguished; the measurement of the depth of the ore is an experimental observation subject to a large number of experimental errors, both constant and accidental; the subsequent computation is a mathematical operation which may be carried out with any desired degree of precision; with a slide-rule or by the use of six-place logarithms, for example. But it must be remembered that the use of the six-place logarithms cannot educe from the approximate data a precise result any more than the minting of lead into dollars will transmute the base metal into silver, and the application of a method of which the precision is greatly in excess of the precision of the data employed is as obviously a waste of time and effort as the action of the assayer who was accustomed to estimate the amount of flux required in his assays and then weigh out the estimated amount to the nearest tenth of a gram. The further steps in obtaining an estimate of the value of an orebody will likewise repay analysis. The chemical determination of the content of each sample is performed with great exactness and the average result of a large number of samples will have a high degree of precision. If, for example, from the analysis of several hundred samples it is determined that the orebody, estimated to contain 100,000 tons of ore, has an average content corresponding to metal worth $9.75 per ton, the estimate is a precise one, so far as the chemical work is concerned and an investigation of the limits of error would possibly show that this result was subject to a ± error of $0.03. On the other hand, the samples taken may fail to represent the average of the orebody by as much as $0.80. Similarly, when we say that the ore has the mineral content mentioned, corresponding to an operating profit of $1.50 per ton, we have taken a change of venue that entirely shifts the limits of accuracy. That the profit will be $1.50 per ton may be either the merest guess or a reasonably accurate deduction, according to the method by which that result was obtained. To use a metaphor, we may laboriously scale the cliff of investigation holding fast by one assured fact after another, but if we trust ourselves to the loose and crumbling rock of insecure data, or if we let go of fact at any point disaster will follow. And precise computations cannot educe accurate results from approximate data any more than a stable structure can be built of granite blocks upon a foundation of sand. One practical feature must not be overlooked here, one which we may perhaps call the bookkeeping of mathematics. When it is necessary to add together a number of results, some of which are precise while others are only approximate, the resulting total will exhibit an appearance of accuracy which is not in keeping with its true character. The true sum should contain no more significant figures than the least precise of its components, and we are obliged to choose between a total which is not the mathematical sum of its components and a total which exhibits a false appearance of accuracy. This is frequently a problem in the keeping of accounts, books must balance, and the convenience of having them balance is so great that it may well be judged desirable to secure it at the expense of a due regard for the errors inherent in the results dealt with. Careful consideration of the factors involved will disclose the proper adjustment of means employed to results desired.

Panama and the Nations

Such an occasion as a presidential visit celebrating the commencement of material preparation for the great Panama-Pacific Exposition has deep significance. It constitutes an opportune moment for announcements of Governmental policy. It is natural to scrutinize the words of President Taft at these exercises to ascertain something more than they seem openly to tell. There necessarily must be veiled meanings in any diplomatic utterance; the world is too closely knit in these days to admit of one nation venturing to establish policies that disregard the interests of others, save when there is peculiar stress, and when the risk of war has not to be regarded.

For three hundred years the world has realized that a canal must be cut across the Isthmus; for three hundred years there have been maneuverings among the nations to obtain advantage in determining the future political status of the isthmian countries; to gain a foothold on Central America if possible; to prevent a selfish domination by any single power. Twice America trembled on the verge of war with England over the difficulties growing out of rivalry for control of the Isthmus. Once, to the great pain of Lord Palmerston, an American naval officer undertook to emphasize his opinion of political propriety by opening fire upon the city of Greytown, despite the fact that the British flag was waving over its ramparts. Happily such incidents as these can not now be repeated. The Mosquito Coast has lost its strategic importance, and only a few years ago we saw the tripartite treaty which guaranteed the British protectorate under Nicaraguan sovereignty ruthlessly torn to shreds without even calling for the landing of British marines.

It had become plain that it was the destiny of America to build the American canal. It has become evident that only America could be trusted to effectively hold and guarantee the neutrality of such a waterway. America is great, America is big, but America is not aggressive in international politics. The American people have a habit of attending to their own domestic affairs, and in the spirit of good husbandry they are equally determined that no one shall disturb their domestic tranquillity. It was less the fear that the United States would unduly benefit by special privileges in a trans-isthmian canal than that other nations might by hook or crook secure discriminative advantages, that a cobweb of treaties was woven around any future canal guaranteeing its use to all nations under equal terms. Thus were we bound to use our birthright with careful regard to the interests of other nations, but there exists no such treaty as that which specifies the regulations governing the Suez Canal to embarrass us at Panama. We have been allowed large liberty, though we have not been permitted a free hand. This the American people seem not to fully understand, just as they forget why a certain clause in the tariff laws has remained inoperative for generations, so that no merchant has yet applied for the rebate of ten per cent which these laws accord him on goods imported in American bottoms; they forget the little 'joker' which recites that nothing in the law shall conflict with existing treaties, conventions, or agreements with foreign powers. In passing we may mention that some very interesting history lies back of that little 'joker'; also some very interesting history precedes the weaker shackles which have been put upon us in regard to the Panama Canal.

With keen interest, therefore, we have listened to the utterances of President Taft at the opening of active work upon the Panama Canal. With perfect logic, like a mathematical necessity, he touched upon the three vital points: the Monroe Doctrine, preferential Americanization of the Canal, and arbitration. In somewhat undiplomatic manner he tells us that he will make the Central Americans stop cutting each others' throats, which we suppose will mean the doing of what our European friends have so long asked us, if we intend to be consistent, namely, to assume the responsibility of policing Latin America. Heaven defend us from annexation! We do not wish to see the corruption that would occur to some generations of men through an attempt to do again what we did in California and the Southwest.

The significance of a firm re-assertion of a Monroe Doctrine properly applied, lies in giving us the excuse to insist upon preferences in the use of the Canal. Existing treaties recite that the Canal must be neutral; the President was silent upon this point; in fact it was needless to mention it, for if Europe objects to fortifications it is perfectly easy to maintain adequate fighting fleets convenient to either entrance. The late Secretary Blaine remarked that "any trans-isthmian canal would be essentially an extension of our coast-line." The American people believe this; President Taft believes it; he tells us that in some way American ships must have the free use of the Canal. There is some humor in it, because there is only one way in which it can be done, unless we wish to be unnecessarily disagreeable to our friends across the water, and that is doing as a government what the Government has denied the railroads the right to do—to grant a rebate in the form of a subsidy to American ships which may use the Canal, sufficient to offset the tolls collected. There are times when a rebate is necessary, which shows us how unmoral ethics is. There seems no reason why this method should not succeed. Any other nation may grant an equal subsidy to its ships passing through the Panama Canal, and thereby enjoy its use under equal terms with us. All these matters are parts of a delicate international mechanism, and a false move of the hand of the engineer might precipitate disaster. Some one's clothing might be caught by a set screw on the shaft and wind him around it, to the consternation of the world. In short, Mr. Taft is pleasantly disposed toward general arbitration treaties, because . . . it is so transparent, we need say no more!

The Cyanide Plant at the Treadwell Mines, Alaska

By W. P. Lass

*The purpose of this article is not only to describe the plant and method of cyaniding the Treadwell concentrate, but to present some of the results of experimental work during the past three years for the Alaska Treadwell Gold Mining Co., at Douglas island, Alaska, under the direction of F. W. Bradley, consulting engineer, and Robert A. Kinzie, general superintendent, of the affiliated companies.

At the time the experimental work was undertaken the concentrate was being shipped to the smelter at Tacoma, and the cost for treatment of 3-oz. (gold) concentrate was $11.95 per ton.

From the experimental work it was estimated that 96% extraction could be made by treatment at the plant, and that the cost, when treating 80 tons per day, would be $3.25 per ton. Adding to this the 4% treatment loss, which on 3-oz. concentrate amounts to $2.48, gives a total cost of $5.73 per ton, a net gain of $6.22 per ton by the local treatment. In addition to this saving, the cyanide tailing would have an economic value due to the sulphur and iron content, as well as the value of the residual gold after oxidation.

The concentrate, amounting to 1.8% of the original ore, contains: Fe, 40%; S, 1%; SiO_2, 11%, and carries from 2.5 to 4 oz. gold and 0.75 oz. silver per ton. The gold and silver amount to about 37% of the original content. The figures in the following table are assays and averages of sizing tests on concentrate from the various mills.

Assay Sizing Tests of Treadwell Gold and Silver Ores

Size of material.	Wt. %	Assay value per ton.	Value %	Value in 1 ton of original.
On 20-mesh screen...	0.44	$70.35	0.48	$0.31
Through 20, on 40.	8.23	203.96	26.05	16.83
Through 40, on 60.	10.96	143.89	24.39	15.76
Through 60, on 80.	12.49	94.88	18.34	11.85
Through 80, on 100.	10.38	60.85	9.78	6.32
Through 100, on 120.	13.37	39.27	8.14	5.25
Through 120, on 150.	7.69	26.61	3.17	2.05
Through 150	36.46	17.10	9.65	6.23
	100.00		100.00	$64.60

Preliminary tests were made in glass jars, after which 50-lb. composite samples were ground to 200 mesh in a clean-up barrel provided with iron balls, the pulp passed over amalgamated plates and then agitated in small Pachuca tanks, 4 ft. high and 14. in diameter. The results showed that 75% of the gold could be recovered by fine grinding and amalgamation and 96% by amalgamating followed by cyaniding. The next step was the construction of an addition to one of the mills and the erection of a 4 by 12-ft. Abbé tube-mill. Various forms of classifier were tried, the Dorr proving most satisfactory. Callow cones were used for dewatering, and the agitation was carried on in a Pachuca tank 10 ft. diam. and 22. ft. high. The complete results of the first 25 experimental runs are seen in the table given below. Throughout this paper the ton of 2000 lb. is used, with gold at $20.67 per oz.; no account is taken of the value of the silver.

No. of Test.	Tons Treated.	* Assay Per Ton. Original Concentrates.	* Assay Per Ton. Ground Product.	Treatment During Grinding.	Extracted During Grinding.	Ground Product Through 200-Mesh.	Ratio Ore to Solution.	* Assay Per Ton. Agitation-Heads.	* Assay Per Ton. Cyanide-Tails.	Extracted by Cyanide in Pachuca.	Cyanide Solution Used.	Lead Acetate Per Ton Concentrates.	Time of Agitation.	Cyanide-Loss Per Ton Concentrates.	Changes of Solution.	Total Extraction.
					Per Cent.	Per Cent.				Per Cent.	Per Cent.	Pounds.	Hours.	Pounds.	No.	Per Cent.
1	20	$42.16	$19.63	Amalgamation..........	54.0	94.0	1 to 1.6	$19.63	$4.00	79.0	0.35	....	48	6.70	2	[illegible]
2	15	54.80	9.00	Amalgamation..........	85.0	99.8	1 to 2.2	9.00	.95	89.0	0.15	1.5	18	4.00	3	98.3
3	18	42.00	10.40	Amalgamation..........	75.2	99.6	1 to 2	10.40	1.40	86.4	0.125	1.14	16	2.97	3	96.6
4	16	47.20	10.00	Amalgamation..........	78.8	99.8	1 to 2	10.00	1.20	88.0	0.1	1.0	16	1.92	3	97.8
5	10	32.00	8.40	Amalgamation..........	73.7	97.0	1 to 3	8.40	.80	90.4	0.14	1.0	24	2.00	2	97.5
6	10	56.80	9.60	Amalgamation..........	83.1	97.0	1 to 3	9.60	1.80	81.2	0.07	....	10	2.30	3	96.8
8	8	50.00	8.80	Amalgamation..........	82.4	98.0	1 to 3	8.80	2.30	73.8	0.068	1.0	18	1.44	2	95.4
9	9	30.80	9.00	Amalgamation..........	70.7	97.0	1 to 2	9.00	1.60	71.7	0.1	....	12	1.08	2	94.8
10	15	52.00	14.60	Amalgamation..........	71.9	90.0	1 to 2.1	14.60	2.00	87.6	0.15	1.0	24	0.90	2	96.1
11	15	37.20	13.40	Amalgamation 0.002 per cent. cyanide.	64.0	88.0	1 to 2	13.40	2.40	82.0	0.15	1.0	24	0.96	2	93.6
12	15	40.80	9.60	Amalgamation 0.05 per cent cyanide.	76.5	98.0	1 to 2	9.60	2.40	75.0	0.15	....	24	4.46	2	94.0
13	15	46.00	9.40	Amalgamation 0.025 per cent. cyanide.	79.6	100.0	1 to 2	9.40	1.70	82.0	0.15	0.67	24	2.20	2	96.3
14	15	36.80	9.80	Amalgamation 0.05 per cent. cyanide..	73.4	100.0	1 to 2	9.80	1.60	83.6	0.15	....	24	3.50	2	95.0
15	15	36.00	5.00	0.07 per cent. cyanide..	86.1	100.0	1 to 2	5.00	1.12	77.6	0.15	1.0	24	4.40	2	96.9
16	7	48.00	18.00	Concentration..........	62.4	100.0	1 to 4	18.00	.90	95.0	0.15	....	18	1.60	2	98.5
17	7	48.00	16.90	Concentration	64.7	100.0	1 to 4	16.90	1.10	93.5	0.15	....	18	1.36	3	97.6
18	9	48.00	19.20	Concentration..........	60.0	99.0	1 to 3	19.20	1.80	90.6	0.075	....	18	2.28	3	96.2
19	12	48.00	[illegible]	0.05 per cent. cyanide..	72.4	99.0	1 to 2	13.20	2.60	80.3	0.1	....	12	5.10	2	94.6
20	10	48.00	12.00	.016 per cent. cyanide	75.0	99.0	1 to 2.2	12.00	2.60	78.3	0.033	....	18	4.80	3	94.5
21	10	32.00	14.00	.018 per cent. cyanide	56.2	99.0	1 to 2.3	14.00	2.80	80.0	0.036	....	36	3.70	4	91.2
22	18	28.00	22.40	.024 per cent. cyanide	20.0	97.0	1 to 2	22.40	2.40	89.2	0.025	....	24	2.90	3	91.4
23	16	33.00	12.20	.032 per cent. cyanide	[illegible]	99.0	1 to 2	12.20	.90	92.6	0.125	....	24	4.70	3	97.2
24	16	55.00	15.35	.028 per cent. cyanide	72.1	99.0	1 to 2	15.35	1.60	89.5	0.12	....	16	5.20	3	97.8
25	15	46.00	17.60	.042 per cent. cyanide	61.8	99.0	1 to 2	17.60	2.08	88.2	0.12	....	16	5.00	2	95.4
26	15	55.00	8.00	0.066 per cent. cyanide	85.4	99.0	1 to 2	8.00	2.90	63.7	0.12	....	16	4.30	2	94.8

* All values are in gold at $20 per ounce. Tests 2, 6, 8, 9, 10, 16 and 17 given preliminary alkali agitation.
All solutions contained an excess of lime.

RESULTS OF FIRST 25 EXPERIMENTS ON CYANIDING CONCENTRATE.

The results of the tests showed that 75% of the gold could be recovered by grinding and amalgamating, or 96% by the combined method of amalgamating and cyaniding. Results also showed that during the process of grinding in 1.5-lb. (0.075%) cyanide solution, a similar extraction could be obtained without amalgamation. Thus a satisfactory extraction was obtained either by amalgamating and cyaniding or by cyaniding direct. A preliminary agitation with an alkali solution was found to shorten the time of cyanide treatment and save 25% in the cyanide consumption. Passing the air used for agitation through a receiver filled with a solution of caustic soda or milk of lime also decreased the cyanide consumption, presumably by the removal of oil and CO_2 from the air. When grinding in solution over 1 lb. per ton (0.05%), followed by amalgamation, it was difficult to keep the plates bright, due to a dull white surface deposit, which if allowed to remain turned to a dull gray. A muntz-metal plate was substituted for a copper plate, but as all the plates were coated no variation in the result was noted, and there did not appear to be any essential advantage gained from its use.

The results obtained from this extended period of investigation, lasting over two years and costing $27,794, justified the building of a plant of 100 tons daily capacity. The preliminary cost was largely offset by the ability of the final plant to treat the concentrate without the usual altera-

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*Abstract of a paper presented at the San Francisco meeting of the American Institute of Mining Engineers.

tions necessary in starting a new mill. It also produced the nucleus of the final mill crew. As the abandonment of amalgamation in favor of direct cyaniding seemed a somewhat radical change, the new mill was planned to operate either way, and ultimately nearly 5000 tons was treated by each method before deciding to cast out the time-honored amalgamated plate. All of the equipment purchased for the experimental work was used in the permanent plant, which was completed in September 1910.

The cyanide plant consists of three buildings situated on a hillside 200 ft. above the stamp-mill. The upper building contains the grinding and amalgamating plant, with a lower floor for solution storage tanks. The lower contains the cyanide equipment proper, while the refinery is in a concrete building at one side, as shown in the illustration. The five mills on Douglas island contain a total of 900 stamps, and crush approximately 5000 tons per day. The crushed ore after amalgamation is concentrated on 360 Frue vanners, yielding an average of 90 tons of concentrate per day, of from 2.5 to 4 oz. gold per ton. The flow-sheet of the operations is given on the next page.

From the vanner-boxes the concentrate is shoveled into specially constructed flat-bottomed steel cars. These cars, each holding two tons of concentrate, are made up into trains at the mills, and brought by locomotives to the foot of the incline below the cyanide plant. This incline is 900 ft. long with 14° rise. A Union Iron Works geared hoist, driven by a 75-hp. electric motor, brings the train to a switch above the upper building. Beginning with this switch, the entire plant is in duplicate throughout. Leaving the switch by gravity, the cars are weighed, sampled, and run into revolving tipples. Upon releasing the brake the tipple revolves, turning the car bottom up and dropping the load from the car. The change in the centre of gravity then causes the tipple to right itself, and the empty car is weighed and returned to the main switch.

Most of the water is removed from the concentrate while in the vanner-boxes by the aid of a bumper, which is simply a large air-piston machine mounted on a truck and moved from box to box. This bumping causes the particles to readjust themselves and pack in the bottom of the box, while the water runs off, leaving about 12% of moisture in the concentrate. It is considerably easier to shovel the concentrate into the cars after the bumping. The concentrate is sampled while in the car by means of a long ship-auger. With the ordinary long spoon it was impossible to obtain satisfactory checks in the samples, as the concentrate is usually covered with water. Unslaked lime is added to each of the empty cars as it leaves the tipple in order to reach the concentrate at the earliest possible stage. It also forms a line of cleavage, causing the concentrate to dump clean from the bottom.

From the cars the concentrate falls into 100-ton steel storage-bins, 15 ft. diam., with 55° conical bottoms. The concentrate in the bins is kept covered with water, which effectually prevents oxidation of the sulphides while lying in the bins. From this point until the cyanide treatment begins the concentrate is in strong lime solution at all times. At the apex of the conical bottom of each bin tight fitting gates control the outflow, which is at once sluiced directly into Dorr classifiers. The sluicing medium is the coarse return product referred to later. There are three Dorr classifiers driven by one 7.5 hp. electric motor, one feeding into each tube-mill and making 21 strokes per minute. This rate of speed, causing greater agitation, was found necessary to separate the large bulk of the fine from the coarse.

The coarse product of the classifiers falls into the spiral feeders of the tube-mills. These mills are of the Abbé type, 5 by 22 ft., lap-welded, trunnion bearings, with corrugated sectional liners; 3-in. Danish flint pebbles are used for the grinding. Two 75-hp. motors on three-phase circuit at 2200 volts are belted to an overhead central line-shaft, which in turn is belted to the pinion shaft of the tube-mills. The tubes are driven from the discharge ends and make 27 rev. per min. The mills are controlled by friction-clutch pulleys on the central line-shaft. For the period from May 15 to July 15, 1911, one tube-mill ground at the rate of 88.75 tons of concentrate per 24 hours actual running time, the power consumption averaging 64 hp. By replacing each 75-hp. motor with a 100-hp. motor, and substituting leather for canvas belts on the main drive, the power consumption was reduced to an average of 59 hp. for the same tube duty. This was with the tube just half filled with pebbles, the normal running load. By increasing the pebble load to 6 in. above the centre of the tube, the power consumption rises to 75 hp., and both the quantity of tube feed and the fineness of the product discharged are increased.

CYANIDE PLANT OF ALASKA TREADWELL G. M. CO.

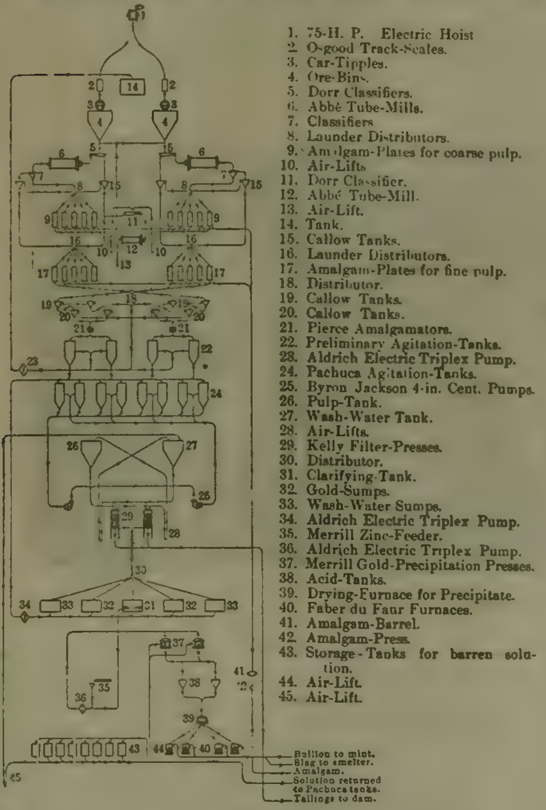
The following is an average screen analysis of the feed and discharge of one 5 by 22-ft. mill, when grinding an original feed of 88.75 tons per 24 hours:

	On 100 mesh.	On 200 mesh.	Through 200 mesh.
	%	%	%
Feed	48.7	41.5	9.8
Discharge	10.1	26.4	63.5

The pulp contained 38.5% moisture.

When the concentrate is amalgamated previous to cyaniding, the product discharged from the tubes is distributed over 10 copper amalgamating plates, each 4 ft. 8 in. wide by 10 ft. long, plated with 2 oz. of silver per square foot. The pulp flows from the plates into launders built into the floor. No traps are used, as they are quickly clogged by the metallic iron which accumulates in the concentrate from the wear of the various machines used in the processes of mining and milling. This iron, if allowed to accumulate in the coarse return-product, will amount to as much as 15% of the total. Experiments are now being carried on with a magnetic device for removing the iron from the pulp. From a sump in the launder an air-lift elevates the pulp to a spitzlutte, from which the coarse material is continuously drawn into a Dorr classifier, the coarse from which feeds a 4 by 12-ft. Abbé tube-mill, similar to the larger ones described above. The discharge from this mill joins the overflow from the spitzlutte, and is elevated by air-lifts to two settling-cones, so situated that the spigot-discharge from them becomes the sluicing medium for the original feed referred to above.

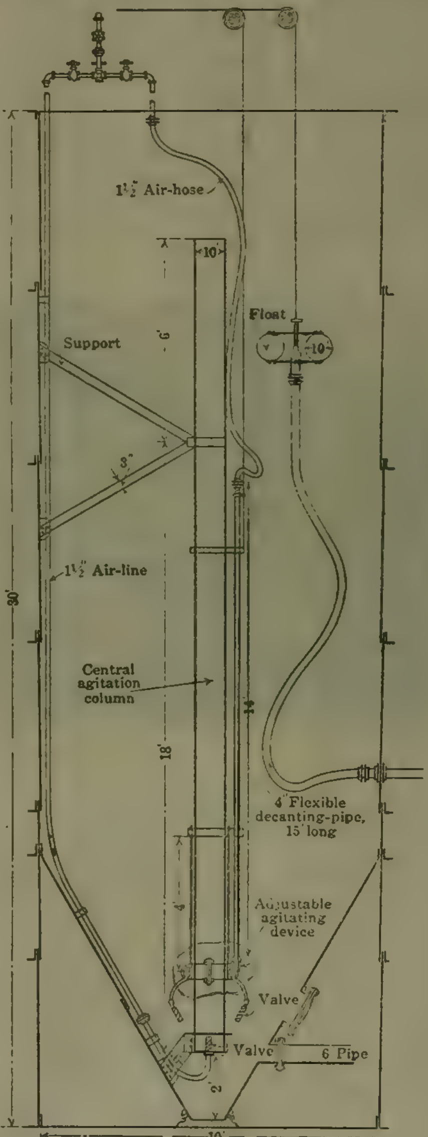
Two points will be observed here: (1) that the Dorr classifiers are at present doing all the classifying for the mill; and (2) that the concentrate is carried around in a closed circuit from which there is no escape until the particles have become fine enough to join the overflow from the back of the Dorr classifiers. The Dorr overflow, which is the product cyanided, is more than 98% through 200-mesh. The remaining 2% is silica from the wear of the pebbles. Of the concentrate, the entire product will pass a 200-mesh screen. The overflow from the Dorr classifiers passes into two Callow dewatering cones, the spigot product of which is distributed over 10 amalgamating plates similar to the coarse amalgamating plates previously described. From the plates the pulp flows into launders, thence into a 6-in. pipe, 37 ft. long, having a fall of $^3/_4$ in. per foot, which conveys the pulp directly to the lower or cyanide building. In the lower building the pulp is received into a wooden distributing-box, from which it flows through two Pierce amalgamators into four 8-ft. Callow cones. The spigot-product from these cones discharges into four similar ones placed lower than the first set.



1. 75-H. P. Electric Hoist
2. Osgood Track-Scales.
3. Car-Tipples.
4. Ore-Bins.
5. Dorr Classifiers.
6. Abbé Tube-Mills.
7. Classifiers
8. Launder Distributors.
9. Amalgam-Plates for coarse pulp.
10. Air-Lifts
11. Dorr Classifier.
12. Abbé Tube-Mill.
13. Air-Lift.
14. Tank.
15. Callow Tanks.
16. Launder Distributors.
17. Amalgam-Plates for fine pulp.
18. Distributor.
19. Callow Tanks.
20. Callow Tanks.
21. Pierce Amalgamators.
22. Preliminary Agitation-Tanks.
23. Aldrich Electric Triplex Pump.
24. Pachuca Agitation-Tanks.
25. Byron Jackson 4-in. Cent. Pumps.
26. Pulp-Tank.
27. Wash-Water Tank.
28. Air-Lifts.
29. Kelly Filter-Presses.
30. Distributor.
31. Clarifying-Tank.
32. Gold-Sumps.
33. Wash-Water Sumps.
34. Aldrich Electric Triplex Pump.
35. Merrill Zinc-Feeder.
36. Aldrich Electric Triplex Pump.
37. Merrill Gold-Precipitation Presses.
38. Acid-Tanks.
39. Drying-Furnace for Precipitate.
40. Faber du Faur Furnaces.
41. Amalgam-Barrel.
42. Amalgam-Press.
43. Storage-Tanks for barren solution.
44. Air-Lift.
45. Air-Lift.

FLOW-SHEET, 100-TON MILL.

The spigot-product from the lower cones enters one of four Pachuca tanks, where it receives a preliminary treatment of 3 hr. agitation in a solution containing 2 lb. of lime per ton (0.1%), after which it is allowed to settle and the clear solution is decanted. The filling, agitating, settling, decanting, and discharging of a 25-ton charge of concentrate, which includes 46 tons of lime solution, requires somewhat less than 24 hr. This preliminary treatment saves in the subsequent treatment at least 1 lb. of cyanide per ton of concentrate. The overflow lime-water from the Callow cones enters the same sump with the decanted lime-water from the preliminiary treatment, and is pumped by an Aldrich triplex 7 by 9-in. electric pump into a reservoir of 75 tons capacity situated in the upper building. The thickened pulp, ranging from 1.8 to 2.2 specific gravity, is drawn into one of eight Pachuca tanks, where it is given the cyanide treatment. All Pachuca tanks in the mill are 10 ft. in diameter and 30 ft. high, with 60° conical bottoms. When filled to the level found best for agitating (which is 6 in. below the top of the central column), each tank holds a volume equivalent to 50 tons of water. This is equal to the regular charge of 30 tons of concentrate with 40 tons of solution, although as high as 40 tons of concentrate has been treated as one charge without any difference in extraction results. The floors under the Pachuca tanks, as well as all other floors in the building, are of smooth concrete, sloping to a central sump, supplied with small pumps to return any escaped solution or pump to the proper tanks.

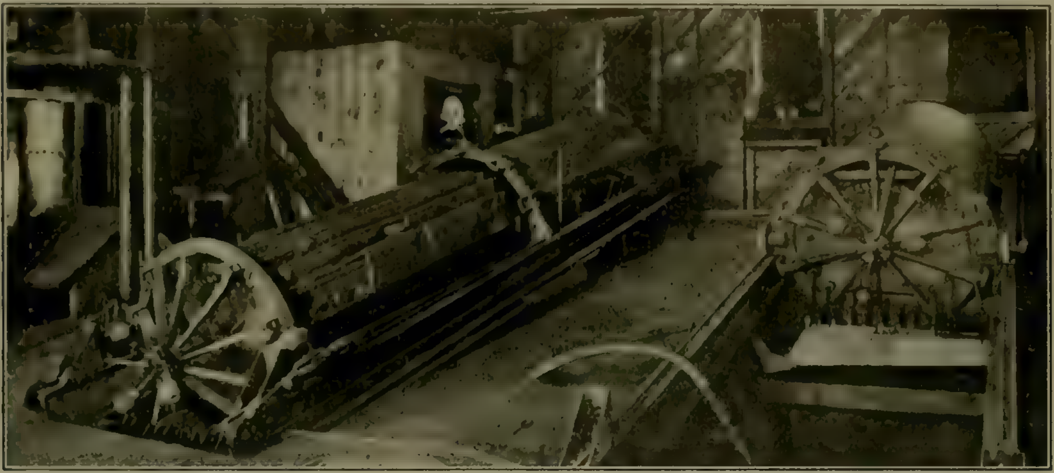


PACHUCA TANK.

The first cyanide treatment consists of 8 hr. agitation in a 2-lb. (0.1%) cyanide solution; either potassium or the mixed cyanides being successfully used. Alkali is kept at 1.25 lb. (0.063%) of lime (CaO) per ton of solution. Lime is added during the treatment if the titrations show below that figure. 18 hr. is allowed for settlement and decantation of this solution. Decantation takes place through a flexible hose, which is made as follows: Canvas coated with tar is wrapped around pieces of old boiler tubing 3 in. in diameter and 4 in. long, spaced ¾ in. apart. The canvas between the short lengths of tubing is wrapped with wire, making the diameter of these spaces slightly smaller than that of the tubing, thus insuring flexibility as well as avoiding the shifting of the tubing. Attached horizontally to the top of the flexible hose is a 3 in. slotted pipe. In operation this slotted intake floats by the aid of two adjustable air-cylinders. The arrangement of these cylinders is such as to allow the vertical adjustment of the intake-pipe to any depth of submergence desired.

The long settlement allowed, with the excessively fine condition of the concentrate, its high specific gravity, from 4.6 to 5.0, and the high alkalinity of the solution, leaves a 30-ton packed mass in the bottom of the Pachuca. This is brought into agitation within 15 min. by a device designated as the 'spider,' which is an adjustable hollow annular casting with radiating fingers, the whole encircling the central agitation-column. When the charge is to be put into agitation the spider is lowered by a small hand-windlass until it rests on top of the settled charge. Air is then turned through the fingers, and at the same time the solution for the next treatment is run into the tank. The device rapidly bores its way to the bottom of the Pachuca, leaving a boiling, churning pulp above, and clearing the way to the bottom opening of the central 10-in. agitating-column. As soon as this is opened and air has been admitted to the inner pipe, the spider is raised from the tank and full agitation of the charge proceeds.

The second cyanide treatment of the charge is with solution drawn from the barren-solution storage-tanks or the wash-solution storage, the cyanide strength being 1.5 lb. (0.075%) per ton of solution. After 2 hr. agitation the air is shut off and almost immediately decantation is started. This decanted solution is pumped directly on to an incoming fresh charge, being strengthened in cyanide as it enters the tank, and becoming the first cyanide solution for the new charge. This cycle in handling solution—barren to wash-solution, then to second cyanide treatment at 0.075% cyanide, then to first treatment at 0.1% cyanide, thence to precipitation and back to barren—gives at each step just the conditions best suited for that step, and is very satisfactory in practical operation. The settled pulp after the second decantation has a specific gravity of 1.8, and is readily agitated by means of the spider, and then discharged into the pulp-storage tank by a Byron Jackson 4-in. centrifugal pump, from which it is drawn to the Kelly filter-press. This thick pulp holds in suspension the sand which would settle through a lighter medium. The storage-tank is conical bottomed, 15 ft. in diameter, and situated at such an elevation that a static pressure of 30 lb. per square inch is exerted at the filter-presses. The pulp in the tank is kept in constant circulation by an air-lift, drawing from the conical bottom and carrying the pulp down close under the filter-presses and back up again over the top of the tank. The pulp as pumped from the Pachuca tanks enters the bottom of this same line, and the whole is thus kept in suspension and circulation past the presses, into which it is intermittently drawn for filter-treatment. The illustration shows the Kelly filter-presses installed to work under a gravity head as described. Above the pulp-storage tank is placed a similar tank for the storage of wash-water, from which a hydrostatic pressure of 25 lb. per square inch is obtained at the presses. This solution is kept in circulation, using the same method as applied to the pulp. The higher gravity of the pulp in the lower tank results in a greater pressure at the presses than that obtained from the wash-solution, although the latter carries a higher head.



KELLY FILTER PRESSES.

Filtering is done in two type 1-B Kelly presses. By opening valves in the circulation-lines directly under each press it is filled with either pulp or wash-solution as desired. The excess pulp or wash-solution from the press-cylinder is returned into its proper line by displacing with compressed air admitted into the cylinder. The amount of wash given depends upon the comminution of the concentrate, the usual pulp being washed with 0.5 ton of solution per ton of concentrate. The cake formed during decantation of the first treatment-solution, being very fine slime and more impervious to wash-solution than the regular pulp, is given 1 ton of wash per ton of concentrate. When filling the press, the contained air is allowed to escape through an overhead pipe attached to the highest point of the press-cylinder. The change in sound of the exhaust indicates to the pressman when the press is full. After drying the cake with compressed air until it contains not more than 10% of moisture, the press is opened and the cakes shaken off with wooden paddles, and then sluiced with water to the tailing-dam. A distributor below the press-launder sends the gold-solution to two gold-sumps and the wash-solution to the two wash-solution storage-tanks. These four tanks, as well as a clarifying-tank which is in the same group, are built of 3-in. redwood, 15 ft. in diameter by 16 ft. deep, and each holds 75 tons of solution.

The wash-solution is pumped to a Pachuca tank as needed, becoming a second-treatment solution. From the gold-tank the solution is drawn into the clarifying-tank, in which are suspended vertically six canvas filter-leaves, all connected to the suction of a triplex 7 by 9-in. Aldrich electric pump, used exclusively for pumping gold-solution through the precipitation-presses. A traveling-belt, driven by ratchet-gears and a pair of eccentrics connected to the pump-drive, feeds zinc-dust into a cone. Here the dust is emulsified with a small stream of gold-solution tapped from the discharge-column of the same pump, and is then drawn into the suction-line. An automatic float in the cone prevents the introduction of air into the pump-suction. The pump raises the solution with the zinc-dust to the upper part of the building and forces it through two 36-in. triangular, 16-frame Merrill presses. An average of 145 tons of solution is precipitated daily, with a consumption of $\frac{1}{3}$ lb. of zinc-dust per ton of solution, equivalent to 0.86 lb. of zinc-dust per ton of concentrate. The average strength of solution before precipitation is 1.25 lb. (0.0625%) of cyanide; 1 lb. (0.05%) of lime, and $9.50 (9.2 dwt.) gold. The barren or precipitated solutions are kept at 10 cents (2.3 grains), or less, gold per ton, and are used for wash-solution or returned to the Pachuca tanks, as desired.

pensating for that received as moisture in the concentrate delivered to the bins. All the solution used in grinding and classifying is drawn directly from the mill-reservoir. The overflow of fine pulp from the back of the Dorr classifier flows at once to the Callow tanks in the lower building, the spigot-product of which empties into one of the 12 Pachuca tanks for treatment.

The specific gravity of the pulp as it enters the Pachuca tanks is 1.5, or a ratio of 1 of concentrate to 1.18 of solution. The charge is agitated for 8 hr., the necessary cyanide and lime being added to bring the cyanide content of the solution to 1.5 lb. (0.075%) and the lime content to 2 lb. (0.1%) per ton. After agitation and settlement, the clear solution is decanted to the gold-tank through the clarifying-press described later, and a fresh charge of barren solution, the same as that used in the grinding, is drawn from the mill-reservoir, brought to the same strength as the previous treatment, and the charge agitated for 4 hours. This is then settled and the solution decanted. Both solutions decanted from the agitators, together with the overflow from the Callow settling-tanks previously mentioned, are drawn by gravity through the clarifying-press before emptying into the gold-tanks. The settled pulp in the bottom of the Pachuca tanks, having a specific gravity of 2, is then agitated by means of the spider and pumped to the pulp-storage tank, from which it is drawn to the Kelly presses for filter-treatment.

Treatment	Regrinding and amalgamation, followed by agitation in cyanide solution.						Regrinding in cyanide solution, followed by agitation in cyanide solution. (No amalgamation.)						Regrinding in cyanide solution, followed by agitation in cyanide solution. (No amalgamation.)					
Period covered	Sept. 16 to Dec. 20, 1910; trial run and first adjustments of the plant.						Feb. 16 to May 15, 1911. (Plant idle Dec. 21, 1910, to Feb. 15, 1911)						May 16 to July 15, 1911.					
	Average head value: $54.0174.			Average tailing value: $1.7589.			Average head value: $46.9360.			Average tailing value: $1.7990.			Average head value: $55.4899.			Average tailing value: $1.8892.		
	Estimated extraction: 96.80 per cent.			Tons treated: 4906.1.			Estimated extraction: 96.17 per cent.			Tons treated: 4620.6.			Estimated extraction; 96.60 per cent.			Tons treated 4080.		
	Costs Per Ton Treated.						Costs Per Ton Treated.						Costs Per Ton Treated.					
			Supplies.						Supplies.						Supplies.			
Operation.	Labor (d).	Electric Power, (c) Compressed Air, Steam Heat.	Item.	Cost.	Sundry Supplies.	Totals.	Labor (e)	Electric Power, (c) Compressed Air, Steam Heat.	Item.	Cost.	Sundry Supplies.	Totals.	Labor (e).	Electric Power, (c) Compressed Air, Steam Heat.	Item.	Cost.	Sundry Supplies.	Totals.
Grinding	$0.2033	$0.6179	Pebbles 8.05 lb.	[illegible]	$0.0449	$0.9843	$0.1512	$0.4679	Pebbles 22.19 lb.	$0.2686	$0.0061	$0.8939	$0.1196	$0.1279	Pebbles 13.55 lb	$0.1776	$0.0059	$0.4310
Amalgamation	0.2324	0.0009	Mercury 3.3 oz.	0.1516	[illegible]	0.3915	....	....	....	....	....	....	....	....	....	....	....	....
Cyaniding	0.3291	0.1378	Lime 19.78 lb. Cyanide 2.46 lb.	[illegible] [illegible]	.... 0.0201	.... 1.2011	0.2646	0.1007	Lime 12.77 lb. Cyanide 2.86 lb.	0.1226 0.5665	0.0251	1.0795	0.2093	0.0396	Lime 7.06 lb. Cyanide 2.19 lb.	0.0649 0.5380	0.0018	0.8486
Filtering	0.3389	0.0791	....	....	0.0233	0.4416	0.2646	0.0729	Press-cloth	0.0109	0.0058	0.3537	0.2093	0.0316	Filter-cloth	0.0038	0.0059	0.2536
Precipitation	0.1549	0.0645	Filter cloth Zinc-dust 0.79 lb.	0.0162 0.0592	0.0053	0.3001	0.1843	0.0567	Zinc-dust 2.16 lb. Filter-cloth Lead acetate 0.54 lb.	0.1635 0.0204 0.0511	0.0134	0.4894	0.1458	0.0234	Filter-cloth Zinc-dust 2.09 lb. Lead acetate 0.15 lb.	0.0103 0.1700 0.0142	0.0209	0.3846
Refining (a)	....	....	....	....	....	....	0.2268	0.0436	Retorts Sulphuric acid	0.0619 0.0617	0.0252	0.4192	0.2243	0.0243	Fluxes Sulphuric acid	0.0193 0.0656	0.0501	0.3836
Analyses, assays, accounting (b)	....	....	....	....	0.1780	0.1780	0.1269	....	....	....	0.1687	0.2956	0.0748	....	Chemicals	0.0142	0.0476	0.1366
Superintendence	0.1936	....	....	....	....	0.1936	0.1890	....	....	....	....	0.1890	0.1495	....	....	....	....	0.1495
Repairs	....	0.0811	....	....	0.0179	0.0990	0.1418	....	....	....	0.0069	0.1487	0.1121	....	....	....	0.0274	0.1395
Totals	1.4522	0 9816		1.0593	0.2961	3.7892	1 5192	0.7418		1.3272	0.2507	3.8689	1.2447	0.2498		1.0729	0.1596	2.7270

(a) During the first period the refinery had not been completed and the precipitate was shipped to a smelter, cost of which is not given.
(b) Assays are made at the central assay office of the combined companies at Treadwell, and charged against the cyanide plant at a proportionate rate per assay.
(c) Electricity, compressed air, and steam are purchased from central power plants, at cost of generation.
(d) Labor, first period, 20 men at $3.75 average wage.
(e) Labor, second and third periods, 22 men at $3 781 average wage. (18 men in mill, 4 men in refinery.)

COST OF CYANIDE TREATMENT, ALASKA TREADWELL G. M. CO.

The Merrill presses are opened when filled or when the pressure exceeds 25 lb. per square inch. Forcing the solution through at higher pressures caused a mechanical loss of precipitate through the canvas. The precipitate is dropped from the press-frames into steel pans and lowered by an electric elevator to the floor below, and thence conveyed by trucks through a concrete passage into the refining-room.

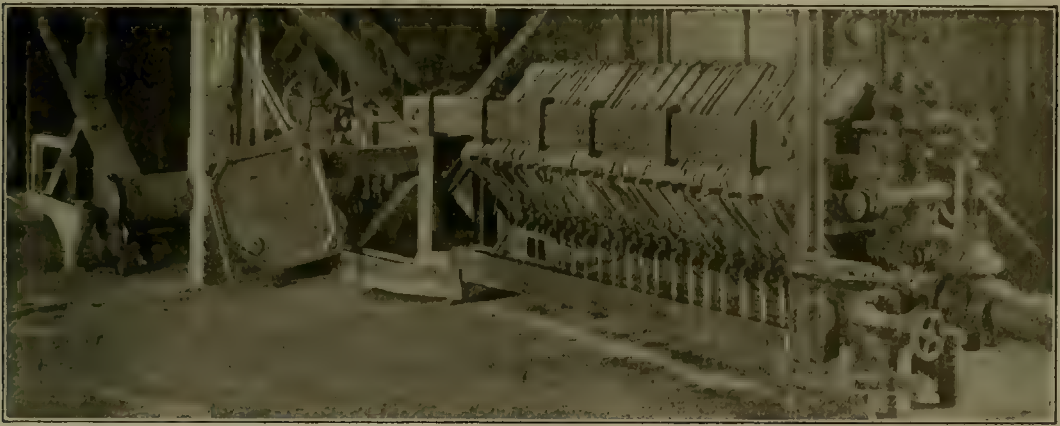
On account of the work required to look after and collect the amalgam, as well as the greater danger of amalgam loss from the pipe-lines and launders, the plates were removed after the first three months' run, and the whole product is now being cyanided directly without amalgamation. In order to handle the larger amount of solution made necessary when grinding in cyanide solution, two 1800-ton steel tanks have been erected, one above and one below the plant. All the precipitated or barren solution flows by gravity from the precipitation-presses to the lower tank. This solution, having an average value of $0.08 in gold, 1.14 lb. of cyanide, and 1.70 lb. of lime per ton, is pumped to the second of these tanks, which is situated 25 ft. above the mill-bins, and acts as the mill-reservoir. Thus at no time is there any cyanide solution run to waste, the solution discharged as moisture in the tailing, plus that absorbed or evaporated in the mill, com-

This method of operation, depending upon the one barren solution for all purposes, keeps the gold-content of the solution to the lowest possible value, which, although contrary to the usual practice, is the object sought in this mill. The solution overflowing from the Callow settling-tanks (containing gold, $10; cyanide, 1 lb.; and lime, 2 lb. per ton) flows by gravity through a special clarifying-press built in the Treadwell shops, the same as receives the decanted solution. This press is of the ordinary plate-and-frame type, yet with a series of ports or channels so arranged as to allow of discharging or sluicing-out a cake without the necessity of opening the press. This sluicing-out press consists of 20 square frames, each 3 in. thick, with the corresponding plates 1 in. thick. The upper channels and two side channels extending through the press have small holes opening into the frame side of the leaf.

The upper small channel allows the introduction of compressed air behind the leaves. The lower triangular channel connects with a 6-in. sluicing-out pipe. The press, with connections, is shown in the illustration with one of the plates standing to the left.

To discharge a cake, water is introduced at the back end of the press through the large triangular opening on the bottom, and flows through the under side to the discharge end, where it empties into the launder leading to the tailing dam. With this passageway clear, compressed air is introduced through the portholes on the plate side of the leaf. The plate corrugations being depressed 0.5 in. leaves a concave surface, in which the cake forms. The air now being introduced behind the leaves by a series of separate knocks or bumps causes the cakes to drop off into the sluicing-out channel, where they are carried away by the stream of water. For the final washing of the leaves, water is introduced through the three upper channels, and, passing through the tapered holes, is sprayed on the two filter-cloths, which bag together by reason of the compressed air introduced from the plate side.

The method of feeding the zinc-dust has been changed somewhat from that originally installed. The reasons for these changes were to create a more even feed of zinc, to do away with the air previously used in the emulsion-cone, and not only to break up any lumps, but to brighten the zinc and grind it even finer. To do this, the drive from the zinc-belt was taken from the Aldrich pump to a small counter-shaft, which was, in turn, belted to a worm-gear for the drive of the zinc-belt, the belt discharging its zinc directly into a small tube-mill 6 ft. long, made from 10-in. pipe, the cast-iron caps of which were turned to run in rollers. This tube is filled with rods of cast zinc 2 inches in diameter. These rods not only grind the zinc to a more uniform product, but may themselves aid precipitation to a slight extent.



TREADWELL SLUICING CLARIFYING FILTER.

Considerable annoyance is occasioned by the clogging of the cloths in the Merrill gold-presses and by the accumulation of precipitate in the entire line from the zinc-feeder and pump to the presses. Filter-cloths of several kinds—heavy duck at 31c. per yard, various grades of drilling at from 9 to 15c., and muslin sheeting at 7c.—have been tried. The lightest and cheapest muslin is now in use, with results no worse than obtained with the more expensive grades.

From the moment of contact of the zinc-dust with the gold-solution, trouble is caused by the slime or precipitate incrusting everything touched. The interior of the pipes gradually becomes smaller in area, even though the solution is driven through at a constantly increasing velocity. After three months' use a 6-in. pipe of 28 sq. in. area was so filled with caked precipitate that only a triangular opening of 4 sq. in. remained. From 80 ft. of this pipe, $25,898 was recovered. Being desirous of operating the Merrill presses more or less intermittently without the necessity of each time closing the cocks to retain the solution, which if allowed to drain not only oxidizes the zinc, but causes the precipitate when the pressure is removed to settle in a mass at the bottom of the press frames, consequently not allowing the greatest amount of solution to pass through the unoxidized zinc, the discharge cocks were removed from the plates, and open pipes discharging into a launder on top of the presses were substituted, as shown. The result of the several changes is a more uniformly low tailing solution, with the consumption of less zinc, while the gold value of the precipitate has been raised from $15 to $25 per pound; hence a corresponding lowering of refining charges.

MERRILL PRECIPITATION PRESSES.

The refinery, adjoining the mill, is 30 by 76 ft. in area; constructed of reinforced concrete with steel-truss roof covered with corrugated iron. The precipitate entering the refinery is crushed through 0.5-in. screen, made up into lots of from 1000 to 1200 lb., weighed, sampled, and charged into one of two redwood tanks, 8 ft. in diameter and 9 ft. deep, conical bottomed, and lined with sheet lead. The tanks are built on the plan of a Pachuca tank, with a central column of wood fitted with lead pipes carrying steam and compressed air for heating and agitating the solutions.

In these tanks the precipitate is treated with acid to dissolve out the zinc, lime, etc. About 1 lb. of 66° sulphuric acid is required per pound of precipitate, and is added in the following manner: About 2 tons of water is introduced into the tank, steam turned on, and the water brought to the boiling-point. Air is turned on the central air-lift, and the acid-valve opened. The acid flows in by gravity, while the precipitate is shoveled in at the rate of 2 lb. of precipitate to each pound of acid. When all the precipitate and from 50 to 60% of the acid have been added, the acid valve is closed and the charge agitated until the acid is entirely neutralized, which generally occurs within 30 min. The tank is then filled with water, and the charge allowed to settle for about 2 hr., after which the clear solution is siphoned off into a filter-tank. The latter is 8 ft. in diameter and 4 ft. deep, having a false bottom of 1-in. strips, placed 12 in. from the bottom of the tank and 1½ in. apart. The strips are covered with heavy iron screen, 1-in. mesh, on which is a bed of burlap 1 in. thick, one thickness of mill blanket, one thickness of light canvas, and a bed 1 in. thick of quartz sand screened between 20 and 80-mesh. The sand is divided into sections of 8 by 10 in. by a light wooden frame, covered by a single thickness of drilling, the latter forming the working-surface of the filter. The solutions filter freely through this medium, the clear filtrate being run into one of three storage-tanks, where it is held until a sample has been assayed, and then run to waste through a series of zinc-boxes. All solutions and wash-waters from the refinery are disposed of in this way.

After decanting the first acid the precipitate in the tank is given two washes of boiling water. Just enough water to enable the charge to be agitated is then added, and the remainder of the acid run in rapidly. This gives a solution containing from 15 to 18% of acid, agitation being continued until the acidity ceases to decrease, which usually leaves about 1% of free acid. The tank is then filled with water, settled and decanted as before. This solution, containing from 50 to 75 lb. of free acid, is at present run to waste.

The charge now receives three or four washes of boiling water followed by washes at about 30°C. temperature, until the wash-water gives no reaction for sulphates with barium chloride, which is generally after 15 washes. After decanting the last wash, the charge is sluiced through a valve in the bottom of the tank on to the filter, which has been thinly covered with silica sand to aid filtration, where the excess water is removed by means of a vacuum-pump. The slime is removed to a large wrought-iron pan, placed upon a 4 by 8-ft. steam-table, inclosed by a sheet-iron hood. When nearly dry but still damp enough to prevent dusting, the slime is rubbed through a ½-in. screen, weighed and sampled, the weight of the acid-treated product being from 25 to 33% that of the original precipitate. Each lot of precipitate is analyzed before and after the acid treatment, which enables a close calculation to be made of the amounts of fluxes required for the monthly melting.

The percentages of the principal substances contained in an average analysis of the precipitate before and after acid treatment are:

	Before, %.	After. %.
Au	5.08	17.34
Zn	42.93	5.15
Pb	8.08	20.09
Cu	6.19	14.28
CaO	10.51	1.89
Fe	1.10	0.52
S	1.41	7.62
Insoluble	3.48	22.85

The high percentage of insoluble after treatment is due to the silica added to the lot just before filtering.

At the end of the month the various lots of acid-treated precipitate are united and the various fluxes added. The melting is done in a specially constructed oil-burning furnace. For melting purposes the furnace is fired with a reducing flame. The crucible of hearth used for the melting is 4 by 3½ ft., lined with either magnesite brick or fire-clay, according to the fluxes used. This hearth is placed on a steel car and run under the furnace. Jackscrews, operated by hand-wheels at the four corners of the car, allow of raising the hearth to form the furnace-bottom.

From the fire-box at one end of the furnace the heat is drawn across the top of the charge, being reflected downward by the arch roof and the down-draft to a dust-condensing chamber. The furnace is charged with precipitate hourly, the slag and lead bullion being tapped off intermittently from opposite sides of the hearth. The month's clean-up, amounting to 1450 lb. of acid-treated precipitate, or a total charge, including fluxes, of 2600 lb., is melted on this hearth in 36 hr., and requires the attention of but one man per shift. A typical mixture of fluxes is:

	Pounds.
Acid-treated precipitate	100
Borax glass	22
Sodium carbonate	25
Old slag	80
Iron-turnings	15
Powdered graphite (old retorts)	3

Such a charge will produce about 35 lb. of metal, from 10 to 15 lb. of matte, and from 160 to 180 lb. of slag. From 150 to 300 lb. of high-grade copper matte is produced each month. This matte is roasted and allowed to accumulate until there is sufficient to make up a charge, when it is mixed with litharge, fluxed, and melted to produce lead bullion, which is the work-lead used for the removal of copper in cupellation. After melting either precipitate or matte, the slag is tapped into conical pots holding about 200 lb., with a tap 4 in. from the bottom, through which the molten core is drawn off. The shells, containing most of the metallic content, are dumped, crushed, and used in fluxing a later charge. The cores, constituting 75% of the total slag, are sampled, sacked, and stored for shipment to the smelter.

The cupellation is done on a limestone test the same size as the melting-hearth, it being run under the furnace on the car previously described. For cupellation the furnace is fired with an oxidizing flame, while free air is introduced over the test by means of a connection from a compressed-air main through a needle-valve discharging into the open end of a 4-in. pipe. This produces low-pressure air, which is introduced into the furnace on the opposite side from which the molten litharge is tapped off. The fine bullion resulting from this cupellation is drawn off and remelted in Faber du Faur tilting-furnaces into bars of 1000 oz. each. The average fineness of the cupelled gold is 880. The retorts of the Faber du Faur furnaces are supported on two 1½-in. iron pipes built into the furnace, through which cold water is kept circulating. These pipes have proved very satisfactory.

In conclusion, the cyanide-plant has now been in operation one year, using the machines and equipment originally installed, with the exception of the abandoned amalgamation plates, the substitution of larger tube-mill motors, and the addition of the 'Treadwell' clarifying-press, with results summarized in the table. During the month ended August 15, and not included in cost-sheet, 2010 tons was treated, at a cost of $2.8764 per ton, and an estimated extraction of 97.025%, as compared with the experimental estimates of $3.25 per ton and 96% extraction.

Classification at the Portland Mill

The work of the new mill of the Portland Gold Mining Co. at Victor is of much interest, and Thomas Crowe, the superintendent, has recently given out the results of a series of tests on the Dorr classifiers, employing a greatly increased feed. By feeding a pulp containing 5 solution to 1 of solid to the classifier at the rate of 145 tons per day the following interesting results were obtained. The feed had the following screen analysis: +40, 12.2%; +60, 16.8; +100, 9.3; +200, 13.4; −200, 47.1.

	1.	2.	3.	4.
Slime.	%	%	%	%
+100	0.2	0.7	1.6	1.7
+200	6.4	9.4	5.4	9.7
−200	93.4	89.9	92.9	90.3
Sand.				
+ 40	26.5	28.0	25.8	36.9
+ 60	29.1	30.0	30.5	30.6
+100	13.2	17.6	16.4	13.8
+200	18.5	14.8	17.6	12.8
−200	12.0	9.6	8.5	6.1

Gold Production of California

By Charles G. Yale

*A few years ago somebody connected with one of those self constituted bodies of unofficial character Chamber of Commerce, Board of Trade, or State Development Board started a catch phrase referring to California as 'The Land of Sunshine, Fruit, and Flowers,' and the railroad magazines and folders keep it steadily in use, working day and night. Yet it altogether ignores the substance which brought California into the Union, which peopled it, and which made it famous throughout the world. All you who come from what we out here call 'the East,' have in your own States, no matter which, sunshine, fruit, and flowers. But your Eastern States, though having these things as we do, have not the gold that we do. Therefore, the old designation of the 'Golden State' applied to California, should be revived, as being the most distinctive term. It is worthy of remembrance, too, that during the dark days of the Civil War this State produced $172,000,000 in five years in yellow gold, and saved the credit of the Nation.

Gold mining has been carried on in California since

"The days of old,
The days of gold,
The days of '49."

and still continues. Since that historic year, and up to the end of 1910, the State has produced, in gold alone, $1,527,930,062. Since 1792 the entire United States' production of gold has been $3,065,631,000, so that the single State of California has, during that period, produced approximately one-half of all the gold from Alaska, Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, South Dakota, Utah, Washington, and the Southern and scattering States. In other words, in 118 years all the other twenty-five gold-producing sections of the United States combined have only produced about the same amount as the single State of California has. Moreover, it has taken California but 62 years to produce its quota; which it has done at the average rate of $24,644,033 per year, or an average gold yield of $2,053,669 per month for the last 62 years. Has not California earned its title of the 'Golden State'?

It is to be noted, moreover, that California is still the leading gold producer among the States of the Union, and there are still a larger number of producing gold mines here than in any other State. Gold is being mined here in larger or smaller quantities in 34 of the counties of the State. Among other mining States of the Union, California has, as a gold-producing region, the distinction of holding the record on all counts. It has made by far the largest aggregate product; made the largest output in any single year; made the highest annual average, although its mines have been worked over 62 years; kept the lead as a gold producer the greatest consecutive number of years; has the largest number of individual gold mines; pursues the greatest number of varied branches of gold mining; and has the widest geographical distribution of its gold deposits. These are reasons why California deserves its title of the 'Golden State', and why all other designations seem absurd and trivial.

The gold belt of the State extends from Oregon on the north to Arizona and Mexico on the south—its extreme length. Gold is mined in the highest parts of the Sierra Nevada mountains, the foothills, the valleys, and on the beaches bordering the ocean. The gold is taken from quartz, placers, pockets, seam diggings, hydraulic, drift, ocean-beach sand, by dredging, wing-damming, dry-washing, and other forms of mining. The snowy ranges, the river beds, the beaches, the desert sands, the ancient buried rivers, the superficial gravel deposits, all yield their quota. The climatic conditions in all except the higher ranges are favorable to work the year round. In some of the foothill counties, the men work their orange or olive orchards and vineyards in the summer and drive for gold under them in the winter months. It is to be noted that today the three great dredging fields are at points where citrus fruits first ripen. The county producing the most gold is in the valley, below the foothills, and not in the snowy mountains.

It is not my intention to read you a statistical paper or bore you with many figures, but rather to endeavor to convey an idea of the present condition of the gold-mining industry in the State, so far as it may be done in a brief paper, and a few figures are necessary. It may be stated that the record year of gold production in the State was 1852, when the placer miners dug out $81,294,700. In 1883 the yield was $24,316,873, and then the annual product gradually declined, owing largely to the closing down of hydraulic mines, until in 1889 the output was only $11,212,413. For seven of those years, between 1883 and 1904, it was less than $13,000,000 annually. Since 1904, the gold yield has averaged about $19,000,000, sometimes over $20,000,000, and it is to be confessed there is not much prospect of an increase at present. With labor at $3 per day, and an 8-hour day law, it is difficult for the quartz miners to make much profit on ore of ordinary grade, unless large orebodies are worked, and many have been compelled to cease operations. Still the tonnage from the deep mines continues to be of considerable proportions, having been 2,697,885 tons last year, of which 1,963,296 tons was silicious, or gold ores. The average content in gold of this ore was $5.20 per ton. In some counties, where the veins are comparatively small, the content reaches to $8 per ton. Taking a typical large mine in one of these counties where nearly 100,000 tons were milled, the average yield per ton was $13.68, and the profit $7.51 per ton, above all costs of operation and development.

In the Mother Lode counties, where the orebodies are very wide, the ore is low grade. In one of these counties last year 547,873 tons of ore was milled, yielding an average of $4.69 per ton. But taking all five of the Mother Lode counties, where 1,170,497 tons was milled, the average yield per ton was only $3.78.

It may be a surprise to some to know that, contrary to general supposition, the placer mines of the State are now yielding 45.09% of the entire gold product, the deep or quartz mines producing 54.91%. About this proportion has prevailed for several years. It is true that the ordinary surface placers, where they use rocker, tom, and sluice, now cut but a small figure, but the drift and hydraulic mines are still yielding, and the dredges are now producing 84.94% of all the placer gold. This comparatively new system of surface mining has given renewed life to placer work. The hydraulic mines, formerly highly productive, now, owing to adverse legislation, are yielding only 7.15% of the placer gold, the drift mines 5.82%, and the surface or sluicing mines only 2.09%. Since 1899 the dredges have dug out $40,318,775 and are now producing at the rate of $7,550,000 per annum, with 71 machines in operation. The details of this dredging work have been given by Charles Janin in another paper. The largest production of gold in California last year came from Yuba county, mainly from dredging. The most productive in gold from deep mines is Amador, one of the Mother Lode counties. The leading hydraulic mining county is Trinity, and the leading drift mining county is Placer. The largest production from dredge mines was from Yuba county.

It is to be confessed that little progress is being shown in the deep mining for gold, or even in the placer fields, aside from dredging operations. There are only three large dredging fields in the State, these being at points where the Feather, American, and Yuba rivers leave the foothills to enter the valley lands, after having, in their course, cut through beds of auriferous gravel, and depositing the fine gold with the soil carried down when the streams are suddenly arrested from their swift flow by reaching level ground. There are numerous isolated points, however, in

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*A paper presented at the San Francisco Meeting of the American Institute of Mining Engineers.

other counties, where the circumstances permit the operation of one or more dredges within restricted areas. For this reason dredging is being carried on in 10 counties of the State.

The speculative era of gold mining has almost entirely disappeared from this State. The stock of not a single gold mine of California is listed on the Stock and Exchange boards, or publicly dealt in. The mining work is now almost entirely carried on by organized companies which provide capital for the enterprise. The day of the nomadic miner is virtually at an end, and the men are now nearly all employed at daily wages. Of course, there are still many prospectors, but most of the miners live in permanent thriving towns near the larger properties, far different from the old-fashioned primitive mining camp. High-priced officials have been dispensed with, office force and expenses reduced, and only skilled men employed. More railroads, better wagon-roads, cheaper supplies, improved methods of transportation, better machinery at lower cost, greatly improved reduction methods and appliances, adoption of proved modern processes, careful saving of concentrate, stronger powder, power-drills, electric and water-power, heavier and larger milling plants, more extensive development, and generally improved systems and appliances have all contributed in recent years toward a change for the better in gold mining in California.

Utah Metal Production in 1910

The total value of the mine output of gold, silver, copper, lead, and zinc in Utah in 1910, according to V. C. Heikes, of the United States Geological Survey, was $32,199,185, against $31,380,092 in 1909.

The total gold production in Utah in 1910 showed a decrease in value of $174,463, or 4.3%. The largest producer of gold was Salt Lake county, which yielded $1,776,058, against $1,780,573 in 1909. The West Mountain or Bingham district produced $1,767,992 of the gold credited to Salt Lake county and 43.8% of the 1910 Utah gold output. Juab county produced $1,181,366 in 1910, against $1,448,096 in 1909, and Utah county $193,234 in 1910, against $276,314 in 1909. The Tintic district, which is partly in Juab county and partly in Utah county, produced $1,370,320, or 34% of the gold production of Utah in 1910. Tooele county produced $721,361 (of which all except about $5000 came from the Camp Floyd district) in 1910, against $820,486 in 1909.

The silver production of Utah in 1910 showed a decrease of 1,250,201 oz., or 10.7%. Juab county produced 3,835,062 oz. in 1910, against 3,544,918 in 1909, and Utah county 1,500,625 oz. in 1910, against 2,995,658 in 1909. The Tintic district silver yield declined from 6,404,847 oz. in 1909 to 5,222,742 in 1910. Salt Lake county produced 2,006,131 oz. in 1910, against 1,780,572 in 1909. Of the Salt Lake county yield, the West Mountain or Bingham district contributed 1,800,410 oz. in 1910 and 1,615,394 in 1909.

The silver output of the Park City mining region in 1910 was 2,571,771 oz., a decrease of 253,614, or 10%, from that of 1909.

Copper production increased in Utah 18,649,261 lb. in 1910, a larger increase than in any other of the copper-producing States. The Bingham district produced 113,725,280 lb. of copper in 1910, against 92,560,340 in 1909, 71,155,740 in 1908, and 45,431,964 in 1907. The Tintic district yielded 8,993,036 lb. in 1910, against 5,915,669 in 1909, an increase of 3,077,367 lb. The Park City district, in Summit and Wasatch counties, produced 1,423,629 lb. in 1910, against 1,655,749 in 1909.

The production of lead in Utah in 1910 was 123,324,635 lb., valued at $5,426,284, against 148,486,463 lb., valued at $6,384,918, in 1909. Of the 1910 output, 30.9% was derived from mines in the Park City district, which produced 38,129,761 lb., against 46,350,390 in 1909. The Bingham or West Mountain district produced 30,271,016 lb. in 1910, about the same quantity as in 1909, and 24.5% of the total Utah lead output. The Tintic district, which yielded 56,502,209 lb. of lead in 1909, produced only 37,553,455 in 1910. This district yielded 38% of the Utah lead in 1909, and only 30.4% of that in 1910.

The zinc production of Utah was 16,367,104 lb., valued at $883,824, in 1910, against 9,860,778 lb., valued at $532,482, in 1909. This shows an increase of 6,506,326 lb., or 66%. The Park City mining district alone produced 9,437,992 lb. of zinc in 1910, against 6,737,237 in 1909. This district yielded in 1910 over 57.7% of the total zinc production of Utah. The Bingham district was also a large producer and increased its output from 649,542 lb. in 1909 to 3,572,347 in 1910. Tooele county, which produced 2,843,032 lb., and Beaver county, which produced 513,733, were the only other counties in Utah reporting a production of zinc in 1910. The zinc in concentrates, amounting to 12,959,422 lb., all came from Salt Lake, Summit, and Wasatch counties.

There were 183 mines producing gold, silver, copper, lead, or zinc in 1910, against 179 in 1909. Of these, 8 were small placers. The number of producing mines in the Bingham district was 31; Tintic, 40; Big and Little Cottonwood, 17; Park City, 17. The total quantity of ore sold or treated in Utah in 1910 was 6,389,398 short tons, an increase of 1,266,809 tons. The average total recoverable value per ton was $5.02 in 1910, against $6.12 in 1909. The lower average value per ton was caused by the large increase in copper ores, of which 5,417,558 tons were sold or treated in 1910. This quantity was 84% of the total ore treated and an increase of 1,201,332 tons over the 1909 production of copper ores.

Of the total tonnage of all classes of ore 263,041 tons, mostly from Tooele county, went to gold and silver mills, 5,182,057 tons, of which 4,937,285 tons were from Bingham district, went to concentrating mills, and 896,834 tons were sent to smelters. It is interesting to note that Salt Lake county produced over half of the total metal production, by value, chiefly from its copper, having furnished 90% of the total production of that metal and $^6/_7$ of the total tonnage of ore treated.

MINE PRODUCTION OF GOLD, SILVER, COPPER, LEAD, AND ZINC IN UTAH IN 1910, BY COUNTIES.

[By Victor C. Heikes, U. S. Geological Survey.]

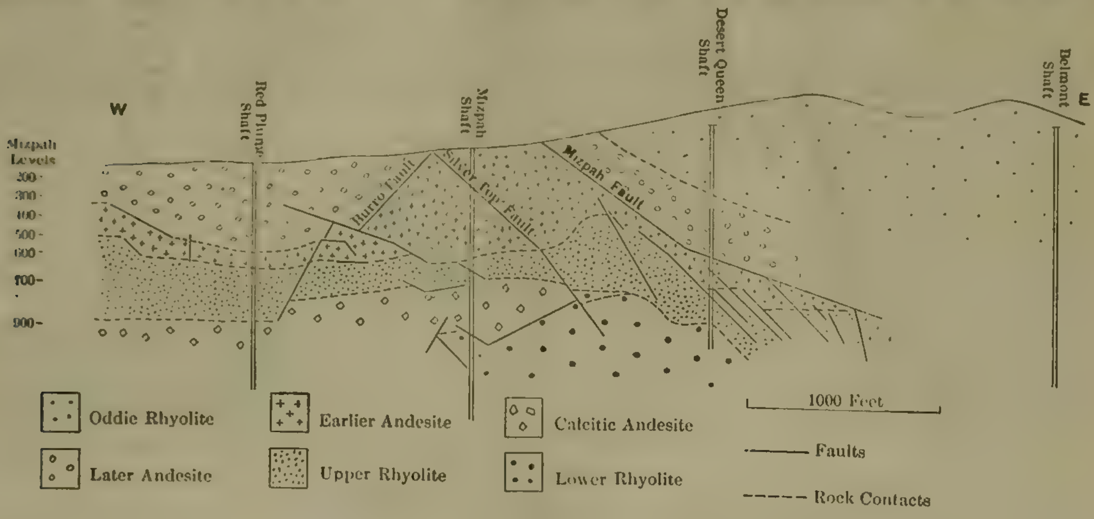
Counties.	Ore treated, Tons.	Gold.*	Silver,* Fine ounces.	Copper, Pounds.	Lead. Pounds.	Zinc, Pounds.	Total value.
Beaver	83,748	$17,114	339.881	1,128,785	6,235,535	513,733	$646,111
Boxelder and Morgan	24,292	19,052	1,147	1,142,961	39,263	....	166,555
Grand, San Juan, Uintah, and Wayne	......	3,980	25	....	....	....	3,994
Iron and Piute	6,726	27,569	9,426	12,127	....	....	34,199
Juab	242,977	1,181,366	3,835,063	9,018,921	19,647,605	....	5,262,198
Salt Lake	5,442,258	1,776,058	2,006,131	114,542,964	31,407,835	3,572,347	18,981,177
Summit and Wasatch	215,339	92,351	2,571,771	1,423,629	38,129,761	9,437,992	3,849,268
Tooele	314,482	721,361	189,143	315,281	8,607,706	2,843,032	1,395,802
Utah	59,576	193,234	1,514,384	12,404	19,256,930	....	1,859,881
Total	6,389,398	$4,032,085	10,466,971	127,597,072	123,324,635	16,367,104	$32,199,185

*Includes placer production.

The Geology of the Tonopah Mining District

By Augustus Locke

*The important geological publications concerning the Tonopah mining district are those of Spurr and of Burgess. In these publications are presented fundamental differences of interpretation, which are the more interesting because both authorities have had ample opportunity for observation, and because both are geologists of proved ability. The general geological features of Tonopah are shown in Fig. 1, and the differences of interpretation referred to are outlined in the accompanying notes. Briefly, Burgess regards the various rocks as flows, lying in the order of their deposition. Spurr regards them in part as flows, and in part as flat-lying intrusives. The disagreement, then, concerns the rocks regarded on the one hand as intrusives, and, on the other hand, as flows. These rocks are chiefly the so-called calcitic andesite, the upper rhyolite, and the lower rhyolite. The economic importance of the question of interpretation is, of course, limited to its bearing on the probable distribution of undiscovered ore. The later andesite is generally conceded to be barren—a 'cap rock,' at whose lower contact the productive veins apex. The earlier andesite has so far yielded the bulk of the production. As has already been suggested, both Spurr and Burgess regard it as a flow, and both have essentially the same conception of its distribution. Above the bottom of the earlier andesite, therefore, the conception of the ore distribution is the same, whichever interpretation be adopted. Below the bottom of the earlier andesite, however, the matter of interpretation assumes supreme economic importance; for, while Burgess regards all the underlying rocks as older than the earlier andesite, and older than the chief ore mineralization, Spurr regards them as younger than both. Under Spurr's hypothesis, exploration in these rocks is emphatically discouraged; under Burgess', it is to a certain extent encouraged.



Geologic column of rocks shown in section (youngest at top).

Spurr (1910).		*Burgess.*
Oddie rhyolite (partly intrusive).		Oddie rhyolite.
Lower rhyolite.		Later andesite.
Later andesite.	} probably identical.	Earlier andesite.
Calcitic andesite (intrusive).		Upper rhyolite.
Upper rhyolite (intrusive).		Calcitic andesite.
Earlier andesite.		Lower rhyolite.

FIG. 1. EAST-WEST SECTION THROUGH MIZPAH SHAFT. (Adapted from Burgess.)

The important evidence appearing to favor the hypothesis that all the rocks occur in flows is as follows: (1) The locus of each rock is horizon like. For example, the lower rhyolite is encountered at depths averaging about 1000 ft., over an area of at least a square mile. Its surface, except where it is faulted, is seldom steeper than hill slopes, and is chiefly flat or horizontal. (2) Materials closely resembling stratified volcanic tuffs occur abundantly on the upper contact of the lower rhyolite, and less abundantly on the upper contact of the upper rhyolite. (3) The contacts between the supposedly intrusive and intruded rocks are, when unfaulted, most often notably straight and regular. Nowhere have the so-called intrusives been conclusively proved to invade by means of offshoots the rocks which they have supposedly intruded. The interpretation of irregularities of contact as proof of intrusion is made difficult by the abundant faulting, and by the possibility of inter-flow erosion. (4) The andesitic cover has, over a large area, rigidly confined the rocks which underlie it. The lower rhyolite, a rock having a characteristic and unmistakable appearance, has been proved to occur on the surface only in the territory considerably north of the producing mines, and there in very small and scattered bodies which may be inclusions. (5) The productive veins in certain places pass without diminution either in size or richness from the earlier andesite down into the upper rhyolite. (6) In many places near the top and near the bottom of the upper rhyolite, there occurs an extraordinary igneous breccia, often many feet thick and crowded with foreign inclusions; the matrix is rhyolitic, and the rock looks exceedingly like a flow breccia. The upper portion of the lower rhyolites has numerous but less abundant inclusions. (7) The rhyolites, though containing abundant inclusions, and, among them some which are andesitic, have never yielded inclusions which can be positively identified as belonging to the earlier or later andesites. (8) The andesites are free from inclusions of all sorts; therefore their freedom from inclusions of rhyolite is no indication that they are older than the rhyolites.

The evidence supposedly favoring the hypothesis that some of the rocks are intrusive is as follows: (1) In the rhyolites, a banding resembling flow structure sometimes follows irregularities in the contact. (2) The rhyolites ocasionally have on their contacts with the andesites knob-like and wedge-like projections, looking like intrusive shapes. (3) In certain places the calcitic andesite is separated by rhyolite from the later andesite with which it is supposed by Spurr to be identical. In certain places the earlier andesite is separated by upper rhyolite from a rock called glassy trachyte, with which Spurr supposes it to be identical. (4) The profitable veins often disappear or weaken when they reach down to the lower contact of the earlier andesite.

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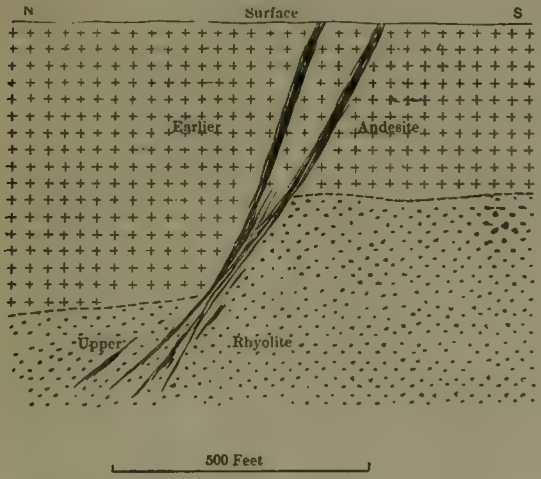
*Abstract of a paper presented at the San Francisco Meeting of the American Institute of Mining Engineers.

It must be granted at the outset that the disposition of the rocks in horizons creates the presumption that they are flows. Most of the shafts penetrate similar rocks in similar succession. Thus, the lower rhyolite, so far as is known, underlies the whole district; the calcite andesite almost everywhere covers the lower rhyolite; and above these rocks come, in order, the upper rhyolite, the earlier andesite, and the later andesite. The individual sheets of rock have many irregularities in thickness; these, however, are satisfactorily attributable to interflow erosion and to faulting.

Again, if we conclude that the earlier andesite is the oldest rock in the district, we must conclude also that it has been floated up by the intrusive underlying rocks to a height of at least 1000 ft., and possibly to a much greater height. (The lower contact of the lower rhyolite is not known.) During the process of floating up, the andesite has retained over an area of at least a square mile, its integrity and approximate horizontality.



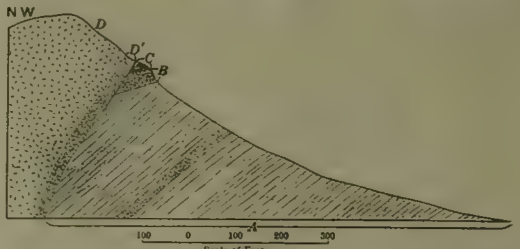
DOWNWARD EXTENSION OF TYPICAL VEIN INTO RHYOLITE.

A general view, then, of the large features of rock distribution affords strong evidence in favor of the theory of extrusion. Nevertheless, it is conceivable that pseudo-flows might result from intrusion, and this evidence is, therefore, by itself, inconclusive.

If the large facts of rock distribution fail to furnish conclusive evidence of the origin of the rocks, this evidence must be sought in the details of the rock contacts. In general, there are certain details of rock contacts whose testimony must be accepted as unimpeachable. One such detail is the existence at contacts of volcanic tuffs; genuine tuffs being proved to exist between layers of volcanic rocks, it is difficult to conceive of evidence, however abundant, which would prove that the layers are not flows. It becomes, therefore, a matter of extreme importance to determine whether or not in Tonopah the supposed tuffs are genuine. Burgess, who discovered them, believes that they are. Spurr believes that they are not. That they are tuff-like, is beyond doubt. They are somewhat soft; they possess stratification, marked by alternating bands of coarse and fine fragmental material; they cleave easily along the junctions of these bands; they lie with their structure parallel with the rock contacts. If they are not true tuffs, resulting from surface deposition, then they are conceivably attributable to one or both of two processes—flow-banding (the arrangement of inclusions along flow-lines) and movement-banding. Spurr's conception of their origin is expressed in the following: "* * * brecciated and granulated rock is often layered by the fault-movement and fault-pressure, so that it assumes all the appearance of certain varieties of surface-formed detrital tuffs."

Microscopic examination of thin sections of specimens from the Mizpah 700-ft. level yields conclusive evidence against the possibility of the production of the supposed tuffs either by flow-banding or movement-banding. (1) The tuffs are made up of sharp-cornered fragments, often crowded closely together, and are typically clastic. (2) They are distinctly layered; layers of coarse material alternate with layers of fine material, with no gradation from coarse to fine. (3) The abundant quartz phenocrysts, with one or two exceptions, when revolved in polarized light, extinguish with much suddenness. The wavy extinction, which is the invariable characteristic of strained quartzes, is strikingly absent. That a sorting out and sharp separation of coarse from fine should result from flow or movement-banding is, of course, incredible. And the significance of the unstrained quartz phenocrysts cannot be questioned. Indeed, the tuffs are so life-like and their detrital origin so obvious that their import would be ordinarily accepted as a matter of fact.

The supposedly intrusive contacts of rhyolite with other rocks at no place seen by me offer incontestable evidence of intrusion. Before such proof can be accomplished, it is necessary to prove that the irregularities were not caused by faulting, or by inter-flow erosion, or by both. Now, in localities of extensive rock alteration and abundant faulting, such proof is impossible; indeed, here the proof that the irregularities were actually caused by faulting is frequently possible. The rhyolite at certain places possesses a banding which follows to some extent irregularities of the contact, and which sometimes looks like flow-banding, and might suggest intrusion. I have failed, however, to find any such place where the evidence of intrusion was unequivocal. Usually, the banding is irregular and very discontinuous. It is quite as often oblique to the contact as parallel with it. Moreover, if contact-movement, as Spurr believes, can produce tuffs, it is very easy to conclude that it can produce apparent flow-structures.



(From *Professional Paper No. 42, U. S. Geological Survey.*)

A. Finely stratified Siebert tuffs (lake-beds) with occasional layers of rounded pumice fragments or water-worn lava.

B. Basaltic agglomerate with bombs, capped by solid basalt.

C. Basalt.

D. Brougher dacite, intrusive neck.

D'. Glassy marginal facies of dacite.

VERTICAL CROSS-SECTION OF SOUTHEAST SIDE OF SIEBERT MOUNTAIN.

The usual restriction of nearly all the probable ore deposits to the earlier andesite is one of the most interesting facts of ore occurrence with which I am familiar. In certain cases, the ore ends abruptly when it comes down to the lower contact of the andesite. In other cases, it extends down into the underlying rhyolite, ultimately, however, weakening and dying out. Occasionally, as seen in the figure, it survives for a time with a hanging wall of andesite and a foot-wall of rhyolite, ceasing shortly after it passes entirely into the rhyolite. Lastly, it passes from andesite to rhyolite without change.

To explain the superior productivity of the andesite, many hypotheses are possible: (1) The andesite is the earliest rock; the chief ore-mineralization followed it and preceded the other rocks. (Spurr's hypothesis.) (2) The source of the ore minerals may have been the andesite itself or the upper rhyolite. (Suggested by Burgess.) (3) The ore was deposited largely by metasomatism. The various rocks, particularly the upper rhyolite and the earlier andesite, present great contrasts in texture. Certain textural and chemical properties possessed by the andesite caused it to be more favorable to the precipitation of the ore minerals than the other rocks. Or the andesite was more favorable to the formation of initial channels than the other rocks. (4) The path of travel of transporting agents was mainly along the andesite-rhyolite contact and upward into the andesite. (5) Ore deposition was a superficial phenomenon, effected through the decrease of heat and pressure near the surface, or through other superficial agencies. The andesite, at the time of ore deposition, was the surface rock, and, therefore, received the bulk of the ore-mineralization. (6) Post-vein faulting at the contact between upper rhyolite and lower andesite in some instances caused the disappearance of the vein at the contact. (7) Ore-mineralization occurred after the eruption of the earlier andesite and in cooling-shrinkage cracks in that rock.

Spurr, as has already been made clear, accepts the first of these hypotheses and, apparently, rejects the others. The fact that the ore frequently extends down into the rhyolite, he explains by a supposition of several periods of mineralization, of which the first and most important was earlier, and the others later, than the rhyolite. Veins contained entirely in andesite belong, then, to the first period; veins in rhyolite, or in both rhyolite and andesite, belong to later periods. That several periods of mineralization did exist is probably true. The assignment, however, of a particular vein to a particular period is often impossible. There is no mineralogical distinction whatever to be made between many veins which, according to the hypothesis, should belong to separate periods. The remaining six hypotheses cannot be easily cast aside. To prove any one of them would be difficult; to disprove would be even more difficult. Yet so long as they stand as possible explanations of the localization of the ore deposits, they must offer impassable barriers to the acceptance of the hypothesis just now considered.

Siebert mountain looks like a succession of flows, but Spurr's interpretation, shown above, regards it as partly intrusive. The fact of the matter is, however, that the supposedly intrusive rhyolite (or dacite), just above its contact with the basalt, has a very well-marked and nearly horizontal flow-structure—a fact scarcely compatible with the idea that the contact has the character shown in Spurr's section. That the rocks of the productive part of the Tonopah mining district are flows lying in the order of their deposition is proved by the occurrence of volcanic tuffs at the contacts whose interpretation has been in dispute. The other available evidence in some instances supports, and in no instance contradicts, this conclusion. There is no good reason, then, for the belief that the rocks underlying the earlier andesite are younger than the chief productive mineralization. Exploration in these rocks is accordingly relieved of the discouragement which would attend this belief.

Mineral Production of Philippines in 1910

The bulletin on Philippine Mineral Resources for 1910 has been unavoidably delayed but is now in the press. In advance of its publication, the following statistics are given:

Total metallic production, including coal	₱505,138
Total non-metallic, chiefly structural material	1,541,031
Total mineral production	₱2,046,169
Total gold production	308,860
Value of iron produced	20,023
Value of total coal production	176,255

The largest amount of gold was derived from Ambos Camarines; the iron was entirely derived from small native mines.

Electrical Iron Smelting in Sweden

By T. D. Robertson

*The success attained in smelting magnetic concentrate at Trollhattan is of great interest. The design of shaft now employed is not considered suitable for the purpose, being too narrow, but in spite of this 65%, of fine concentrate caused no inconvenience in working. The inventors of the furnace are of the opinion that with a specially designed shaft, all fine concentrate could be smelted alone. Iron sands and lean magnetites, which are easily concentrated, but which are expensive to nodulize or briquette into a form suitable for blast-furnace smelting, are of frequent occurrence, and that where these are within easy reach of water-powers, there seems to be a good field open for electric smelting. Haanel, in his report on the experiments made at Sault Ste. Marie, mentions that no difficulty was experienced in smelting titaniferous ores electrically, and it is interesting that the Swedish experience bears this out, although no ores were used with more than 0.8% TiO_2. The electric smelting of ores with high sulphur content is another problem. Haanel was successful in producing low sulphur iron from sulphurous ores, but in Sweden there are practically none of these ores mined, so that this point was not confirmed on a large scale at Trollhättan; however, there can be little doubt that the electric furnace, with its reducing atmosphere and basic lining of the hearth, permitting as it does of the use of a slag rich in lime, offers the best method of producing sulphur-free pig iron from ores containing that unwelcome element.

The pig iron produced by the furnace was sent to various Swedish iron works for conversion into steel in open-hearth furnaces. The characteristic feature of electric pig iron is its freedom from oxides; and in consequence electric pig of normal silicon content (say, 1% and over) takes a longer time and more ore to convert into steel than ordinary blast-furnace gray iron. Low-carbon electric pig iron, however, is found to give surprising results, charges made up of 50% of this iron and 50% of scrap producing hot fluid steel with considerable saving of time over ordinary practice. As was to be expected, the open-hearth furnace managers looked somewhat askance at this iron at first, as they knew the disastrous effect of using low-carbon iron full of holes from the blast-furnace; however, after giving it a trial, the workmen asked for more, as they said that the furnace worked better and more rapidly with the new pig iron. Fortunately for the electric furnace in Sweden, it is more economical to make the white iron, that the steel-makers prefer, than to make high-silicon gray iron. Thus it may be maintained, on the strength of the experience gained, that for the open-hearth process, high silicon contents are detrimental rather than advantageous, while in the blast-furnace pig iron a certain quantity is necessary to neutralize the defects of a reduction process less perfect and ideal than that employed in the electric furnace. The quality of the steel produced has been thoroughly tested by making it up into various products and comparing it with steel made from Swedish charcoal blast-furnace iron. In no case was the new steel inferior, and, from the most recent reports to hand, it was in several cases decidedly superior.

The Trollhättan furnace was shut down at the end of May of this year in order to make certain alterations suggested by the results of its six months' campaign. Two of these deserve mention.

(1) Since the furnace was designed, the manufacture of large carbon electrodes, of high conductivity, has made great progress. It is now possible to obtain cylindrical electrodes of 600-mm. diameter, fitted with screw joints. These have recently been installed at Trollhättan, and result in two considerable improvements, the first one being that the loss due to stump ends is done away with, as when an electrode becomes too short, a new one can be

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*Excerpt from a paper presented before the American Electrochemical Society, Toronto, September 21 to 23.

screwed above it. The second one is that the electrical contact can be made at the point where the electrode enters the roof, in this way saving about 40 kw., which with the old arrangement was lost, due to the resistance of the whole length of the electrode through which the current had to pass. This new arrangement will permit of the furnace taking 3000 hp. instead of 2500 horse-power.

(2) The other important alteration is in the gas-circulating arrangement. The old dust-catcher was not very effective, as only very fine dust is expelled from the furnace. The result was that the dust collected in the centrifugal fan, and had it not been that this was kept fairly clear by a jet of water, would have choked up the blades in a few hours; as it was, the fan had to be stopped and cleaned every week. Now a water-scrubber takes the place of the dust-catcher, and a fan on the ground floor blows the cleaned gas into the furnace, and the other fan being held in reserve. At the present time the following 'Electrometall' furnaces are either working or in course of erection:

Sweden.	Hp.
Trollhättan, one furnace	3,000
Domnarfvet, one furnace	4,000
Hagfors, two furnaces (3000 hp. each)	6,000
Norway.	
Tyssedal (Hardanger), two furnaces (3500 hp. each)	7,000
Arendal, two furnaces (2500 hp. each)	5,000
	25,000

In these newer furnaces, 3-phase current is used, and by means of three single-phase transformers low-tension current is furnished to six carbon electrodes. Owing to the recent improvements in electrode manufacture and furnace design, it is now possible to construct units up to 6000 hp. which it is expected will work for two years without serious repairs to the hearth. Rather more than three metric tons of pig iron are produced by the electric furnace per electrical horse-power year, using one ton of charcoal for the reduction of the ore. The blast-furnace uses about three times this amount of fuel per ton of iron, so that in Sweden, where, owing to the demand of wood for the pulp industry, the price of charcoal is yearly advancing, there is a great field open for electrical smelting on account of the saving in fuel. The furnaces in Norway have a somewhat different form of shaft, as coke is the fuel employed for smelting. The volume of the shaft is smaller, but its diameter is greater, than the corresponding shaft of a charcoal furnace. The coke in the charge gives a greater conductivity, so that a lower tension has to be used. In the London correspondence of the October 14th issue of the *Mining and Scientific Press*, interesting details of the application of the electrical furnace to the smelting of complex sulphide ores are given.

Metal Mining in Washington, 1910

The total value of the gold, silver, copper, and lead from the State of Washington in 1910, according to C. N. Gerry, of the U. S. Geological Survey, was $968,249, against $448,966 in 1909. The output for 1910 was the largest in gold, silver, and lead and the smallest in copper for six years. The production of gold in 1910 was $788,145, against $362,051 in 1909; that of silver was 205,345 oz. valued at $110,886, against 79,488 oz., valued at $41,334; that of copper 86,918 lb., valued at $11,038, against 255,134 lb., valued at $33,167; and that of lead 1,322,278 lb., valued at $58,180, against 288,700 lb., valued at $12,414. The number of producing mines in Washington increased from 11 placers and 35 deep mines in 1909 to 21 placers and 55 deep mines in 1910. The placers produced, however, only $3859 gold in 1910. The deep mines produced 59,209 tons of ore in 1910, an increase of 22,901 tons over the output of 1909. The Republic district, in Ferry county, produced the greater part of the gold and silver in Washington, and mines in Stevens county produced nearly all the copper and lead. The Republic district alone produced gold, silver, copper, and lead valued at $813,686 in 1910.

Ore Deposits in South Central Porto Rico

Peter Nelson, an experienced prospector and miner from the Western States, reports that he has recently discovered a mineral belt several miles in area on the southern side of Porto Rico in the municipal district of Guayama, about the central part of the island. The veins are traceable from the bottom of the foothills to a distance of about six miles from the coast and have variable strikes and dips, although many seem to have a northwest strike, with a dip to the southwest. The veins rarely project above the surface, and there is nothing to indicate them but the foot-walls, which are much harder than the hanging walls or the usual country rock. These veins have numerous shoots of high-grade oxidized and sulphide ores, chiefly galena, which can be uncovered at many of the projecting walls by removing from 4 to 10 ft. of loose earth and shattered rock, which has crumbled from the harder foot-wall. The north and south veins also contain galena, but are of a different character, being associated with schist and limestone, and in many places outcrop high above the surrounding country. On this projecting rock there can sometimes be seen fragments of galena which is 'frozen' to the wall-rock. This can also be found on the hillside for some distance from the outcrop from which it has floated. None of these have been developed, so far as known, and probably never were discovered until the present time, but in the same belt there are two veins that were discovered and developed in a crude way during the Spanish régimé. These veins have an easterly strike and show some high-grade ore. None of the old excavations are deeper than 20 ft., all of the work was open-cut, and the dumps show that nothing but the coarsest and hardest pure galena was saved, for all the carbonate ore has been thrown on the waste dumps. One of these old Spanish claims has a shaft to a depth of 60 ft. on a vein that has a dip to the northeast, in which there was a shoot of galena, but when a depth of 20 ft. was reached, the galena entirely disappeared and there was nothing left of the shoot but a small streak of hard quartz carrying some sulphides, and at intervals showing copper stains. An adit was driven under a shallow hill and it was discovered that the ore reached the same depth below the surface at that place. The problem was carefully studied and it was observed that the shoots had come from another vein that joined them near the surface and had a directly opposite dip. So the shaft will be sunk on the same dip, and cross-cuts will be driven through the separating dike to cut the vein that has ore-shoots.

The shaft is only to a depth of 60 ft. and is the deepest shaft known on the island, sunk for mining purposes. The showing at present is very promising, and there is apparently no reason why this district will not turn into a flourishing mining centre within a short time, as the ore from some of the veins which average a foot in width, assays as high as 4.03 oz. gold and 19 oz. silver, besides the lead there is in the ore. Shipments of two small lots, already made, show the ore to run as high as 55% in lead, free from zinc. The first shipment proved to be 49% lead and the second 55%, as it was extracted from a lower level and more free from surface dirt. Veins have also been found from cross-cutting on the surface, 10 ft. wide where they were cut, and the returns on the assays are favorable, as the ore carries from $5 to $7 in gold besides the lead. Most of the claims are at a good elevation, so that they can be worked by adits to a considerable depth.

The district is being explored by Messrs. Nelson, Link, Shanton, and associates, who are doing development work and are finding good ore in many places. The properties on which the work is being done are held by option. There has not yet been sufficient work done on any of the properties to determine the extent of the orebodies. The gentlemen mentioned have now filed with the Secretary of Porto Rico articles of incorporation of the Porto Rico Mines Co. Mr. Shanton, who has been assisting in the exploitation of the development work, is Chief of the Insular Police of Porto Rico, having for five years held the same position on the

Isthmus of Panama, and is well known among all the business men and Government officials on the island of Porto Rico. It is to be hoped that this discovery may prove but the forerunner of many others and eventually lead to the development of Porto Rico as an important mineral region.

September Copper Review

By M. E. Appelbaum

Very little of interest happened in the month of September to affect copper one way or another. The copper market exhibited great strength in the face of the severe declines in securities; which, in my opinion, is due to the fact that the entire visible supply is practically controlled by one interest. While I am not at all enthusiastic as to the copper prices during the coming year, I am nevertheless inclined to think that during the next few months business conditions will be sufficiently good to reduce the visible supply and, of course, cause temporarily higher prices. Production for the month of September shows that temporarily, at least, the production will range about 115,000,000 lb., against which there should be combined deliveries of about 125,000,000 to 130,000,000 pounds.

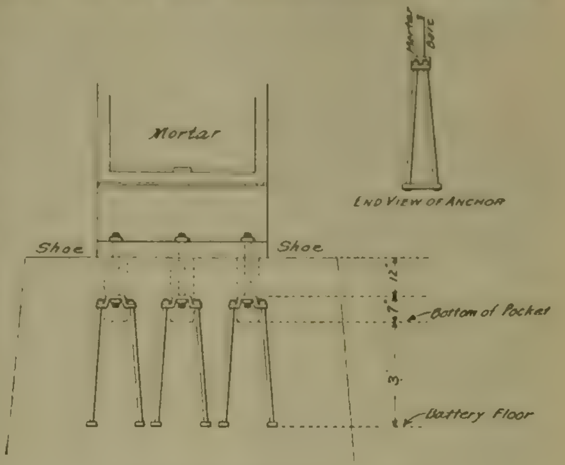
Bearing Metal

When white bearing metal is repeatedly remelted, according to the researches of E. Heyn and O. Bauer, published recently in *Mitt. kgl. Material-prüfungsamt.*, some tin and antimony are lost because of the readiness with which these metals are oxidized at the melting point. The relative amounts of tin and antimony are not changed by the remelting, but the percentage of copper is slightly increased. No appreciable changes in hardness or strength result therefrom. Much more important than the slight changes in chemical composition which result from remelting, is the nature of the cooling which the casting receives. Rapid cooling, in general, increases the hardness, the resistance to hammering, and resistance toward pressure. Presumably there is a corresponding change in the suitability of the metal for bearings. To a certain extent the mechanical properties can be judged by the appearance of the fracture, provided the chemical composition does not vary much from the usual specifications. Rapid cooling produces a fine-grained structure. A more accurate conclusion can be drawn from the microscopic study of a polished specimen. The appearance of the fracture does not give any idea of the chemical variations in the bearing metal, but these can be determined by chemical analysis. The addition of magnesia and aluminum as deoxidizing agents causes a slight increase in hardness, but the mechanical properties are not materially changed by the small amounts of these elements that would be added for the above purpose. In melts deoxidized by aluminum, some efflorescence of Al_2O_3 was observed, but it could not be determined whether this was harmful. Since the change in chemical composition by remelting five times was slight, it does not seem necessary to add any deoxidizing agent. The chief requisite in making bearings is to be sure that the casting temperature is not too high and that the cooling is sufficiently rapid.

By regulating the velocity at which red metal castings cool an important influence is produced upon the mechanical properties of these bronzes. Rapid cooling from above 782° C. increases the hardness and tensile strength, and for this reason sand molds do not produce the best results. The size of the casting influences the rate of cooling in sand molds and sand castings are porous. The change in chemical composition which the alloy undergoes on remelting is slight with copper-tin alloys low in zinc, although there is a tendency for some of the tin to oxidize and remain in the alloy as oxide. By repeated remelting, the hardness and tensile strength are not much affected, but the elasticity and resistance to shearing stress and to shock are diminished. The influence of arsenic upon the temperature at which crystals separate out from the melt is only felt when the arsenic content is considerable.

Battery Foundations

A good form of battery foundation is seen in the accompanying sketch. The anchors are bedded solidly in the concrete at about the level of the mill floor and the concrete continued solidly up to 7 in. below the top of the caps. Then the pocket mold is placed and the block completed. The short mortar bolts prevent any drifting of the mortar, and with the modern high base, deep trough mortars can be easily removed or replaced in case of breakage. In the smaller sketch the details of the construction of the anchor bolts is shown. Each complete anchor consists of two foot plates, 1 by 3 by 10 in., hot-riveted to the four anchor rods, 1 in. by 3 ft., which are provided with a thread and hexagon nut at the top. The cap plate is 1 by 5 by 15 in., bent to the shape shown. The mortar bolt is 1¾ in. by 2 ft., provided with a square nut at the bottom and a hexagonal nut at the top. The mold for the pockets can be readily made of wood and sheet iron.



CONVENIENT BATTERY FOUNDATION.

The Trinity River Basin

The gold-bearing gravels of the Trinity River basin, California, form the subject of a brief report by J. S. Diller, of the United States Geological Survey. The basin is especially noted for its placer mines, which have been worked since the early fifties, and it contains the La Grange mine, the largest hydraulic mine now in operation. In tracing the early geologic transformations of the region Mr. Diller states that there were many advances and retreats of the glacial ice through a long period, and shows that the movement of the glaciers were closely related to the development of the valley terraces during the last cycle of erosion, when the modern streams were trenching their present valleys deeply below the general level of the plateau. Glaciers, Mr. Diller says, are 'gravel mills,' and the gravel and boulders of the till of the earlier glaciers, having thoroughly decomposed, liberated all the gold for concentration by stream action in the gravels capping the terraces of the present streams. In thus initiating the concentration of gold glaciers have a distinct economic aspect.

Mr. Diller discusses three distinct cycles of erosion and the resulting concentration of gold in the different types of gravels of the area, and past and present development of mining. Certain of the deposits, he believes, are worthy of careful prospecting, especially the beds of gravel on the bars and benches of the upper part of Trinity river. If the dredges already started at Trinity Center and Poker Bar prove as successful as they promise, he says, a new impetus will be given to placer mining in the basin. A copy of this report (contained in Bulletin 470-B) may be obtained by application to the Director, United States Geological Survey, Washington, District of Columbia.

Japan Excursion, American Institute of Mining Engineers

On Sunday, October 15, the members of the Institute and their guests, to the number of about 200, made an excursion to the Bohemian Grove, on Russian river in Sonoma county. After an hour spent in strolling about the grove, lunch was served, followed by an hour of music in the leafy amphitheatre. The party returned to San Francisco in the early evening, enthusiastic over the quiet beauty of the spot. On Monday evening the local members of the Mining and Metallurgical Society entertained the visiting members and prominent members of the Institute at a dinner at the Fairmont hotel. The dinner was followed by a discussion of the Alaska land laws, which was opened by H. Foster Bain, and in which Dr. Raymond, George Otis Smith, E. W. Parker, W. R. Ingalls, Charles G. Yale, M. L. Requa, R. Kanda, W. C. Ralston, and W. L. Saunders joined.

On Tuesday morning the members of the Institute who are to visit Japan sailed on the *SS. Manchuria*, Joseph Struthers, the secretary, being in charge of the party, which is accompanied by Reiji Kanda, who came to San Francisco as the representative of the Japanese mine owners' association. The provisional itinerary, so far as it can be fixed in advance, is as follows:

Tuesday, October 17.—Leave San Francisco.

Monday, October 23.—Arrive at Honolulu in early morning. 9 a.m., automobiles visiting Pearl Harbor, Pali, aquarium, and Bishop museum. 12 noon, luncheon at Moana Loa hotel. Late afternoon, leave by *SS. Manchuria.*

Friday, November 3.—Morning, arrive Yokohama. 1:30 p.m., leave Yokohama. 2 p.m., arrive Tokyo, Imperial hotel (Institute headquarters while in Japan). Evening, 9 p.m., ball, tendered by Minister of Foreign Affairs, in honor of the Emperor's birthday.

Saturday, November 4.—Morning, in Tokyo. Noon, luncheon, Hotel Seiyoken, Uyeno Park. 2 p.m., reception by committee, Hotel Seiyoken. Evening, dinner tendered by Baron Iwasaki, Baron Mitsui, and Mr. Furukawa.

Sunday, November 5.—Morning, in Tokyo. Noon, luncheon, Imperial hotel. 1:30 p.m., reception, Mining Institute of Japan, Maple Club. 3:30 p.m., reception, Minister of Agriculture and Commerce, Nobles Club. Evening, Empire theatre, invitation of Reception Committee.

Monday, November 6.—8:50 a.m., leave Tokyo. 12:40 a.m., arrive Nikko, Nikko hotel and Kanaya hotel. 2 p.m., Nikko Copper Works, Furukawa Mining Company.

Tuesday, November 7.—Nikko.

Wednesday, November 8.—1:50 p.m., leave Nikko. 5:35 p.m., arrive Tokyo, Imperial hotel.

Thursday, November 9.—Section A (one-half of party): 9 a.m., leave Tokyo; 10:08 a.m., arrive Kamakura, Kamakura hotel; visit Kamakura temples and Yenoshima islet. Section B (other half of party): 9:10 a.m., leave Tokyo; 10:41 a.m., arrive Kozu, electric car and ricksha to Miyanoshita, Hakone, Fujiya hotel, Miyanoshita.

Friday, November 10.—Section A: 8:15 a.m., leave Kamakura; 9:05 a.m., arrive Kozu, electric car and ricksha to Miyanoshita, Hakone, Fujiya hotel, Miyanoshita. Section B: 9:25 a.m., leave Kozu; 9:55 a.m., arrive Fujisawa (Kamakura); visit Yenoshima islet and Kamakura temples, Kamakura hotel.

Saturday, November 11.—Section A: morning, leave Miyanoshita for Kozu in time for 10:10 train. Section B: 9:15 a.m., leave Kamakura; 10:07 a.m., arrive Kozu. Sections A and B: 10:10 a.m., leave Kozu; 8:40 p.m., arrive Kyoto, Miyako hotel and Kyoto hotel.

Sunday, November 12.—Kyoto.

Monday, November 13.—8:10 a.m., leave Kyoto. 9:35 a.m., arrive Nara. Noon, luncheon, Nara hotel. 4:55 p.m., leave Nara. 6:17 p.m., arrive Kyoto, Miyako hotel and Kyoto hotel.

Tuesday, November 14.—7:30 a.m., leave Kyoto. 8:27 a.m., arrive Osaka, reception by Mr. Fujita. 1:30 p.m., leave Osaka. 2:38 p.m., arrive Suma, reception by Mr. Sumitomo at his villa. 4:35 p.m., leave Suma. 4:51 p.m., arrive Kobe. Evening, dinner at Oriental hotel. 10 p.m., embark *SS. Omegaka Maru.*

Wednesday, November 15.—Early morning, arrive Shisaka island; visit Sumito's Smelting Works. Forenoon, leave Shisaka, sail through Inland sea. Evening, arrive Miyajima; quarters on steamer.

Thursday, November 16.—Morning, Miyajima (said to be one of the three most beautiful places in Japan). Afternoon, leave Miyajima by *SS. Omegaka Maru.*

Friday, November 17.—Daybreak, arrive Moji. Morning, at Wakamatsu; visit Imperial Iron Works. Afternoon, return to Moji; quarters on steamer.

Saturday, November 18.—7:10 a.m., leave Moji by train. 10:46 a.m., arrive Omuta; visit Miike coal mines. 5:30 p.m., leave Omuta. 9:10 p.m., arrive Moji; quarters on steamer.

Sunday, November 19.—9:50 a.m., leave Shimoneseki by train.

Monday, November 20.—2:30 p.m., arrive Yokohama, Grand hotel.

Tuesday, November 21.—Morning, leave Yokohama by *SS. Siberia.*

Thursday, December 7.—Arrive San Francisco.

Among the members of the party are Mr. and Mrs. H. Foster Bain, Mr. and Mrs. George B. Berger, Mr. and Mrs. LeRoy Brewster, Mr. David W. Brunton, Mr. and Mrs. Will L. Clark, Mr. and Mrs. F. H. Daniels, Mr. and Mrs. Henry S. Drinker and daughters, Mr. Carlos F. Galan, Mr. and Mrs. H. W. Goddard, Mr. Charles W. Goodale, Mr. and Mrs. Henry Chester Greer, Mr. Abbot A. Hanks, Mr. and Mrs. Robert W. Hunt, Mr. Reiji Kanda, Mr. and Mrs. Clement Le Boutillier, Mr. and Mrs. William R. McIlvain, Mr. William McIlvain, Mr. and Mrs. Walter B. Manny, Mr. E. A. Montgomery, Mr. and Mrs. Willard S. Morse, Mr. W. V. Morse, Mr. and Mrs. Seeley W. Mudd, Mr. Seeley C. Mudd, Mr. Jose Muriel, Mr. and Mrs. T. H. Proske, Mr. and Mrs. Rossiter W. Raymond, Mr. and Mrs. Joseph W. Richards, Mr. William L. Saunders, Mr. and Mrs. F. C. Smink, Mr. Joseph Struthers, Mr. and Mrs. Edwin Thomas, Mr. A. E. Vaughan, Mr. and Mrs. Eli Whitney, Mr. and Mrs. William H. Wiley, Mr. and Mrs. David Williams, Mr. and Mrs. Newton R. Wilson, Mr. and Mrs. Philip Wiseman, Mr. P. Kenneth Wiseman, Mr. and Mrs. Otto C. Wolf.

Platinum Production in 1910

The production of crude platinum in the United States for 1910, according to Waldemar Lindgren was 390 troy ounces, having a value of $9507, the entire output being confined to placer mines in California and Oregon, where it is obtained in gold-washing. The production of California in 1910 was 337 oz. valued at $8386. This is chiefly recovered as a by-product of gold-dredging operations in Butte, Yuba, and Sacramento counties, though small quantities are derived from river gravels in Siskiyou and Trinity counties and from beach sands in Humboldt county. The production in Oregon is chiefly derived from beach sands near Port Orford in Curry county and near Bullards in Coos county. The copper mine at Rambler, Wyoming, is now finally closed down, having never been of importance as an actual producer. The production of crude platinum in the United States has been variable, ranging from over 1400 oz. in 1906 to 375 oz. in 1907. The production in 1909 was 638 oz. valued at $12,803. The price of ingot platinum has been equally variable, having been $20.50 per ounce in January 1906, increasing to $38 in January 1907, falling to $18.20 in August 1908, and having recently been quoted at $47.50 per ounce. Although prospecting for platinum has been carefully carried on in the United States, no deposits of much importance have ever been found. The world's supply of platinum is derived from Russia and Colombia, the former having produced 190,087 oz. in 1909, and the latter 6000 ounces.

Concentrates

Most of these are in reply to questions received by mail Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

MANGANESE is the best deoxidizing agent for nickel and its alloys. Not only does it remove the oxygen, but the sulphur as well.

TO REMOVE RUST from metal, cover the metal with sweet oil, rubbing it in well, let stand 48 hours. With a piece of cotton wool apply oil freely, then rub well with powdered unslaked lime.

PIPES used for conveying water to the electric power houses are often composed of California redwood. This is a great advantage, as such pipes cost less than metal ones, and are more durable.

COPRA is not a mineral, but is the dried meat of the cocoanut, and an important article of commerce in many parts of the Far East. Coprolites are the fossil droppings of sharks; neither of these substances contain any copper whatever.

POLYBASITE is a soft, iron-black silver mineral of the composition $(Ag,Cu)_9SbS_6$. It frequently occurs tabular crystals, and resembles tetrahedrite when massive. It can be distinguished by the reactions which it gives for lead before the blowpipe and when treated with acid.

TUNGSTEN is valuable as a filament in incandescent electric lamps because its melting point is very high, about 1700°C. It gives a whiter light than carbon, and is doubly as efficient. One pound of the metal is enough for thousands of filaments. Contrary to a generally accepted belief, tungsten is not used in the manufacture of armor plate, though it may have been used in experimental plates.

TOPOGRAPHIC atlas sheets of the United States are sold by the Director of the Geological Survey, at Washington, in accordance with an act of Congress, at the nominal rate of 5c. per copy—the cost of paper and printing—or $3 per hundred if at least 100 copies of any map or maps are purchased. They are also sold by dealers in many of the larger cities. The Geological Survey at Washington also publishes index maps showing the quadrangles which have been mapped throughout the United States, and a copy of this will be sent free to anyone requesting it.

NATURAL GAS can be liquefied by pressure, either alone or with the aid of refrigeration in a manner similar to that employed in the manufacture of 'blau gas,' which is liquefied under a pressure of 1500 lb. per square inch and is shipped in steel drums to wherever it is needed. On releasing the pressure the liquid becomes a gas again and can be employed for any purpose for which gas is used. Recently it has been claimed that gasoline may be made by compressing and cooling natural gas. While this is not impossible, it is not probable, and the claims should be carefully investigated.

DELAY ACTION fuses have been used to advantage in certain classes of adit or shaft excavation. These are made so that a very short space of time intervenes between their ignition by the electric current, and their detonation. Two kinds are manufactured, one kind detonates a little before the other, when both are connected in the same blasting circuit. When they are used in conjunction with regular electric fuses, the latter will detonate at the instant the electric current passes through the circuit; the first period fuses will follow, and the second period fuses will detonate a little later. By their use it is possible to fire one section of a blast sufficiently ahead of the following section for the material blasted by the charges in the first section to be blown out of the way before the following shots produce their effect.

WHEN a valve is wanted near a right angle turn in a pipe line, it is generally a good idea to use an angle valve instead of a globe or a gate valve, and an L, as it requires less joints to make and keep tight, and it makes a better looking job; also because less friction will be caused by water or steam passing through the line. On pipe lines that are to convey superheated steam from one point to another, it is not wise to use valves with hard rubber disks in them, as the heat will dissolve them in a short time. Use only brass or gun metal valves for such places, or remove the hard rubber disks and substitute one made of bronze.

MINE FIRES often burn for long periods of time. Probably the best known mine fire in the United States is that near Summit Hill, Pennsylvania, on the property of the Lehigh Coal & Navigation Co. The fire in question was discovered February 15, 1859, and has been burning continuously ever since in spite of several efforts to extinguish it. It began and has continued in the mammoth vein which, through this section, is about 50 ft. thick, and as in the early workings of this vein the coal was very imperfectly taken out, a large amount was left for the fire to feed upon. It is also close to the surface and the rocks overlying the coal have caved and been broken in many places, affording ample inlet for air and making it very difficult to seal off the fire by closing up old passage ways. Various schemes for checking the fire have been tried, but thus far have not proved effective. The distance from the point of origin of the fire to its present location is now about 4000 ft. and the burned out area varies from 600 to 1500 ft. in width. Should the fire advance much farther, it would pass over the anticline and into the Lansford Valley in which the area of coal exposed to attack would be greatly increased. It was, therefore, decided to attempt to seal off the fire by clay barrier entirely across the coal seam and preliminary work was begun December 18, 1908. The work is still in progress and it is estimated that 100,000 cu. yd. of clay will be needed to fill the shafts and to construct the barrier.

THE APEX LAW or right to follow the vein indefinitely on its dip, was originated and put into practice by the miner, who believed that the discoverer of a vein on the surface, was entitled to all of the vein in depth as his reward; also, that if the right to follow the vein in depth was not granted him, he would of necessity have to appropriate a large amount of ground on each side of the outcrop or apex of the vein, in order to insure his possession of the vein in depth, which would work a hardship on him in trying to hold the ground and on others in preventing them from prospecting this additional area. At the time the law was originated, the 'true-fissure' type of quartz vein was the prominent and ruling type of orebody known. Such a vein occupies a fairly regular fissure in the earth, and is comparatively clear cut and well defined. It may be likened to a leaf within a book. If all veins or lodes were of this type, the wisdom of the epex law would be unquestioned. As mining progressed, it was found that ore deposits departed more and more from the theoretical idea of a vein or lode upon which the law was founded, especially in the case of base-metal vein and lodes, and impregnation and replacement deposits. The questions that arose regarding the apex law were of two classes. The first question was, who had the apex according to the geologic facts? The statutes, it was soon evident, had made no provision for the varying conditions under which apexes and claim-lines were found. Having determined the geologic facts as to who had the apex, what decision should be handed down, became the second question. The second question, one of law, has been answered by the various court decisions covering most of the forms of apex and claim-line occurrence, so that if the facts of the apex are established, the law can be applied. The first question, what are the conditions under which the vein or lode occurs and who has the apex, the question of fact, can only be determined by geologic investigation and engineering work, and is the difficult point in all apex suits.

Special Correspondence

ST. PETERSBURG, RUSSIA

Russian Gold Production. — Total Production by Dredging.—Yield per Dredge.—The Most Successful Dredges.

The 1910 results of the gold and platinum production in Russia and Siberia by means of dredging show a large increase over 1909, and furnish additional proof of the importance of dredging in the Russian and Siberian gold and platinum fields. The number of dredges in the goldfields continues to grow and is now stated to be 66, compared with 55 in 1909. The increase is accounted for by the installation of new dredges by the Nishni-Tagil and the Amgun company, besides the setting to work again of some old dredges. But although 66 dredges are at work, returns are available only for 55; the owners of the remaining 11 having for one reason or another abstained from making the statement of their year's work as requested of them. The number of working hours done per dredge (average) was the largest of the five years of which 1910 was the last; though the quantity of sand washed per dredge was slightly inferior to that washed in 1909, but greatly superior to the next preceding years; and again the quantity of gold produced was slightly inferior per dredge to the corresponding result of 1909. For the purpose of comparison the metallic gold return per dredge is given for the five years ended 1910, thus: 1906, 2 poods,* 22 funts, 24 zolotniks; 1907, 2p. 6f. 67z.; 1908, 2p. 28f. 91z.; 1909, 3p. 17f. 54z.; and 1910, 3p. 16f. 10z. This close resemblance in the returns for the last two years suggests that little advance had been made in that period either as to improvement in the technique of the industry, or as to the selection of ground on which to work. That is, that higher grade sands than those hitherto worked have not yet been found.

Although the yield of gold per dredge was smaller than for the preceding year, the total result is a substantial advance because of the larger number of dredges engaged in the work. The increase over 1909 amounts to 25 poods, 32 funts, or 183p. 15f., against 157p. 23f. The increase is sufficiently large to prompt the observation that dredging is a continuously growing element in the Russian gold and platinum industry, with the reserve that notwithstanding the increased extent of the Siberian gold sands offering such an ideal field for the use of dredges, these do not require such a relative importance as they have acquired in other countries. The increase is due to the installation of new dredges; probably of large bucket capacity and improved workmanship. No doubt is entertained that the use of dredges on these great and suitable goldfields will continue to advance. One of the most powerful causes of the dilatoriness in that application is the cost of foreign dredges under the protective tariff to which must be added the confessedly inferior quality of the Russian built dredge. The attitude of the Siberian goldfield exploiters toward this question is one of unending protest against the disabilities under which the gold industry must labor as long as foreign dredges are so dear, and home dredges are so poor. An idea is given of the capacity of the dredges by a table showing their production, thus: eight dredges produced less than 1 pood; one produced between 1 pood and 1 pood 20 funts; five between 1p. 20f. and 2p.; nine between 2p. and 2p. 20f.; eight between 2p. 20f. and 3p.; six between 3p. and 3p. 20f.; four between 3p. 20f. and 4p.; four between 4p. and 4p. 20f.; two between 4p. 20f. and 5p.; two between 5p. and 5p. 20f.; and one each between 5p. 20f. and 6p., 6. and 6p. 20f., and between 6p. 20f. and 7p. To these 52 dredges there remain to be added three which produced 8p. 36f., 10p. 32f., and 16p. 5f. respectively. These three remarkably successful dredges operated on the Demidoff San Donato Successors' works in the Nishni-Tagil area; and as they are all in the same ground, it may be assumed that their success is due rather to the richness of the sand than to the superior efficiency of mechanism.

The next most successful dredge was that of the Southern Taiga, belonging to the Fedoroff Gold Co. Its production was 6 poods 27 funts. This company had also a dredge each on the Southern and Northern Taiga respectively, which yielded over 4 poods each. It had nine dredges at work. The Trans-Ural Mining Co. operated a dredge on the Solvin goldfield which won within a fraction of 6 poods of gold and platinum. The Neviansk company produced 5 poods 6 funts of gold and platinum by one dredge. This company had seven dredges working. It has quite abandoned dredge building, to which branch of industry it paid much attention in time past. No other dredge on the Russian Siberian fields reached the 5 poods level, though numbers reached 4 poods and upward. A number did not even reach 1 pood.

JOHANNESBURG, TRANSVAAL

Records of Production for August.—Missing Gold at East Rand Proprietary. — Proposed Increase in Equipment.—The Miners' Phthisis Problem.

Again the Transvaal monthly production of gold exceeded three millions sterling in value, the Chamber of Mines' declaration of the output for August being 713,407 oz., valued at £3,030,360. Of this yield the Rand alone was responsible for 682,401 oz., valued at £2,989,673, and it is not too much to expect that by the end of the year the Witwatersrand alone wil declare an output of three millions sterling. But for the strange affair in connection with the East Rand Proprietary Mines, which to the man in the street remains as much an enigma as ever, the three leading companies would have again produced quite a fourth of the total output of the Rand. The Crown Mines again did well, crushing with its 640 stamps and 19 tube-mills 149,000 tons, yielding 59,464 oz. valued at £252,587; but these mines are destined to do even better in the future when the new mill gets fairly at work. Randfontein also did well with its 750 stamps and 23 tube-mills crushing 198,252 tons, yielding 57,334 oz., valued at £243,539, and the coming race between these two companies for the position of premier gold producer of the world, promises to be a very interesting one. It is pleasing to be able to report that despite the somewhat general scarcity of unskilled labor, the Randfontein property has been able to increase its ore reserve, during the last half year, by well over half a million tons; that is, from 6,289,300 tons to 6,870,200 tons. Considering that over a million tons was crushed during the same period, and that for such a huge milling equipment as that existing at Randfontein, the ore reserve at the starting of the big mill was somewhat small, the achievement is therefore all the more welcome, as it places the property at once in a sound position. The East Rand Proprietary Mines have again sunk to the third position on the list, and it would almost seem that they are destined to occupy that position for a considerable time to come.

Further official and semi-official statements have been issued during the week, but they throw little additional light on the actual cause of the disappearance of the 13,000 oz. of gold at the East Rand Proprietary. The greatest loss hitherto known on the Rand through zinc-shaving failing to precipitate the gold is recorded as 500 oz., and how a loss of 13,000 oz. could arise without some gross neglect has yet to be explained in face of the high standard of metallurgical talent hitherto always at the disposition of the East Rand Proprietary Mines. W. A. Caldecott, who has had considerable experience and is justly regarded as the leading metallurgical expert on the Rand, gives it as his opinion, after an exhaustive investigation, that the 13,000 oz. of gold will probably be lost, while the mining editor of the *Star*, in what is apparently a semi-official statement, says that there may be some grounds for hoping that some of the missing gold may yet be recovered. Naturally most credence is attached to Mr. Caldecott's opinion, the hopes expressed that some of the gold may be recovered only tending to add to the existing confusion. In another statement of the position having all the appearance of coming from an inspired source, it is stated that the trouble dates back to the days of dual management. As the days of dual management came to an end about twelve months ago, this statement also tends to add to the confusion rather than otherwise, because surely a twelve months' period ought to be sufficient time to allow things to be put right, whereas they would appear to have gone from bad to worse. It is during the last twelve months that most of the trouble has arisen at the East Rand Proprietary Mines culminating, however, in the present impossible position. Retrenchments, fire, and accidents have all occurred during the last twelve months, and left their mark upon the company's history and profits. A hesitating, changing policy has also been pursued, followed by the closing down of a portion of the deepest section of the property, when the best interests of the company would seem to indicate the necessity of driving to the dip to ascertain the facts. The Micawber-like policy pursued with regard to the missing gold has not given satisfaction to the shareholders, nor have the labored efforts made to show that the mine is all right. Had the shareholders been advised promptly that the gold was not being recovered as anticipated, it is probable that the shares would not have depreciated to the tune of over two millions sterling, and the desperate steps taken to hide the troubles would never have been necessary. However, the proposal to establish a cash reserve fund with the object of equalizing dividends is certainly a step in the right direction, as is also Mr. Caldecott's proposal to add to the reduction equipment; but in the face of recent disclosures and what is known about the property, it may be deemed necessary to add to the equipment even to a larger extent than recommended so as to work the mines on a more extensive scale. Under the circumstances, the anxiety felt by the shareholders should be considerably allayed by the announcement that Sir Geo. Farrar, chairman of the company, sails from London in a few days' time with the object of reorganizing affairs at the mine.

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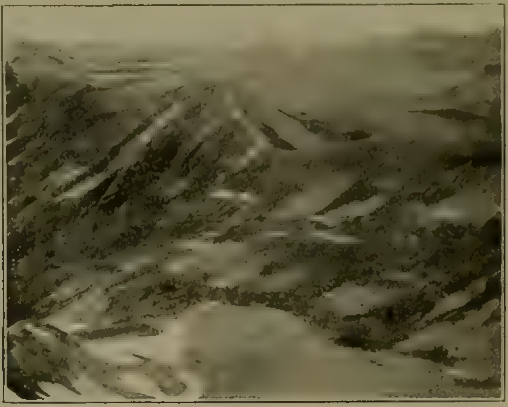
*1 pood of pure gold = $10.886; 1 funt = $272.17; 1 zolotnik = $2.835.

A topic of some interest on these fields is just now that of miners' phthisis, recent investigations showing that it is undoubtedly on the increase. A mining engineer who was formerly Commissioner of Mines, now a prominent member of the Labor party and Government Commissions, suggests as a remedy the abolition of contract work on the mines as a cure for the disease. This suggestion has the merit of novelty, however impracticable it may be, and coming from an ex-member of the Transvaal Legislative Assembly and some time principal member of the Mines Department under the Crown Colony Administration of Lord Milner, may seem to call for some comment. The suggestion to abolish contract labor underground seems to admit that the miners place more importance upon earning high wages than on the preservation of their health. There can be no doubt about this, because no matter what facilities the mine-owners may provide, in accordance with the mining regulations, to prevent the formation of dust underground, the miners steadfastly refuse to use them. It does, perhaps, seem strange that a government will go to all the trouble of passing the legislation necessary for the protection of the health of the miners, and even appoint a staff of mine inspectors to administer the law, without insisting that the laws shall be obeyed. The refusal of the miners to observe the mining regulations also seems strange when their observance would not only protect their health against miners' phthisis, but would also help them in the work, as shown by a paper read before the local Institute of Engineers by one of the inspectors of mines. The administration of the mining regulations has been somewhat difficult in the past and remains so today by the lack of the needed co-operation prevailing almost throughout these fields between the miners, mine officials, and Government inspectors, to insure the due observance of the regulations. That with such co-operation the mining regulations can be carried out on this question without entailing any loss to the miner was clearly shown in the above-mentioned paper. The number of miners suffering from phthisis on the Rand is variously estimated to range from 20 to 25%, of those employed, and even if the application of water might result in a little inconvenience to the miner when drilling, the preservation of his health ought to be of the first importance. Government inspectors, as a rule, do not show much hesitancy in insisting on the full observance of the mining regulations, and why they should do so in this instance is difficult to understand, especially seeing that at the Nourse Mines the management has succeeded by sheer force and determination in carrying out the dust-prevention clauses of the mining regulations.

SILVERTON, COLORADO

Disastrous Flood in San Juan County.—Vermillion Closes. Iowa Tiger Reduces Force.—Aspen and Nevada Resume.—Silver Ledge Flooded.

A heavy rainstorm, lasting nearly 24 hours, resulted in one of the most disastrous floods in the history of the San Juan on October 4. Telegraphic and telephonic communication with Durango were cut off and details of the disaster are just coming in. The mines escaped serious injury, but the railroads were badly damaged. The line from Silverton to Animas Forks is in fair shape and will be repaired at once. The Gladstone road is badly damaged and it is doubtful if it will be reconstructed this fall. The Mineral creek road, joining Silverton and Red Mountain, suffered severely, but will be repaired at once, as the greater part of the food supply must come that way until the main line of the D. & R. G. can be restored. On this line the greatest damage was done. The track from Silverton to Needleton is in good shape except for several small washouts, but from Needleton to Tacoma, a distance of about 15 miles, the track is all gone and the river has washed the canyon clean from wall to wall. It is variously estimated that it will require from one to two months to repair this line.



A GLACIAL CIRQUE NEAR SILVERTON.

The Vermillion mine at Animas Forks has closed down because of insufficient funds to meet the payroll and other obligations. This mine has been employing an average of 70 men. The Sound Democrat is working three shifts in the mill and crushing 25 tons per day. No shipments have yet been made so that the results under the new lease are not available. The Iowa Tiger Leasing Co. has reduced its mine force, as the new bodies failed to extend more than 30 ft. above the fourth level, although the third level was in good ore above. Development work will be started on the Tiger side in the near future. The Silver Lake has 40 men at the mine and is milling about 50 tons per day. The ore is of better grade than last month. The Aspen is being cleaned out and retimbered and some development work will be done. The Nevada, part of the estate of the

Silver Lake, has been leased to Walter Eals, formerly mine foreman at the Silver Lake, and the lessee is prospecting in the hope of finding some shipping ore. The Gold King is subleasing and expects to mill about 150 tons per day. The lessees will do no mining, but will depend upon their sub-lessees for ore, and operate the tram and mine. The Hercules flume was wrecked by the flood and will require several weeks work to repair it and again operate. The Silver Ledge filled with water from the sixth level to a point about 40 ft. above No. 5 level. All pumps are drowned and the company is bailing water. The Congress is shut down because of a burnt-out transformer. This will be repaired at once and development resumed on the excellent ore developed on the surface during the last month.

Future operations in this district depend very much upon the speed with which the railroad is opened and the storage capacity of the mills. Should there be no train to Durango for 60 days most of the plants of this county will be stopped. There is an ample coal supply on hand, but a poor supply of food stuff. Provisions are already being packed from Ouray, and so long as this road is open there is no danger of a shortage.

NEW YORK

ABANDONMENT OF COPPER MERGER.—COPPER SITUATION.—MARKET PECULIARITIES.—RECONSTRUCTION OF ARIZONA COMMERCIAL SMELTER.—SHATTUCK-ARIZONA DEVELOPMENT.

The important event of the week in mining circles was the final open abandonment of the proposed Calumet & Hecla merger. The directors of the Calumet & Hecla Mining Co. have given out a statement which goes no further than to say that owing to the delay caused by litigation, it is thought best to abandon all plans for consolidation, and the proxies of the Calumet & Hecla company will be voted against the merger at the meeting to be held at Laurium, Michigan, November 16. There are several factors which have undoubtedly influenced the directors in fixing their present determination. The uncompromising stand taken by the Federal authorities on all questions arising under the Sherman Anti-Trust Act has greatly retarded the development of all merger plans, and, in spite of the several announcements to the effect that all of the suits brought to enjoin the Calumet & Hecla merger would be fought to final decisions, the likelihood that the new enlarged Calumet & Hecla would be born an outlaw, was probably the ruling consideration. Copper merger talk has, of course, been without foundation for some months, and, in view of the Calumet & Hecla action, may now be finally dismissed, until the present situation shall have been settled in some reasonably permanent manner. As the proposed plans go into permanent pigeonholes, it may be anticipated that the discussions which have been raised as to the values of the subsidiary companies will be quieted. The Ahmeek, the absorption of which was most bitterly contested, is to make early entry into the ranks of the dividend payers, with an initial distribution of $2 per share. One thing which is gained by the old Calumet & Hecla is an increase of its copper-selling business. Several of the Lake properties which were to have been absorbed formerly sold their copper through the United Metals Selling Co. Hereafter the copper of the Ahmeek, Osceola, Tamarack, and Isle Royale will be marketed by the Calumet & Hecla. The aggregate output of these companies is some 56,000,000 lb. annually, but Michigan deep-level mines are in many cases biding their time and awaiting a betterment of the metal market. The contracts which the Calumet & Hecla have secured are therefore a good asset for the future and will be of increasing assistance in maintaining a steady level for Lake copper.

Copper producers in general appear to be tightening belts and preparing for a further indefinite period of low prices and decreased consumption. Unsettled conditions abroad must cut down the real export demand, and, while it is said on all sides that stockyards are as bare as they can be so long as business continues at all, yet there is no incentive, either in general business conditions or in the copper situation itself, to induce consumers to take on copper. The increase in surplus of some 7,500,000 lb. was not treated as of any particular importance. Exports were off as expected, domestic consumption exceeding the export figure for the first time since May last. The important element in the copper situation for the near future is the new production, and the analysis of the cost-sheets of the new mines will determine largely its weight as a controlling factor. Is the present copper status due to the development of metallurgical processes and automatic machinery capable of handling immense tonnages rather than to any actually overabundant supply of copper? Will the enormous investments made in the steam-shovel properties force continual production at capacity and drive the metal to lower prices? Will many of the principal deep-level mines be forced to restrict production or close down altogether until nearing exhaustion increases costs for the porphyries? As an example of modern commercial development, as a concrete economic problem, and as an illustration of the present world-wide organization of business, the copper situation is peculiarly interesting. It appears to present one of the strongest arguments in favor of combination against competition in the interest of conservation, and might well be pointed out by those who are trying to combat the overpowering sentiment of the day against all forms of large combination.

Some of the market developments of the week have been aptly illustrative of the absence of public interest. Tuolumne failed to declare its regular quarterly dividend, since which announcement the shares have been advanced and the market held apparently strong, mostly because there was no attempt by the public to make market capital out of the cessation of dividends. Another instance was the advance in Chino and in Ray Consolidated immediately upon the appearance of the monthly figures of the Producers' Association. In neither case was market action logical, nor would it in either case have been possible with a public in the market. Live Oak Development, one of the important properties at Miami, is to be traded in hereafter on the Boston Exchange. The brokers in the Boston market are gratified over the abandonment of the Calumet & Hecla merger.

The plans for the reconstruction of the plant of the Arizona Copper Co. are moving along without hitch. Some months ago, a number of the officers of the Arizona came over from Edinburgh and in company with L. D. Ricketts of the Greene-Cananea made a tour of inspection, with a view to choosing a site for a new smelter. Mr. Ricketts' report on the general condition of the property has been sent to Scotland, and it is expected that all decisions will be made and actual work begun without loss of time. The $2,000,000 which will be expended for a new equipment under Mr. Ricketts' supervision will be raised abroad. Mr. Ricketts' work on the Greene-Cananea and his present task for the Scotchmen in control of the Arizona entitles him to a leading place among the engineers engaged in construction of reduction plants. On the Greene-Cananea, the old plant was almost past rebuilding, but is now a model of up-to-date completeness. The Arizona equipment has for many years been considered remarkable, inasmuch as it held together and managed to pay a profit. Not until the death of the late John Gill of Edinburgh, for many years chairman of the board, was it possible for the more progressive directors to obtain consideration for plans to rebuild the antiquated plant, now to be replaced by a new one rather than reconstructed.

Chino has the first unit of its concentrator in commission. The other units are expected to start up at intervals of thirty days, and the whole plant will be in operation before midsummer of 1912. Chino will probably be one of the important producers from porphyry ores, as it will be mined for the greater part by steam-shovel work. Shattuck-Arizona, which recently met the copper situation squarely by suspending shipments, is to build a smelting plant of two blast-furnaces and a converting plant. Some $450,000 will be expended in construction work which will be in charge of J. E. McAllister, general manager for the British Columbia Copper Co., Greenwood, B. C., and who will later act as general manager of the mine and smelter. The Shattuck is an example of individual conservation of resources. The mine can make money on the present metal market, but the management has insisted on developing the mine, and in doing so is removing as little copper as possible.

It is something of an innovation for new copper producers to place selling contracts in the hands of individuals, when so large a percentage of the business has been handled for such a length of time by the United Metals Selling Co. and the American Smelting & Refining Co. S. S. Rosenstamm, who was for some years with the old United Metals Selling Co. before it was connected with the Amalgamated Copper Co. and while it was still controlled by the Lewisohn Brothers, has secured a contract to handle the copper of the Miami Copper Co. This year is not expected to see Miami producing at capacity, but Mr. Rosenstamm will have the marketing of probably 30,000,000 lb. of copper during 1912.

The Bonanza Development Co. of Colorado, which at one time owned the Santa Rita ground, which it sold to the Chino, has declared a dividend of 20c. per share. The last dividend paid in June 1899, was $1.50 per share, and was paid out of the proceeds of the sale of the Chino. The Bonanza Development Co. was organized in 1880 with a capital of $300,000. Out of its operations and sale of properties the stockholders have received $1,425,000.

The advantage of large acreage at Cobalt is illustrated by the action of the Kerr Lake Co., which has been compelled to again reduce its quarterly distribution, having now discontinued all extra payments and retaining only the regular dividend of 25c. per share. Kerr Lake has made a splendid record; the mine made some of the cheapest silver produced in Cobalt, and the shareholders have had some three and three-quarter millions in dividends. Like Goldfield Consolidated, Kerr Lake paid 50c. per share and sold on a basis where it returned better than 30%. Were the property of larger extent, like La Rose and Nipissing, its position would be much stronger. The company holds a large interest in the Wettlaufer in South Lorrain, a producing property, but this interest of 150,000 shares outstanding can hardly be expected to reinstate Kerr Lake as a spectacular dividend payer.

TORONTO, CANADA

Change of Government.—Possible Coal Famine.—Reconstruction at the Dome.—Mill Construction at the Vipond.—Progress Notes.

The accession of a Conservative government at Ottawa has involved some changes in mining administration. It is a little too early as yet to forecast any changes in policy consequent upon the political overturn, but the mining interests are hoping for more vigorous and energetic action in regard to several important questions affecting the industry that has been displayed in the past, and more particularly for the speedy enactment of a uniform mining code and an effective measure regarding the storage and handling of explosives.

Owing to the protracted strike of coal miners in British Columbia, serious fears have been for some time entertained of a coal famine during the winter in Saskatchewan. Some weeks since, the Government temporarily removed the duty on coal imported for western consumption, as a precautionary measure, and the Saskatchewan government issued strong appeals urging all who could afford to do so to lay in their supplies as soon as possible. The question was energetically taken up by civic and public bodies, and for some time large shipments from the American mines have been going forward. It is hoped that by the close of navigation sufficient supplies will have been laid in to provide for the needs of the settlers through the winter, though even in that case, there may be considerable suffering in the more isolated districts. In addition to the heavy importations required to meet the normal demand of the prairie provinces, the great railroad companies have been importing and storing unusually large quantities for their own use. As a general rule, they only lay in during the fall sufficient fuel to last them until the opening of navigation. This season, however, they are accumulating a supply which will provide for at least a year's consumption ahead. It is stated that they anticipate a protracted strike of the American miners next spring, when the termination of the agreement now existing between the miners and the operators will probably be the occasion of a demand for a large increase in wages.

Construction work on the Dome is employing a large force of men, the permanent buildings being nearly finished. The scale on which they are built is indicated by the fact that about 1,000,000 lb. of steel was required for the work. The extensive buildings of the Dome Extension are also nearing completion. Both companies have well equipped, independent power-plants, so that in case of the failure of a supply from outside, there need be no suspension on account of lack of power. Diamond-drills are working on the vein known as the Golden Sidewalk on both the Dome and Dome Extension, and it is stated that at 500 ft. on the former property the vein shows equally as rich as on the surface. Work has been resumed on the main shaft of the Dome Extension. At the Pearl Lake the encouraging results from core-drilling have decided the management to put down the main shaft to 400 ft. No cross-cutting will be undertaken until this level is reached. The Vipond has raised sufficient funds by the sale of treasury stock to provide for the erection of a mill of 100 tons capacity, and construction will begin at once. At the Rea a large body of ore has been blocked out. The main shaft is being continued to 300 ft. Shaft No. 2 is down to the 200-ft. level and is connected by an adit with the main shaft. The principal vein has been uncovered for over 400 ft. and is from 12 to 20 ft. wide. Harold Kingsmill, lately in charge, has resigned in order to accept a lucrative appointment in South America. The Crown Chartered is developing the Davidson claims, adjacent to their original holdings. A shaft is down 73 ft. on the lot known as Davidson No. 1. It will be put down to 110 ft. and a cross-cut run to find the vein. The McIntyre has decided upon a 40-stamp mill, which is being designed by A. G. Kirby of New York. It is expected that three of the shafts now going down on this property will reach the 200-ft. level in two weeks, when development will be carried on with 12 drills in operation. The Eldorado has found good ore at the bottom of a 30-ft. shaft. A Nissen drill is being set up on the property of the Niagara Porcupine company in Deloro. A 6-drill compressor has been installed on the Apex. The Porcupine Reserve is opening up the Birke claim, about a mile southeast of the Hollinger. A surface lead has been discovered which pans free gold, and a shaft is being sunk. After uncovering a vein 4 ft. wide and showing free gold for 130 ft., operations on the Success, owned by English capitalists, have been discontinued. The Scottish Ontario, hitherto operated by a syndicate, has passed into the hands of an English company, which will be represented in Canada by John Willocks. It is capitalized at $1,000,000, but the stock will not be placed on the market.

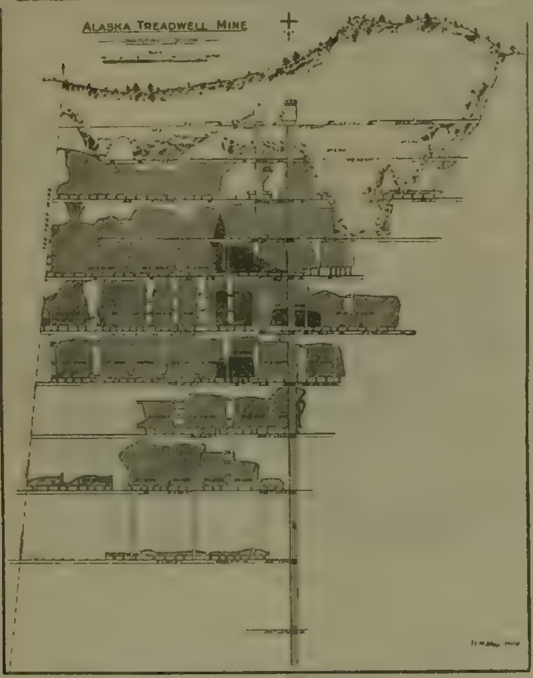
TRAIL TO PORCUPINE IN WINTER.

General Mining News

ALASKA

JUNEAU

The Alaska Treadwell G. M. Co., in the month ended September 15, made a net operating profit of $113,078, from a total of 79,380 tons of ore crushed. The sulphides saved amounted to 1571 tons. The gross value of free gold for the month is estimated at $117,808, according to the official report, and the sulphides at $93,531, making a total production of $211,340, with a realizable value of $205,626. Operating expenses amounted to $92,548. The yield per ton of ore milled was $2.66, and the stock of broken ore was increased by 22,931 tons. Construction expenses amounted to $18,338. During the month, 1119 ft. of development work was done.



LONGITUDINAL SECTION, ALASKA TREADWELL MINE.

PRINCE WILLIAM SOUND

The report of the Sealey-Davis M. Co. for the year ended September 30 includes the following items: Total receipts, $25,289, of which $25,000 was from the sale of stock; cash on hand, $1935; improvements, $2228; expense (surveying, attorney's fees, and office), $1678; development, $15,748. The annual meeting of the stockholders was held October 3 at Valdez. During the year 1246 ft. of adit was driven at an average cost of $10.44 per foot, with an average cost of $1.04 per foot for mine supplies. The company has 12 claims surveyed.

A large shoot of good-grade ore has been found in the Willow Creek district on the property of the Gold Bullion M. Co. In a three days' run, with seven stamps dropping, according to reports from Valdez, about $5000 in gold was extracted. The mill is handicapped by lack of power, but the companies operating in the district are planning to unite in the construction of a large electric plant. William Bartholf is superintendent for the Gold Bullion company.

Sam Erickson has discovered exceptionally rich ore near Chitina. It is believed that the vein is the source of the rich float found in O'Brien creek.

The Standard Mines Co., capitalized at $1,000,000, has been organized at Cordova, to prospect in that district. R. J. Barry heads the board of directors.

The Skagway Milling Co. has been formed with a capitalization of $10,000. L. S. Keller heads the board of directors, according to recent reports from Cordova.

THE TANANA

Reports brought to Fairbanks by the steamer *Reliance* are to the effect that ore panning $40 to $50 per pan has been discovered along the Hammond river in land which has been prospected many times without finding the paystreak. The dredge of the Alaska Exploration Co., known as the English syndicate, reconstructed on Fairbanks creek, was put in operation September 11.

ARIZONA

GILA COUNTY

Shaft No. 2 of the Live Oak company is down 830 ft. and is still in the comparatively high-grade ore found at 705 ft. It is reported that the ore pierced by this shaft so far assays on an average over 3% copper. Five churn-drills are being operated and two holes are in ore.

The experimental mill at the Inspiration mine is being enlarged to a capacity of 150 tons per day for trying out the concentrating method proposed by J. M. Callow. In preparation for active development, the track in the main adit is being widened to a 30-in. gauge. It is estimated that about 4,500,000 tons of ore can be extracted through this adit, and that the rest of the ore must be taken out through shafts. Surveys are being made for pumping stations, reservoirs, and pipe-lines.

The Miami company, with its four sections of the mill in operation, is mining and milling about 1850 tons of ore per day, and is producing about 82 tons of concentrate averaging from 41 to 42% copper. The mill recovery is about 70 per cent.

CALIFORNIA

INYO COUNTY

(Special Correspondence.)—The Four Metals Co., operating the Cerro Gordo mine, near Darwin, is shipping 40 to 50 tons of $50 silver-lead ore per week. Shipments are made to the United States smelter at Salt Lake by way of Mina. This ore is coming from between the 600 and 800-ft. levels. L. D. Gordon and associates, who have a lease on the zinc producing veins of the property, are shipping about 30 tons of zinc ore per day to Oklahoma. The ore is from the Union adit, 200 and 400-ft. levels. The zinc carried by the product averages 35%. Eastern people have taken a bond on the Unexpected, in the Pine mountains, a few miles from Big Pine. The bond is for $10,000 and a one-third interest. Work is to start within two months, and the payments to be made in three installments, at the end of four, eight, and twelve months, respectively. The vein consists of altered rhyolite lying between gray porphyry and lime shale, and is said to be over 35 ft. wide at surface, and to be traceable for two miles. The claims were located three years ago by Wilkinson brothers, of Big Pine.

Bishop, October 13.

KERN COUNTY

(Special Correspondence.)—On the Royal Bohee group of claims near Randsburg, five veins of tungsten ore have recently been discovered. It is reported that in trenching the veins, 6 tons of ore averaging 8% tungsten has been sacked. On another part of the claims four tons of $40 gold ore has been taken out at the surface.

Randsburg, October 16.

NEVADA COUNTY

Joseph N. White and William A. Worthington, miners engaged in retimbering the shaft of the Champion mine, were killed on October 10 when John Hooper, hoisting engineer, let a car he was oiling start down the steep inclined shaft without being attached to the cable. Hooper has been engineer at the Champion for ten years.

SIERRA COUNTY

(Special Correspondence.)—The Tightner mill went into commission today and is working satisfactorily. The plant comprises 10 stamps, and it is planned to operate all winter, an abundance of ore being available. Eight sacks of high-grade ore, valued at about $20,000, were shipped to San Francisco last week from the Twenty One mine. This property adjoins the Tightner and is operated by San Francisco people. The vein is reported to be about 18 in. wide and has been opened at a point 500 ft. below the Tightner lower workings. F. M. Phelps is manager. It is reported that work has been resumed at the Poker Flat gravel property. M. Duvall is manager. At the Ante Up, near Mountain House, a 4-ft. vein has been opened. Samples of the quartz are said to run about $40 per ton. A drift is being extended along the vein which is showing excellent strength. Horace A. Morse is superintendent. The Neocene M. Co. is enlarging its restraining dams and otherwise arranging for larger operations. Pipes have been laid to work the deposits under the old town of Scales Diggings. This is one of the largest active hydraulic properties in central California. J. F. Johnston is manager. Good gravel has been opened on the Taft-Sherman property, in Jim Crow canyon. Considerable coarse gold is reported. The gold is recovered by sluicing. J. B. Carney is in charge. A chimney of high-grade quartz was recently discovered at the Osceola, situated between the Tightner and Nonpareil mines. The main vein is 6 ft. wide with milling value prevailing throughout. The property was recently reopened after lying idle for 20 years. Dan McGonigal is manager. C. M. Root, manager of the Gladstone mine, near Gibsonville, announces plans to add more stamps to the mill. A recent run showed the quartz plating $22.50 per ton.

Alleghany, October 14.

Trinity County

Work is progressing rapidly on the Alta Bert dredge holding, sometimes known as the Payne ranch, at Trinity Center, say recent newspaper reports. The property has been bonded to San Francisco men, who have purchased the Callahan dredge, a 7-ft. bucket-type outfit, built about three years ago for the Callahan ranch in Siskiyou county. The dredge, with electric-light plant, cost about $168,000, but was offered for sale last year for $75,000. The McDonnell placer mine, the Larsen tract of 30 acres, and the Ellery claims of about 50 acres, have been bonded to the same people.

Tuolumne County

(Special Correspondence.)—The price to be paid for the Longfellow group of mines by Sol Kahn, of San Francisco, became known this week through the recording of the bond, which calls for the payment of $100,000 in installments before November 1, 1916, as follows: First payment of $7500 in 8 months; $10,000 in 20 months; four payments of $10,000 each, 6 months apart; $12,500 in 56 months, and $12,500 in 62 months. Absolute title to the entire property will be given for $75,000 if payment of that sum be made before the expiration of 20 months. Mr. Kahn agrees to operate the mine continuously, expending at least $2000 each month in the development of the property, and is to pay to the owners 50% of the net returns, which will apply on the purchase price.

Los Angeles and San Francisco investors are to begin development in the Big Four mine, near the old Dead Horse mine. The property is owned by W. D. Deming, of Tuolumne. A long adit exposes a strong vein of milling ore. Rich ore has been found in the Somerset mine, which, with the Spring Gulch property, is being operated by W. B. McCubbin and George Ash. The find was made at a depth of 100 ft., the vein from side to side being 5 ft., all milling ore, with a streak several inches across that will run as high as $1000 per ton. The Somerset is owned by the William Sharwood estate, but it is understood that the bondholders will soon make the payment that will give them absolute title to the property. Hoisting has been done by means of a whip, but it is announced that an up-to-date equipment for the development of the property will be put in.

Tuolumne, October 14.

(Special Correspondence). In the Black Oak mine, the management reports, the north drift on the fifteenth level (1300 ft. deep) is now out 575 ft. following the body of ore found in the cross-cut on this level. This drift shows a 4-ft. vein of ore assaying about $22.50 per ton for the entire length, with 5 ft. of good ore in the face. On the fourteenth level, 120 ft. above the fifteenth level, the drift is out from the fault 150 ft., showing the orebody to be the same size and value on this level. A raise from the fifteenth level to the fourteenth level, has just been completed in the ore, giving good ventilation in this part of the mine. The property is equipped with a mill and cyanide plant, in which some changes are contemplated to bring its capacity up to 100 tons per day. The property is controlled by Charles E. Knox, John Bryant, and S. A. Knapp, of San Francisco. R. C. Knox is superintendent.

Tuolumne, October 16.

COLORADO

To give the mine operators of the State a better acquaintance with the latest mining methods, the Colorado Scientific Society has appointed a committee to arrange a series of practical lectures or talks. The members of the committee are R. A. Parker, a mining engineer of recognized ability, and Victor C. Alderson, president of the Colorado School of Mines. Fifteen or twenty speakers will be secured, and the course probably will be given at Silverton, Ouray, Idaho Springs, Boulder, and other mining towns.

Clear Creek County

Ore from the Ready Cash vein near Williams Forks, owned by John C. DeVotie, milled 259 oz. silver and 19% lead, say reports from Georgetown, and there is a good vein. Mr. DeVotie, however, stated that life is too short to spend it in such a desolate country. He recently inspected the property worked by Bert Hagar, two miles from the Ready Cash mine, and is of the opinion that later on when the Hagar property is developed by men with capital it will be a big mine.

Dolores County

The discovery of a body of copper sulphide ore entirely free from zinc on a new claim known as the New Year is reported by the owner, M. T. Chestnut. The claim is situated near the Rico townsite on Newman Hill, and the ore is the first copper sulphide opened in this part of the district. It will average, it is said, 15% copper, 30 oz. in silver, $5 in gold, and 10% lead, and some of it runs as high as 40% copper and 100 oz. in silver.

Leadville and Mexico operators, according to newspaper reports, have secured an option on the A. B. C. group in this district from John W. Burns and E. A. Thayer. The price reported is $75,000, and payments of $10,000 per month are to be made beginning October 1.

Ouray County

Thomas B. Crawford of Denver has secured an option on what is known as the old Hill smelter at Ouray. If successful in financing the enterprise, he will use the plant for producing a low-grade matte. There is an abundant supply of the silicious and iron ore that will be needed, near Ouray, and the Red Mountain district will furnish the copper. Recent development on the Indiana group, owned by Mr. Crawford, in the Red Mountain district, has opened a chimney of copper-silver ore. A promising find has been made in the Camp Bird. This ore, it is reported, was found in what had been thought to be barren ground about 1200 ft. from the surface in the west workings from the fifth or adit-level.

Teller County

The Elkton Con. M. & M. Co., operating the Elkton mine at Cripple Creek, paid an extra dividend of ½c. per share as well as the regular dividend of 1c. per share on October 14. Ore said to be remarkably rich is being taken from a new level, below the old water-level.

A new crusher is to be purchased for the Jo Dandy mill at Cripple Creek, according to newspapers, as the Blake crusher now in use is not heavy enough to crush large pieces of ore. Thomas Kavanaugh is manager of the mill.

The Gold Dollar estate, on the east slope of Beacon hill, shipped 1100 tons of ore in September. All of the ore was shipped by lessees, the Union Leasing Co. making the largest shipments. The company received about $2200 in royalties.

Reports from the mills and smelters give a total production of 76,805 tons, with an estimated value of $1,316,683 for the Cripple Creek district in September.

Frank Caley has purchased a 12-drill Imperial type electrically-driven compressor from the Ingersoll-Rand company for use at the Jerry Johnson mine. It is a duplicate of the compressor recently obtained for the Modoc mine. Owen Roberts, a lessee of the Gold King, is planning to buy a similar compressor, according to reports from Cripple Creek.

The Metallic M. & L. Co. is to resume work in a few weeks at the Hiawatha property, according to reports from Cripple Creek.

The Humphries-Thompson syndicate, which has opened a promising vein on the bottom level of the Ruby mine probably will resume work by November 5. The retimbering of the shaft has almost been completed.

RICO, COLORADO.

IDAHO

Idaho County

The Idaho Realty, Power & Mines Co. is about to put in an electric plant at Dixie. The company has enlarged its ditch for the mine, which is a placer property. The elevator is ready to run, and active operation will be commenced as soon as the water starts running in the stream. S. R. Gayton is manager for the company.

Lemhi County

The Pittsburg-Idaho company paid a dividend of 4c. per share, on October 15. The dividend was the third for one year. Instead of making the dividend larger, the directors decided to pay the 4c. dividend and make a payment of $16,000 on the bond issue of $23,000. It is reported that the company will declare a dividend of 7c. in January. The property is near Gilmore.

Shoshone County

Work has been resumed by the Clear Grit M. Co. on its property in the Beaver district, a mile from Delta. R. B. Bohannan, of Spokane, Washington, is manager for the company.

MONTANA

Lincoln County

(Special Correspondence.)—The Libby Placer Mining Co. is now operating steadily with the new hydraulic plant which was recently completed and which has a capacity four times greater than the old outfit. Operations will be carried on as long as the weather permits. This company owns nearly 1000 acres of placer ground on Libby creek. The Comet Placer M. Co., controlled by practically the same stockholders, has closed down for the present, owing to lack of water.

George Chew, of Spokane, owner of the old Vaughan & Greenwell placer claims on Libby creek, is taking steps to have his holdings patented, the papers in the case having already been sent to the land office by Gray & Rowland, attorneys. There are five claims in the group.

Libby, October 14.

NEVADA

Esmeralda County

The Round Mountain M. Co. in the quarter ended August 31 made a net profit of $34,763, according to a statement recently issued by J. R. Davis, president and manager of the company. In this period the company mined and milled 13,084 tons of ore, at a cost of $58,915, or $4.50 per ton. The gold recovered amounted to $90,014, or $6.88 per ton. There were miscellaneous earnings of $3364, or 28c. per ton, making the gross earnings $93,678, or $7.16 per ton. Mining costs have been reduced from $6.39 per ton to $4.50 during the quarter. The new mill has a capacity of 175 tons of ore per day. The company has extended the cross-cut on the 450-ft. level 528 ft. and has opened the downward extension of the foot-wall orebody on the 135-ft. level. What is believed to be an important orebody has been opened at the 700-ft. level. The Secretary of the Interior, says the report, has not disposed of the petition of the Round Mountain Sphinx M. Co. for the issuance of a writ of certiorari to review his decision denying a protest against the issuance of a patent to the Round Mountain M. Co. for the Great Western No. 1 claim.

Lyon County

In another month the ore-sampling mill of the Mason Valley M. Co. will be completed, according to a statement of Jules Labarthe, general manager for the company. The mill will do custom business.

By building a custom smelter at Thompson, near Wabuska, a station on the Tonopah & Goldfield railroad, the Mason Valley Mines Co. will start the Yerington district on its career as a regular producer of copper. Its output will not be an important factor in the metal market at present, and its production will grow very slowly. There is no property in the district that is prepared to put out a large tonnage. All of the ore is a direct smelting product and only a small percentage of that so far developed averages higher than 3½% copper.

The largest body of ore that has been blocked out is in the Blue Stone mine, owned by J. R. De Lamar. It is said to contain from 1,500,000 to 2,000,000 tons, averaging about 2¾% copper.

After an inspection of the company's property, Duncan MacVichie, engineer for the Yerington Copper Co., has advised the directors to put the property on a producing basis in order that it may earn some of the money required for development.

Nye County

The Tonopah Belmont Development Co. in September made a net profit of $144,972, according to the official report recently issued. A total of 9816 tons of ore was shipped to the mill and smelter. The production of gold was 3712 oz. and of silver 388,227 ounces.

The Tonopah M. Co. in September, according to the official report, made a net profit of $132,349, the smallest since July, when the profit was $120,415. During the month a total of $268,515 oz. of gold and silver bullion, valued at $198,370, and 109 tons of concentrate, valued at $44,425, was shipped. The ore shipped to the mill amounted to 14,020 tons and was valued at over $19 per ton.

TONOPAH, NEVADA.

Preparations are being made on the Kendall-Douglass lease on the Consolidated property for the erection of a 20-hp. electric hoist which is now on the way.

Rich ore has been discovered recently on the Kendall lease on the Joker property, now owned by the Big Four company.

A new company is being formed in the North Manhattan part of the Manhattan district for the construction of a mill to serve all mines on the northwest slope of Bald mountain and vicinity. The J. D. Johnston company is one of the more active organizations in that district. The J. D. Johnston company has been doing some retimbering on claims of the old Butler company. Arthur S. Putney is superintendent for the company. Rich ore has been found on the Gray Wolf claims, owned by Thomas S. Jones and associates.

It is reported in Manhattan that S. W. Steffner and I. P. Carpenter will soon break ground for a new mill to be situated near the Consolidated workings.

Bath brothers have taken a lease on block No. 1 of the Earl, in the Litigation hill section, and are taking ore out through their old shaft on the Union No. 2 property. The ore is said to assay $50 per ton.

Storey County

The total production of the North End mines on the Comstock lode for the last week was $35,681, the Ophir leading with a production of $23,737. In the Ophir mine ore from the 2100-ft. level stope averaged $85. The shipments for the week included 377 tons of second-class ore to the Kinkead mill. Shipments from the Mexican included three cars of first-class ore to the smelter. The winze used jointly by the Sierra Nevada and the Union was sunk 12 ft. during the week and is now 602 ft. below the 2000-ft. station. In the Con. Virginia the southwest prospecting drift on the 2550 ft. level was extended 18 ft. during the week, and some timbering was done. The hydraulic elevators in the C. & C. shaft ran successfully throughout the week, and the water was 297 ft. below the 2550 ft. station at the end of the week. The drift in the old Union Mexican east cross-cut in the 2450 ft. level was cleaned up for 150 ft. Work for the temporary pump station was continued. A south drift is being driven on the 2500 ft. level of the Mexican to take air from the Mexican winze to the old Union Mexican winze for pumping. Remodeling the buildings at the Ward shaft continues, and on the 2200-ft. level cutting out beside the shaft is under way for a pipe line from the bulkhead to the pump compartment. The east cross-cut on the 1200-ft. level of the Overman was advanced 9 ft., and the joint Overman and Seg. Belcher east cross-cut was pushed 9 ft. The joint Imperial-Confidence-Challenge shaft was sunk 6 ft. At the 800-ft. level, No. 1 Brunswick shaft, operated by the Chollar company, the east cross-cut was advanced 11 ft. At the Yellow Jacket mill 794 tons of Crown Point ore was run through the bins and a clean-up finished the No. 2 run from the Crown Point mine. At the Belcher mine a total of 85 ft. of retimbering was done. Crown Point shipped 315 tons of ore to the Gloryhole from the Yellow Jacket shaft, and hoisted a total of 473 cars of ore averaging $10. Work was confined to the 1400-ft. level and in repairs to south drift No. 1, where much low-grade ore was saved.

OREGON

Josephine County

The Greenback gold mine, twenty miles north of Grants Pass, has been bought by Robert C. Robertson and Frank C. Robertson, of Parish, New York. All claims against the property have been paid through C. H. Clements and R. G. Smith, attorneys for the purchasers. The mine is reported to have produced over $2,000,000, and in the past many men were employed there.

UTAH

Salt Lake County

The Utah Con. Copper Co. has declared a dividend of 50c. per share. It is reported that there will be a semi-annual disbursement of this size.

About 11,000 tons of ore per day is being shipped over the Bingham & Garfield, the new Utah Copper Co. railroad, from the Bingham camp to the smelter at Garfield. In addition to this ore, state recent press reports, the Denver & Rio Grande road is carrying 17,500 tons of ore per day for the Utah Copper Co., bringing the daily shipments to the largest figures ever reached by the company.

Tooele County

The lead smelter of the International S. & R. Co. at Tooele will be in commission early in the new year, recently stated E. P. Mathewson, general manager for the company. The construction of the smelter is progressing in a satisfactory way. Mr. Mathewson stated that reverberatory furnaces in the copper smelter are doing better work than ever. A record of 328 tons per furnace per 24 hours recently was made. A quartering and bucking department will be added to the sampling plant of the smelter. A 400,000-gal. reservoir is being constructed in Pine canyon.

WASHINGTON

Ferry County

(Special Correspondence.)—Ben Hur shaft is down 406 ft. Sinking from the 300 to the 400-ft. level and timbering was accomplished in 24 days, making the best record ever made in the camp. Work will be resumel in the Morning Glory mine in a few days. During the month of September the Republic Mines Corporation shipped 21 carloads of ore from the Surprise and 3 carloads from the Lone Pine mine. During the first 13 days in October 14 carloads were shipped from the Surprise and 1 from the Lone Pine. The Surprise shipments averaged in value about $40 per ton, and the Lone Pine shipments assayed from $15 to $22 per ton.

In Keller camp rich silver-copper-lead ore has been discovered in the Tenas mine, formerly known as the Iconoclast. Operations have been resumed in the Kettle River mine, near Rockcut, under the supervision of W. S. Bliss, a new manager, whose address is Orient, Ferry county. The ore contains gold, silver, copper, lead, and zinc. Unless the character of the ore changes, a modification will be made in the mill for the purpose of separating the zinc from the other minerals.

Republic, October 13.

Okanogan County

(Special Correspondence.)—Robert L. Norris, of Schenectady, New York, has arrived at Chesaw recently and will succeed R. Irwin Plomert as resident trustee and manager for the Molson Gold Mining Co., Meyers Creek district. The company is preparing to patent its holdings.

Chesaw, October 13.

CANADA

North Canada

Reports from Porcupine, Ontario, state that R. S. Elmsley, of Ottawa, Ontario, and Richard White, of St. John's, are fitting out a vessel for further exploration of quartz and placer gold deposits, they are said to have discovered on a previous trip to Baffin's Land and northern Labrador.

Ontario

The new shaft has been started on the Pearl Lake mines at Porcupine. It will be driven to a depth of 400 ft. before the first station will be cut, and cross-cutting started.

The Kerr Lake company has declared a regular quarterly dividend of 25c. payable December 15 to stock of record December. Three months ago an dividend of 15c. and six and nine months ago, extra dividends of 25c. each, were declared.

(Special Correspondence.) — The Swastika district is becoming increasingly prominent as a gold camp. There are now about 3000 people there and some 17 mines in most of which preparations are being made to install modern mining plants. The Homestead Mines Ltd. is capitalized at $2,000,000, and has 78 acres which has been under development for the last four months. Camp buildings have been erected and an adit of 60 ft. run into this hill. Frank L. Culver of the Beaver mine, Cobalt, is president of the company. The Lucky Cross is installing machinery preparatory to sinking a shaft, and has found free gold in a number of veins.

At the annual meeting of the Consolidated Mining & Smelting Co., held in Toronto, October 12, the financial report showed that the gross value of the output was $4,437,901 as compared with $5,911,767 for the previous year, a decrease being shown in all the metals. This was due to the working out of the St. Eugene, and the fire in the Slocan, which closed down the Kaslo and Slocan railway. Operations yielded a net profit of $202,278 as compared with $309,945 the previous year. The amount of $438,354 was expended on development and $193,342 written off for depreciation. Since the close of the fiscal year arrangements have been completed with the liquidators of the Le Roi for the purchase of all its properties in Rossland.

Toronto, October 13.

Yukon

(Special Correspondence.)—E. E. Stockton, of the Auditor-Generals Department at Ottawa, who has just returned from Dawson, after auditing all the Government accounts, including the gold royalties, states that the gold production of the Yukon district this year will be about $4,500,000 or $250,000 over the output in 1910. The Yukon Gold Co. had seven dredges in operation and was also extracting gold by other methods and other companies were also doing considerable work. Mr. Stockton anticipates a slow but steady increase in the gold production of the Yukon.

Toronto, Ont., October 13.

MEXICO

Chihuahua

Additional machinery will be purchased for the Esmeralda-Parrall M. Co. property. The output will be considerably enlarged and boilers, a hoist, and an air-compressor will be secured. The mine recently was inspected by William P. Fairman, of Philadelphia, president of the company. Wade Armstrong is superintendent of the mine.

The control of the Veta Colorada recently passed into the hands of what formerly were the minority stockholders. G. J. Ashe, of Knoxville, Tennessee, the new president of the company, is about to visit the property on a trip of inspection.

The National M. & S. Co. is now operating the Lustre Magistral, one of the largest mines in the Parral district, and is employing a large force of men in development.

The Mines Company of America, which will cut its next quarterly dividend from 2½ to 1½%, is planning to use the money thus obtained in buying other properties in Mexico.

Mills in the Inde camp are running full capacity, according to the latest press reports, and the mines are making their usual shipments.

Rienze W. McFarlane is making an examination of the San Diego mine, in the Santa Barbara district, and has temporary charge of the property.

NACOZARI, MEXICO.

Sonora

During the six months ended June 30, according to a report by A. V. Dye, U. S. Consul at Nogales, titles were issued to 977 mining claims in Mexico, covering a surface area of 36,591 acres. Of this number about one-fourth were issued in the State of Sonora, the exact number being 244 claims, covering an area of 13,133 acres. In Sonora the largest number were located in the Altar district, that is, 43 claims covering 2518 acres, although in the Montezuma district the 34 titles issued covered an area of 2923 acres.

While there was some cessation of development during the period, most of the producing mines kept up their normal output. The exports of minerals to the United States passing through the northern frontier ports of Sonora during the six months were as follows: gold, $1,432,707; silver, $1,857,478; copper, 33,299,986 lb., valued at $3,905,595; lead, 3,023,438 lb., valued at $69,189; zinc, 154,637 lb., valued at $3337; total, $7,268,306.

Shipments of ore and bullion from northern Sonora for September reached the total value of ₱1,468,000, against ₱1,500,000 for August, and ₱1,453,500 in July. The gross weight of September exports was 9996 tons, against 14,332 tons for August. The Nacozari was the largest shipper of ore, with 203 cars. The El Tigre made one shipment of bullion and silver precipitate to the Monterey smelter, valued at ₱59,000.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

S. J. Gormley is in San Francisco.

D. W. Brunton has gone to Japan.

N. J. Martin was in San Francisco.

F. H. Morley has returned to Denver.

W. J. Loring has left San Francisco for London.

F. M. Woods will be in San Francisco tomorrow.

F. M. Simonds is on professional business in Cuba.

J. F. Newsom has returned from South America and New York City.

H. E. West has moved from Haileybury, Canada, and is now in London.

F. L. Ransome is at Tombstone, Arizona, from where he will go to Ray and Miami.

C. W. Goodale is with the American Institute of Mining Engineers Japan excursion.

Howard D. Smith has gone to Midway on an extensive examination of the oilfields.

William R. Jewell has moved his office to 317 Brower building, Bakersfield, California.

J. Malcolm Maclaren was in San Francisco over Sunday and has returned to the Mother Lode.

A. D. Foote recently underwent a severe operation in San Francisco, but is making a good recovery.

George Otis Smith was in San Francisco for the meeting of the Institute and has left for Chicago, stopping in Nevada.

H. W. Edmondson has just returned from an examination of the Pioneer group of mines near Goldroads, Arizona, for Eastern people.

Corey C. Brayton was in San Francisco to attend the excursion to Bohemian Grove and the Mining and Metallurgy Society dinner.

Robert Scott has returned to San Jose, California, having erected a 25-ton quicksilver plant for the Mercury mine, Nye county, Nevada.

Jesse J. MacDonald is traveling in Arizona and other States, and later will be with the Utah Copper Co. at Garfield, Utah, for some time.

Inquiry is being made for the present address of J. F. Staver, a California graduate of '91, who is requested to communicate with this office.

Edward M. Rabb, Jr., has gone to the Jackson district, Graham county, Arizona, on professional business, and expects to be at Tucson the latter part of this month.

John T. Reed, of Lovelock, Nevada, has just completed an examination of mineral lands within the Central Pacific railroad grant in Nevada in the interest of the Government.

Howland Bancroft has left South America, where he has been examining mines for the past few months, and is now on his way to Mexico, where he will be for the next few weeks.

William F. Kett has been appointed by the directors of the Mountain Copper Co., Ltd., as general manager of their business in California, with headquarters in San Francisco. Mr. Kett has held the position of assistant general manager for the past six years, and now succeeds Lewis T. Wright, who recently resigned.

Alfred H. Brooks, of the U. S. Geological Survey, was in San Francisco this week on his way from Alaska to Washington, D. C. It is expected that Mr. Brooks will continue in charge of the Alaskan work of the Survey, having stated his preference for that position both in his cabled reply to George Otis Smith, Director of the Survey, and at their conference here this week, when the question of a successor to C. W. Hayes as chief geologist was considered.

The San Francisco members of the Mining and Metallurgical Society of America entertained the visiting members and distinguished guests at dinner at the Fairmont hotel on October 16. Those present were Ralph Arnold, E. H. Benjamin, F. W. Bradley, D. W. Brunton, H. F. Bain, C. C. Brayton, Albert Burch, S. B. Christy, G. H. Clevenger, F. G. Cottrell, E. T. Dumble, Francis Drake, H. S. Drinker, Courtenay De Kalb, J. B. Farish, D. L. H. Forbes, C. W. Goodale, G. H. Garrey, E. A. Hersam, Ross B. Hoffmann, W. R. Ingalls, Chas. Janin, W. J. Loring, L. W. Malcolmson, Bernard MacDonald, J. M. Maclaren, C. W. Merrill, F. H. Morley, W. W. Mein, G. W. Metcalfe, S. W. Mudd, W. S. Noyes, E. W. Parker, W. C. Ralston, T. T. Read, D. M. Riordan, R. S. Rainsford, J. W. Richards, R. W. Raymond, M. L. Requa, F. L. Sizer, A. W. Smith, G. O. Smith, J. W. Struthers, W. L. Saunders, Whitman Symmes, W. A. Wilson, C. G. Yale.

Decisions Relating to Mining

Specially reported for the Mining and Scientific Press.

Mechanics' Lien on Oil Wells.

The Indiana statutes providing for a mechanic's lien for materials furnished for any structure, does not authorize a lien on the interests of a lessee under an oil lease for coal furnished a contractor employed by the lessee and used by him as fuel in drilling an oil well on the leased premises.

Niagara Oil Co. *v.* McBee, (Ind.) 91 Northeastern, 250. March 1910.

Notice of Injury Under Employers' Liability Act

The New York employers' liability act provides that no action shall be maintained under the act for injuries to, or death of a servant, unless notice of the time, place, and cause of the injury is given to the employer. Under this statute a notice was held sufficient where it stated that the death of a servant occurred on the morning of August 13, 1909, in a chamber of the employer's mine, known as the Big John room, while the servant was in the discharge of his duties as a laborer in the mine, taking down props which supported the roof whereby it suddenly caved in and buried him, and that the cause of the injury was the negligence of the owner's superintendent in directing the servant to take down the props to enable another workman to shift the tramway or track, instead of directing the other workmen to remove the track in sections. A notice under this section otherwise sufficient, is not rendered insufficient, or defective because it states several additional alternative causes of the injury, and which additional causes the plaintiff fails to prove on the trial of the case.

U. S. Gypsum Co. *v.* Sliwienska, 183 Fed. 688. Dec. 1910.

Mining Lease—Ownership of Fixtures or Mining Machinery

A lease of a mining plant and machinery provided that the lessee should keep the plant in good repair and make all improvements, repairs, and replacements necessary to keep it in good running order and repair. It also provided that such improvements, repairs, and replacements should become the property of the lessor. On the construction of this lease in an action between the lessor and the lessee, the Court of Appeals of Missouri held that the agreement that the improvements, repairs, and replacements should become the property of the lessor did not apply to a dummy elevator and sludge table added to the plant by the lessee, and which were not necessary to keep the plant in good repair and which could be removed without injury to the realty, as these were trade fixtures. The lessee also had the right, at the expiration of his term, to remove a mining plant and machinery erected by him to mine, clean, and prepare ore for the market, as these were personal property.

Weeks-Betts Hardware Co. *v.* Roosevelt Lead & Zinc Co., (Missouri) 134 Southwestern, 35. Feb. 1911.

Market Reports

LOCAL METAL PRICES.

San Francisco, October 19.

Antimony	12—12½c	Quicksilver (flask)	46
Electrolytic Copper	14—15½c	Tin	47—48½c
Pig Lead	4.50—5.45c	Spelter	7½—8½c

Zinc dust. 1400 lb. casks. per 100 lb., small lots $9.50—9.75; large $7.50—8.50

METAL PRICES.

(By wire from New York.)

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Oct. 12	Holiday.	No market.		
" 13	12.08	4.23	6.10	52¼
" 14	12.13	4.23	6.15	52¼
" 15	Sunday.	No market.		
" 16	12.18	4.23	6.18	53
" 17	12.20	4.23	6.18	52⅞
" 18	12.20	4.23	6.18	53⅛

ANGLO-AMERICAN SHARES.

(Cabled from London.)

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

	Oct. 12. £ s. d.	Oct. 19. £ s. d.
Camp Bird	1 7 0	1 8 3
El Oro	1 3 3	1 3 3
Esperanza	1 14 4½	1 13 1½
Dolores	1 5 0	1 5 0
Oroville Dredging	0 5 0	0 5 0
Mexico Mines	6 12 6	6 13 9
Tomboy	0 19 4½	1 0 0

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing Prices. Oct. 19.		Closing Prices. Oct. 19.
Amalgamated Copper	$ 52	La Rose	$ 3⅞
A. S. & R. Co	64¼	Mason Valley	7⅞
Braden Copper	4⅝	Miami Copper	19¼
B. C. Copper Co	3⅞	Mines Co. of America	4
Butte Coalition	15	Nevada Con	16⅜
Chino	20¼	Nevada Utah	⅛
Davis Daly	⅞	Nipissing	7⅝
Doble	1¼	Ohio Copper	1¼
Dolores	4	Ray Central	1⅝
First National	1	Ray Con	13⅝
Foley O'Brien	¾	South Utah	⅝
Giroux	3¾	Superior & Pittsburg	17
Goldfield Con	4	Tenn. Copper	34½
Greene-Cananea	5⅞	Trinity	3¼
Guanajuato Con	⅛	Tuolumne Copper	3⅜
Hollinger	11¼	United Copper	1⅝
Inspiration	7⅜	Utah Copper	43
Kerr Lake	2⅞	Yukon Gold	3⅜

COPPER SHARES—BOSTON.

(By courtesy of J. C. Wilson, Mills Building.)

	Closing prices, Oct. 19.		Closing Prices Oct. 19.
Adventure	4	Mohawk	$ 39
Allouez	26½	North Butte	24
Calumet & Arizona	47	Old Dominion	36½
Calumet & Hecla	380	Osceola	86
Centennial	9	Parrot	9
Copper Range	51¾	Shannon	7
Daly West	5	Superior & Boston	2¼
Franklin	6¼	Tamarack	22
Granby	29	Trinity	3
Greene Cananea, ctf.	5¾	Utah Con	15¾
Isle-Royale	13¾	Victoria	1⅝
La Salle	4	Winona	3¾
Mass Copper	5¼	Wolverine	88

NEVADA STOCKS.

(By courtesy of San Francisco Stock Exchange.)

San Francisco, October 19.

Atlanta	$ .18	Mayflower	$ .03
Belcher	.55	Mexican	3.80
Belmont	8.07	Midway	.27
B. & B.	.18	Montana-Tonopah	.81
Booth	.08	Nevada Hills	2.70
Chollar	.13	Ophir	1.87
Combination Fraction	.08	Pittsburg Silver Peak	.90
Con. Virgina	.79	Round Mountain	.60
Florence	.98	Sandstorm Kendall	.04
Goldfield Con.	4.10	Savage	.23
Gould & Curry	.11	Tonopah Extension	1.05
Jim Butler	.25	Tonopah of Nevada	7.00
Jumbo Extension	.20	Union	1.30
MacNamara	.28	West End	.85

New Type of Steam-Shovel

An interesting new type of revolving steam-shovel has been introduced by the MARION STEAM SHOVEL Co. which is provided with an unusually long boom. This permits the making of wide cuts and the dumping of the excavated material far enough to one side so that the ore thus uncovered may be mined out without being partly under the spoil bank. This eliminates the handling of the overburden in cars and reduces the labor required to the shovel crew. When opening a new field, these shovels are capable of digging a thorough-cut and depositing the excavated overburden all on one side within the limits of their reach. After the thorough-cut is well started, the uncovered material can be removed, so that when the shovel completes the one cut it can return on another, this time depositing the overburden in the open pit or excavated space where the coal, for instance, has been taken out. This will permit a wider cut to be made the second time, on account of there being more room, and as the machine revolves in a complete circle the only necessity, in working back and forth against the face, is to shift the track each time for it to work on when returning. It is desirable, however, to take out the ore immediately following the shovel as it advances, so that no time is lost or delay occasioned at the end of a cut. Another superior feature of these special shovels over the ordinary type of excavator is that they will handle overburden of a far greater depth and width of face. They are simple in design and easily controlled. The entire upkeep and operating expense is surprisingly small, which makes it possible now to handle at a splendid profit many stripping enterprises hitherto considered unworthy of development. The shovels are provided with $3\frac{1}{2}$-cu. yd. dippers, and the boom is 65 ft. long. This allows making a cut 148 ft. diam. at 30 ft. elevation or 110 ft. diam. at the bottom of the pit. The approximate working weight of the shovel is 146 tons. The boom is of the all-steel type, of the most modern design, well trussed and braced. It is pin-connected to step castings resting on the two inner sills of the rotating frame immediately over the roller path, thus transmitting direct to the truck frame all the strains. Rods connected to the middle of the boom and anchored at the fore corners of the rotating frame stay the boom in starting and stopping. The crowding engines are double, reversed, and controllable by a central valve of the balanced-piston type. They are of the same design and type as the rotating engines, and are geared direct to the shipper shaft, which is machined square for the gears and turned for the shipper shaft and dipper-handle yoke block bearings that are provided with bronze bushings. The dipper handle is of the combination steel and oak type. Both sides of each member are armored with steel plates and covered top and bottom with heavy steel bars. The racking is of manganese steel, bolted and riveted to the bars on the under side of the handle. An end socket casting is secured to the handle and pin-connected to the dipper back, thereby allowing the pitch of the dipper to be changed to suit the work.

REVOLVING SHOVEL WITH LONG BOOM.

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EDITORIAL

A SEMI-TECHNICAL contemporary, referring to the harvest moon, says that it occurs at the autumnal equine. It is doubtless proper to greet this with a horse-laugh.

IN OUR editorial pages of October 14 *The Mining Financial News* was, through a blunder, referred to as *The Mining Age*. Having thus unintentionally injured the latter journal, we hasten to make this acknowledgment in reparation.

MISSOURI SCHOOL OF MINES celebrated its fortieth anniversary at Rolla, Missouri, this week by laying the cornerstone of a new building, thus emphasizing progress rather than self-gratulation. The School has a record of honorable achievement, and we extend our congratulations for the successes of the past and good wishes for the future.

SUCCESS as a result of persistence is the lot of the Ahmeek Mining Company, which, though organized in 1880, has recently declared its first dividend. With a capital of $1,250,000, of which but $850,000 has been paid in, it has persisted, opening the present workings in 1902 and paying for improvements from current earnings. We hope its period of prosperity may be equally protracted.

BONDS are becoming popular at the expense of shares in these days of financial uncertainty. Funds are continually coming in to the market for investment, but wise investors, realizing that the chances of a share market that is kaleidoscopic in its changes are all against them, are seeking securities that are reasonably stable. Financial house-cleaning is remarkably like the ordinary kind and the effects are equally disquieting to all concerned.

RAILROADS are, to some degree, an index of general business conditions, and it is encouraging to note that the first week of October shows an increase of 0.7 per cent in gross earnings, compared with the same period of last year. The official summary for the year ended June 30, 1911, shows that total operating revenues were 0.6 per cent less than the corresponding period of 1910, while operating expenses were 2.8 per cent higher, corresponding to a decrease in operating income of 8.8 per cent. It is interesting to note that Southern roads prospered, while the reverse was true of Western roads, the former recording an increase of operating revenue of 3.3 per cent, while the latter exhibited a decrease of 2.7 per cent.

TO THE business type of mind there is necessarily something adventitious in the viewpoint of the scientist. To all such the action of Mr. Alfred H. Brooks in refusing promotion to the position of chief geologist of the United States Geological Survey, as recorded in our 'Personal' columns last week, holds something of the incomprehensible. Yet from the scientific viewpoint Mr. Brooks' decision was a natural and fitting one. Through years of painstaking achievement as chief of the Alaska work of the Survey he has indissolubly associated his name and personality with that work, and naturally feels that he cannot afford to leave it uncompleted to take up new responsibilities. We are proud that in our Government service men are to be found to whom the work is greater than opportunity for personal advancement, and it is good to believe that Mr. Brooks is not alone in this regard.

THE Mother Lode district of California is as productive of interest as it has been of gold, and the recent taking over of the Plymouth mine by Bewick, Moreing & Company is a matter of more than passing note. The Plymouth was worked to the 1700-foot level before the fire which led to its being closed down many years ago, but was showing a good profit, and the outlook for its development into a steady producer is correspondingly bright. And the advent of English capital into gold mining in California is a matter of no less note. We extend the purchasers our good wishes for the profitable outcome of their venture and the hope that it may lead to closer relations in the future.

DISSATISFACTION with the land laws of the United States is daily becoming more acute. The need of revision of the land laws, as applied to Alaska, has recently been the subject of discussion by both the San Francisco and Philadelphia sections of the Mining and Metallurgical Society, and the same topic has been a feature of the discussions at the American Mining Congress during the week. As a means of clarifying and unifying the ideas of the members of the mining profession such discussions are excellent; as a means of securing remedial legislation they are ineffective. If a committee from one of the national societies would draft new laws and submit them to Congress through their representatives, definite results would be attained.

PROPHECY, to judge from the experiences of prophets since the time of Moses and Aaron, is not an altogether satisfactory vocation, but if the impulse is irresistible it is best to be an optimistic prophet. Some such impulse must have actuated the *Boston Commercial* when, as recently, it prophesied that copper production for this year will reach 1925 million pounds, while the consumption will amount to 2225 million pounds, which leads to the deduction that a new Calumet & Hecla, a new Nevada Consolidated, and a new United Verde must be provided each year to keep up with the growing consumption. With electrolytic copper at 12.08 cents on October 13, this is a comforting prophecy. Who would not be a prophet rather than a statistician!

LEARNING by experience, though the most effective method of acquiring accurate and trustworthy information, is but a slow task. In the estimation of costs experience is the only sure guide, for usually the data available are fragmentary or incomplete, and it is difficult not to overlook some essential factor, the existence of which could only be known to one thoroughly familiar with the conditions which circumstance the case in question. Engineers, having acquired a large fund of accurate information, often, not unnaturally, regard it as part of their assets and refuse to make public what has been secured as the result of much effort. Mr. Charles T. Hutchinson's discussion of the cost of constructing stamp-mills, given on the following pages, is all the more noteworthy, therefore, and even those whose interests lie outside of stamp-milling can read it with interest and profit. Mr. Hutchinson rightly emphasizes the important part which small and oftentimes unnoticed factors may play in increasing the cost of construction. The handling of timber by manual labor, the working under unusual and unsatisfactory conditions, the accentuation of unfavorable and the lessening of the effect of favorable conditions, all may combine to raise costs far above the preliminary estimates. We cannot have too much of definite information of practical value.

TUNGSTEN is a metal once classed as rare, but which has become of such importance in the industrial world that the not inconsiderable sum of 5289 tons of 60 per cent tungsten trioxide ore was produced in 1909, of which the United States contributed nearly one-third, corresponding in value to over a half million dollars. Colorado has long been the leading State in the production of this metal, its whole output coming from Boulder county, but California is a notable producer also, San Bernardino county having a number of small mines. On another page Mr. John H. Williams briefly describes some of the San Bernardino county deposits. Tungsten is not only important in the manufacture of ferro-alloys, but also in many branches of chemical technology, and though the industry is not large, measured in terms of tons and dollars, it is a matter of much interest.

THE American Mining Congress has been meeting in Chicago this week, and a notable program was provided. The delegates were welcomed by the Governor of Illinois and the Mayor of Chicago, and on Wednesday the president, John Dern, read his annual address, which was followed by the reports of the committees on workmen's compensation and on Federal legislation, and by an address by Martin D. Foster, chairman of the House Committee on Mines and Mining. In the evening J. A. Holmes discussed the problems of the mining industry, James Douglas described what is being done to protect the lives of coal miners, and E. H. Benjamin described the mining industry of California. Thursday was given over to discussions of the coal industry. Friday morning Alaskan problems were discussed by a notable list of speakers, including A. H. Brooks, and at the afternoon session the public lands in the West were the topic, the governors of Utah and Arizona being the principal speakers. The notable features of the evening session were the report of the committee on a general revision of the mineral land laws, which is given in full on another page, and an address by W. L. Fisher, Secretary of the Interior. On Saturday morning 'The Federal Government and the Mining Industry' was the topic upon which William H. Taft, President of the United States, was to speak. It goes without saying that much good must flow from so notable an assemblage of speakers, and the American Mining Congress may congratulate itself upon attaining a higher level of influence than ever before.

Technical Discussion

At a recent election in California a constitutional amendment granting equal suffrage to women was enacted by a small majority. It is not our purpose to discuss the wisdom or unwisdom of this departure, though much might be said upon the topic, but allude to it in passing merely to note that, so far as a Californian is concerned, it marks the passing of the only public topic upon which it was possible to excite a vigorous general discussion. Those whose memories extend back to the period before the Civil War recall with interest and some amusement now the bitter enmities that then arose from differences of opinion on public questions of the hour. In one way or other a broader spirit of toleration has grown up, a willingness to concede to the other man a right to his peculiar views, even if they interfere slightly with our own, that marks a more mature stage of mental development. But it would almost seem as though the law of simple harmonic motion governed the movements of society, and that the pendulum, having swung free beyond the median point must travel an equal distance on the other side of it. Too great toleration may lead to a *laissez faire* attitude of mind which is prejudicial to the best interest of the individual and of society as well. In short, mental indolence threatens us. This is even more true when limited to the technical world. No more striking contrast could be desired than that between the discussions recorded in the proceedings of the Institution of Mining and Metallurgy and the Chemical, Metallurgical and Mining Society of South Africa and those which mark the meetings of the American Institute of Mining Engineers and the Mining and Metallurgical Society. Discussions in the Institute are like snakes in Ireland, and the most notable ones in the Society deal with the problem as to whether local sections, supposedly composed of competent engineers, can be trusted to comport themselves properly without rigid supervision. In the columns of the *Mining and Scientific Press* there have recently appeared many notable contributions, in which the authors set forth views or made public data that merit extended discussion before being unhesitatingly accepted. Yet comment and discussion upon them by our readers has been conspicuous by its absence, and a notable contribution, the value of which to the profession might have been greatly heightened by added perspective afforded by being seen from more than one viewpoint, has apparently passed unnoticed. The plea of 'too busy' is a common one, to which the most adequate reply is the retort of an instructor during our college days: "Are not your days also twenty-four hours long, like those of others?" Men have always found opportunity for whatever they really wish to do. And that engineers should cease to wish to take an active part in the development of their profession, is so clearly contrary to their best interests that we find it impossible to believe that it is actually the case.

Revolution in China

Mining engineers are cosmopolitan by nature and training, and therefore may be expected to feel keener interest than ordinary men in events upon the other side of the globe. During the past two weeks the actual news which has emanated from China has been of grave import, but it has been buried in so much journalese and overlaid with so much that is obviously incorrect that our readers will perhaps be glad of a winnowing of the wheat of fact out of the chaff of newspaper report.

Many will wonder why this particular time, when the institution of a constitutional form of government was in steady progress, should be marked by an outbreak of rebellion against the Manchu monarchy, but the underlying reason is not far to seek. Briefly, it is a double one, the growing control of provincial affairs by the national authorities, and the popular feeling that the course being followed by the national government in the creation of powerful foreign influences in the affairs of the nation through the agency of large foreign loans, is an unwise policy, have led to an attempt to overthrow those now in control of the reins of government. Several facts should be kept in mind. The authority of the Chinese Government along the southern and southwestern borders of the Empire has been but shadowy always, and sporadic outbreaks of rebellion have been of constant occurrence since the accession of the present dynasty. Another significant fact is the lack of national unity in China. The Empire consists of an aggregation of communities, and the spirit of China is a community spirit rather than a national spirit. It must furthermore be noticed that while the government of China has been, in the past, theoretically a despotism, practically it has been democratic in the extreme, and the will of the people has, at all times and places, been able to make itself felt upon all matters that are of prime importance. Considerations of space forbid a more extended discussion of these vital factors, but the essential point to be kept in mind is the community spirit of the nation.

Some years since, when railroads were first being recognized as a powerful factor in the national development of China, it was proposed to construct a railroad from Peking to Canton. As foreign assistance, both technical and financial, was necessary, concessions were granted to foreign corporations, and as it would obviously have been unwise to allow a single nation to control so important a road, a concession was granted to Belgian interests for the northern half of the line and to American interests for the southern half. The details of the subsequent proceedings are not essential for our present purpose; the important fact is that the American interests sold their concession to the Belgians, thereby dealing a blow to American prestige in the Far East, the memory of which many years of fair dealing will not suffice to wipe out. The outraged gentry of the provinces traversed by the southern half of the line united and raised sufficient capital to buy back the concession. With commendable zeal they have endeavored to construct the road by their own efforts, but unfortunately with but little in the way of results, beyond the absorption of capital.

In its recent policy of nationalization of the railways the Chinese Government has, as is well known, negotiated a loan from British, French, German, and American sources for the construction of this and other lines of railway. The diplomatic fencing by which these nations endeavored to secure, each for itself, advantage in the terms of the international loan is another story. The essential fact is that a railroad, the right to build which had been bought by the influential merchants of the provinces traversed, was now to be built under national auspices and foreign supervision by means of a foreign loan. In return for the several million dollars which the gentry had already expended in their attempt to construct the road 50 cents upon the dollar was to be paid, and they would lose control of the line. Nothing better calculated to bring popular unrest to the boiling point could well have been devised. It would be idle to deny the existence of an anti-Manchu and an anti-dynastic spirit throughout southern China, just as it would be idle to deny the influence of many other factors, but the essential question is that of 'States rights' (which troubled the United States many years ago) to which the sting of 50 cents on the dollar has been added.

The outcome of the present uprising is still a matter of doubt. The rebel troops have gained successes, and Yuan Shih-kai, to whom the national authorities turned in their extremity, appears to be unwilling to commit himself to the defence of a government which so recently degraded him. What seems inevitable is what in England could be called a change of ministry. Prince Ching and his colleagues who belong to the Han-lin period of enlightenment are doomed to retirement, and men more in touch with modern progress must be brought to the fore. The most striking thing about the outbreak is, to one familiar with the Far East, the contrast in the attitude toward foreigners in 1911, as compared with 1900. In 1900 the national unrest exhibited itself as a blind rage, now it shows itself as an intelligent comprehension of the real problems, and, whatsoever the outcome of the present uprising, it is safe to say that notable progress toward the development of China into a modern power will be the result.

Report of the American Mining Congress Committee on General Revision of the Mineral Land Laws

EDMUND B. KIRBY, Chairman

This committee had assigned to it the work of securing action from the Congress of the United States upon the request of the American Mining Congress for a general revision of the mineral land laws. By the time the list of committee members had been appointed, and had conferred and agreed upon their plans, the winter session of Congress was so near its close that it was found that no effective action was then possible. During the special summer session there was a general understanding in the House and Senate that no general legislation was to be introduced, and this understanding prevented the consideration of our measure. It was, therefore, decided to undertake it early in the regular session this winter, at which time a joint resolution on the following lines will be introduced through our friends in Congress:

> That ——— Committee ——— is instructed to prepare and submit at this session a mode of procedure whereby Congress may undertake a general revision of the Mineral Land Laws of the United States in the way which will best promote the public welfare and meet the peculiar needs of the mining industry. The plan recommended should provide a practical means whereby Congress may utilize the best experience and judgment available in the industry and which will give the mining regions of the United States and Alaska ample opportunity for public hearings and the discussion of remedies.

In the meantime, your committee has taken up the matter with the Governors and United States Senators and Representatives of the Western States and Territories affected. It has informed them of the request of the American Mining Congress for a general revision and its reasons therefor, and of the aforesaid joint resolution to be introduced at the next session. The replies show that in this undertaking the American Mining Congress has not only no opposition, but the general approval and support of the public men of Western States, while a number of them show a keen personal interest in the matter. It is clear that, with the support promised, and the non-partisan nature of the measure, there will be effective action by Congress at the next session.

After Congress has empowered some committee to act, your committee hopes to have the opportunity of presenting to it such detailed information and suggestions as may aid in preparing a plan, whether for a commission or otherwise, which will be satisfactory to Congress and accomplish the ends desired. Your committee believes that this may be secured through a wisely selected commission, authorized to draft a revised code for the use of Congress. This commission should hold public hearings in the principal mining centres of the West and Alaska. It should call before it men prominent for their knowledge of prospecting, of claim locations, of mine operating, mine litigation, and the history of mining laws, and should invite opinions from the public bearing upon the specific points at issue. The authorities and experience of other mining countries should also be consulted, and the recommendations of the commission should be presented in the form of a fully drafted code.

It is clear that there is a best practical solution for each one of the difficult problems involved in a general revision of the mineral land laws, but in order to determine these best solutions, all opinions must be brought to a focus before some authoritative body which had the power of decision. Moreover, in order to assure the general approval and acceptance of reforms affecting so many varied interests, the personnel of this body should be such as to command confidence, and the mining communities should have opportunities to present their views before it. There is a wealth of learning and practical experience in the country, which is available for the work of framing a revised code, but it is distributed among many men and must be focused by the plan indicated. In order properly to follow up the business now under way, your committee asks that it be authorized to continue its work during the coming year. A memorandum is attached, explaining the request of the American Mining Congress for revision and the reasons for its action.

The American Mining Congress, representing the mining industry of the United States and Alaska, asks that Congress shall undertake a general revision of the mineral land laws. The mineral land laws of the United States and Alaska, framed in 1872 and interwoven with a mass of supplementary State legislation, differing in every State, fail to meet the present requirements of the industry. Moreover, they have developed various evils, the injurious effects of which are steadily increasing. These have become so serious as to retard the development of mining and create dissatisfaction and complaint everywhere.

At every annual session of the American Mining Congress during the past twelve years the prevailing discontent with the present code has been voiced by various resolutions calling attention to its evils and asking for the correction of this or that feature of the laws relating to mineral claims located upon the public domain. Such complaints, steadily increasing in volume, have found expression not only in the Mining Congress but also in the press of the mining communities, all the mining journals, in the societies of mining engineers, and, in fact, through every medium available for the expression of public sentiment. They have, nevertheless, been without result, for the reason that the mining laws are largely interdependent, and it is difficult, if not impossible, to correct one fault without involving the entire code. Moreover, the States affected, some of which have often attempted to make improvements, find that nothing effective can be done without the action of Congress. In short, patchwork is impossible, and a general revision is necessary.

Since the problems involved in the work are peculiar to the industry and are unusually difficult, it is evident that their satisfactory solution will require the aid of the most experienced judgment together with a free and direct expression of views by the mining communities themselves. Among the many questions which will arise during a revision are the following, which will illustrate the nature of the work: (1) the apex law, with the uncertainties of title and litigation caused by it. The latter includes not only the conflicts caused by the extralateral right, but also those occasioned by the consequent shapes of claims and the overlapping of lines. (2) The creation of definite procedure for acquiring rights to those claims in which the mineral is not near the surface and where discovery must in consequence be long deferred. (3) Adit locations and the uncertainties of title caused by them in neighboring claims. (4) The recent non-observance of the law of discovery. (5) The more or less complete non-observance, through various expedients, of the law of assessment. (6) The location of an unlimited number of claims by one individual. (7) Locations by proxy.

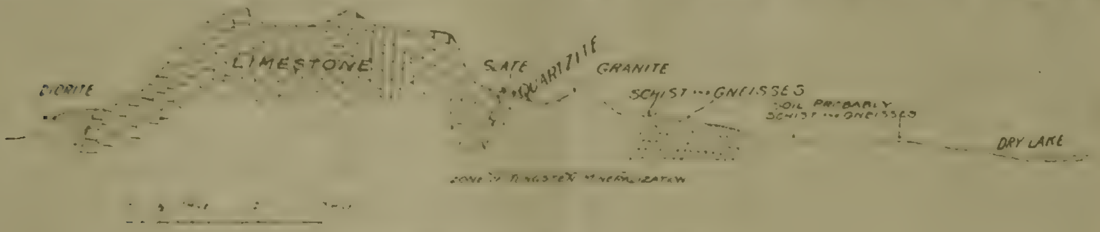
A general revision now will be particularly timely because of the public interest in conservation and the new legislation now under consideration for timber, oil, phosphate, and coal lands, and also power sites. To omit the mining code from any program for the betterment of laws relating to natural resources would be to pass by the field where relief is most urgently needed. The American Mining Congress therefore reached the following decision:

"That Congress be asked to undertake promptly a general revision of the mineral land laws, which in view of the difficult problems presented, should be in coöperation with the mining industry. The plan adopted for this coöperation should give all sections opportunity for public hearing and the discussion of remedies. The Mining Congress will suggest a practical plan for this purpose later on if desired."

Tungsten Deposits in San Bernardino County, California

By John H. Williams

The tungsten deposits are situated in the northeast part of San Bernardino county, in what is known as the Ivanpah quadrangle, a part of which is shown on the map. This region is interesting, not only by reason of its production, but also because of the facilities which it offers for the study of certain forms of tungsten ore deposits. In the tungsten mines the valuable mineral species found are: wolframite, a tungstate of iron and manganese; hubnerite, a tungstate of manganese; ferberite, a tungstate of iron; and scheelite, a calcium tungstate. The first three minerals are so intermixed that for an exact determination a chemical analysis is necessary. All ores are found over an area of $2\frac{1}{2}$ miles wide by 10 miles long, at elevations from 4000 to 6900 feet.


LIMESTONE
SLATE
QUARTZITE
GRANITE
DIORITE
SCHIST AND GNEISSES
SOIL PROBABLY SCHIST AND GNEISSES
DRY LAKE
ZONE OF TUNGSTEN MINERALIZATION

CROSS-SECTION THROUGH CLARK MOUNTAIN.

Clark mountain, in which the mines are situated, has a general northwest direction. The mountain is flanked on both sides by broad valleys. The upper part consists of limestone; adjoining the limestone are slate and quartzite; adjoining the quartzite the granite occurs, in which the tungsten deposits exist. Adjoining the granite are granitic rocks, mostly altered gneisses and schists. The tungsten ores are found solely within the area of the granite and granitic rocks; instances of their occurrence in the other rocks are not known.

VICINITY OF CLARK MOUNTAIN.

The granite is a coarsely-crystalline rock revealing to the unassisted eye feldspar, quartz mica, biotite, and hornblende. The granites have not a uniform texture and show strong evidence of foliation and other effects of dynamic action. The granite weathers easily and crumbles to a coarse sand. Nearly 2000 ft. to the east from the limestone-slate contact, a pegmatite dike runs parallel with the granite. The dike outcrops for five miles, and varies considerably in size, ranging from 40 to 150 ft. in width. In places wolframite and scheelite occur on the surface, but so far have not been developed. The schists and gneisses adjoining the granite to the east are far more regular and even in foliation. They are garnetiferous, showing stringers of sulphides and magnetite. At some places exposures of muscovite mica occur, sheets of 4 by 6 in. are common.

The ores are variable and their distribution in the granites irregular. Some of the ore-shoots occur as lenses, associated with quartz and calcite veins, running in every direction, with the exception of three parallel veins on the Jack claims. These three veins run parallel for nearly 1100 ft.; their average width is from 8 in. to $1\frac{1}{2}$ ft. A shaft down 66 ft. with nearly 42 ft. of driving, showed both faces and bottom of the shaft in good ore. Besides the smaller ore-shoots in the quartz-calcite veins, the tungsten ores are also deposited in quartz dikes from 10 to 45 ft. in width. The quartz dikes run partly northwest-southeast, and east and west. They contain both wolframite and scheelite in lenses and bunches. The lenses are very regularly distributed; in places I measured $1\frac{1}{2}$ ft. wide by 60 ft. long, averaging 12% tungstic acid. Another shoot was from 2 to 3 ft. in width, 24 ft. long, averaging 15% tungstic acid; this shoot contained wolframite and scheelite, the latter predominating. Both drifts on this last shoot are still in good ore. So far the deepest workings are at the Jack claims, showing the ore at a depth of 148 feet.

As regards the method of formation of the tungsten ore-shoots, the most reasonable and natural explanation is that they have been formed during the final stages of the cooling and consolidation of the granitic magmas, the mineralized waters and vapors given off filling the dikes and cracks due to the contraction of the cooling mass. It may be said of the district that the tungsten minerals are generally confined to quartz veins and dikes in the granitic rocks. Veins containing tungsten ores may occur anywhere within the area of the granitic rocks. In closing, I will say that the local conditions are admirably adapted for mining and milling, there being plenty of water and timber in the mountains. A concentrating plant is in course of erection, and the future outlook for this new tungsten district is promising.

Profitable Low-Grade Mines

The Under Secretary for Mines in Victoria, in his annual report, mentions that on the low average of $3\frac{1}{2}$ dwt. per ton the New Imperial Co. at Buninyong, and the Goldfields Consolidated at Bendigo paid dividends. The former treated 20,640 tons, yielding 3699 oz., and paid £750 as a dividend; and the latter put through 8483 tons, yielding 1498 oz., and distributed £996 to its shareholders. Surprisingly low average yields per cubic yard are now profitable in dredging. The Tewksbury Amalgamated Co., at Bright, won 4160 oz., worth £16,907, from 1,553,360 cu. yd. of ground, and paid £3325 in dividends. The average is only 1.1 grain per yard. The Porepunkah Dredging Co., at the same place, on an average of just one grain per cubic yard, paid £500 to its shareholders on a yield of 901 oz. from 421,071 cubic yards of ground.—*Queensland Government Mining Journal.*

Cost of Constructing Stamp-Mills

By Charles T. Hutchinson

Estimating on the cost of stamp-mill construction is not an exact science. No engineer or contractor can see far enough into the future to know beforehand what unusual or unexpected conditions will arise during the progress of construction, any of which will influence the cost of the work. A run of bad weather, the loss of a car of freight, incompetence or unreliability of teamsters, and a score of other things may raise the cost of construction well above the amount of the original estimate. Presupposing the existence of ideal conditions is both foolish and unbusinesslike, as the unexpected always happens, and the remark most often heard after a job is finished is, 'It cost me more than I figured.' It is not possible to impart by a brief written article the experience of years in judging, on inspection and study of local conditions, just how much to allow for carrying on each separate section of the work to be done; but the average cost of the various classes of work may be given and the various elements entering into construction costs may be briefly pointed out with the object in view of furnishing a basis by which a man familiar with the ground on which the mill is to be erected may prepare an intelligent estimate. The following has not been prepared for the large company, which is financially able to employ experts on construction to superintend the erection of its machinery. It is written primarily for those who contemplate the erection of small mills up to 20 stamps in size and who prefer to calculate systematically rather than indulge in guess work with its aftermath of disappointment.

There is an idea prevalent among mining men in general that stamp-mills can be built complete and turned over in running order for $1000 per stamp. This estimate may be correct in possibly one case in a hundred, but as no two sets of conditions governing the cost of mill construction are exactly alike, the use of this formula—if it may be so called—can only result in disappointment. The figures here given are based upon California conditions of labor and climate, the rate of wages being as follows per 8-hour shift: millwrights, $5; carpenters, $4; helpers, $3; masons, $5; machinists, $4.

Estimates

The elements entering into the cost of stamp-mill construction will each be treated separately and will all be found in the following summary which affords a good form for preparing estimates, and will be of aid in itemizing the factors which make up the total cost:

Material:

Cost of machinery f.o.b. factory.
Lumber for mill building f.o.b. shipping point.
Timber for ore-bin and battery-frame f.o.b. shipping point.
Shingles or shakes for roof.
Galvanized corrugated iron for sides and roof.
Doors.
Windows.
Building hardware.
Nails.
Cement.
Sand.
Broken rock.
Building bolts and washers.
Red brick.
Fire brick.
Fire clay.
Lime.
Tools for construction.
Freight charges on all the above from shipping point to railroad station nearest mine.
Hauling charges on all the above from railroad station to millsite.

Labor:

Cost of framing and erecting building.
Putting on siding; shingle roof; shake roof.
Iron siding and roof.
Setting doors and windows.
Erecting machinery.
Hauling building material and machinery on the ground.
Framing and erecting battery-frame; ore-bin.
Masonry retaining walls.
Concrete retaining walls.
Wood mortar-block.
Concrete mortar-block.
Concrete foundations.
Brick setting for steam-boiler.
Superintendence.
Timekeeper and office work.
Allowance for unforseen contingencies.

Machinery, Cost at Factory.—This information is the easiest of all to obtain and an inquiry sent to any reputable machinery manufacturer will meet with a prompt response. Modern trade catalogues are so carefully prepared and enter into so much detail that they are practically text-books on machinery construction and design. Most machinery houses maintain a competent engineering department, which will co-operate with prospective customers and assist them in making proper selection of the machinery best suited for treating their ores. Much time will be saved if prospective buyers will give the manufacturer a definite idea of conditions to be met in order that an intelligent estimate may thus be prepared. In sending an inquiry to a manufacturer for prices of mill equipment it is necessary that he should be informed as to (*a*) the character of the ore; (*b*) process that is to be used; (*c*) number of tons per day of 24 hours that it is desired to treat; (*d*) fineness to which it is desired to crush; (*e*) kind of power to be used.

If conditions require gasoline-engines for power, the altitude above sea-level at the millsite must be stated, as internal-combustion engines lose about 3% efficiency for each 1000 ft. rise above sea-level. If steam-power is to be used, the kind of fuel should be stated.

If electricity is to be used, the voltage must be stated if current is continuous; phase, voltage, and frequency must be stated if the current is alternating. If transformers are required, primary voltage and phase must be stated.

If water-power is to be used, the manufacturer must know the quantity of water available in cubic feet or gallons per minute or miner's inches, and the head in feet or vertical distance between point of intake and point of outlet. If pipe-line is already in place, length and diameter must be stated; and if not already in place, the length only will suffice.

Erection of Machinery.—This is an item which may cost from $30 per ton upward, depending upon the skill, ingenuity, and experience of the man in charge of construction. After all orders for machinery, building material, and supplies have been placed, instructions should be sent to the various concerns furnishing material, for the purpose of arranging a systematic schedule of shipping dates, so as to have the machinery and other material arrive on the ground as nearly as possible in the sequence in which it is required. There is seldom any gain in attempting to rush all shipments indiscriminately, as the confusion and chaos on the ground will result in more lost time and delay than is gained by quick though unsystematic shipments. If foundations are ready for the heavy machinery, the latter can be lifted direct from wagons and set in its proper place in the mill; otherwise it may have to be handled two or three times, and each time it is handled it costs money.

Bolts, washers, and small fittings when unpacked from shipping cases should be systematically arranged according to size. I have seen a $5 per day man spend an hour looking through a pile of small parts for a bolt, which should have had its place and been in it. Manufacturers generally send out a detailed statement with each shipment showing the contents of each package and case, so there is no excuse for waiting until a job is nearly ready to turn over and then find that the work must be hung up and a crew of men stand around idle, waiting for some small detail or missing part which may have been overlooked at the factory or lost by careless unpacking of material. Small parts and fittings liable to be lost or damaged by exposure to the weather should be housed. Even the crudest kind of a shed will save its cost many times over during construction of the plant. Building material, lumber, etc., should receive the same care and systematic handling as machinery and supplies. It is surprising how much time and money can be saved by a little foresight in this direction. A suitable framing yard should be prepared, as near the millsite as possible, in which all lumber can be systematically stacked on arrival according to width, thickness, and length, and where all framing can be done. Carrying lumber, heavy timbers, etc., back and forth by manual labor and trying to make a good job of framing when working on a side-hill are not compatible with low costs. When a man has spent much of his time and money in developing a prospect, and then has spent more time and hard work in financing his company, it can be readily understood why he is impatient to get started, but he should stop to consider that it nearly always costs as much money to try to force work ahead at a pace faster than circumstances will permit, as it would to go to the other extreme and delay matters.

Freight and Hauling.—These two items are governed entirely by local conditions, and no general information on this subject can be given; therefore, calculations must necessarily be made in each case according to circumstances.

CONSTRUCTION

Lumber for Mill Building.—The first cost of lumber is governed by local conditions and by the prevailing market price existing at the time the order is placed. The labor cost is also a variable factor, depending upon local conditions and the individuality of the workman himself, but the following rates will give a fairly close average approximation:

Framing and erecting mill buildings up to 30 ft. in height, $25 per M board-feet.

Framing and erecting mill buildings 30 ft. in height and upward, including setting roof-trusses, $35 per M board-feet.

Putting on 1-in. rough siding, battened, laying wood floor, etc., $20 per M board-feet.

It has been found by actual experience that a workman can work about half as fast at a height of 30 ft. or over as he can when below that point, and for this reason roof-trusses should always be framed and put together complete on the ground, then hoisted into place, and fastened, rather than be put together piece-meal in position.

Ore-Bin and Battery-Frame.—The same remarks as regards first cost of material apply in this case as in that for lumber for mill building proper. Dressed timber need not necessarily be used, although many builders prefer it on account of appearances. Occasionally builders prefer to have the timber furnished already cut and framed where machine tools are available, on the ground of economy, but it is questionable whether this course pays in the long run, since sufficient stock must always be left to allow for trimming when lining up the frame, camshaft bearings, and guide girts, which work cannot be done until the machinery is actually in course of erection. The cost of framing and erecting a battery-frame and ore-bin, including planking, is about $35 per M board-feet.

The following table will be of assistance in figuring lumber bills and the quantity required:

NUMBER OF FEET, BOARD MEASURE, IN LUMBER OF VARIOUS SIZES

Size, inches.	Length in feet							
	10	12	14	16	18	20	22	24
1 by 2	1⅔	2	2⅓	2⅔	3	3⅓	3⅔	4
1 by 3	2½	3	3½	4	4½	5	5½	6
1 by 4	3⅓	4	4⅔	5⅓	6	6⅔	7⅓	8
1 by 5	4⅙	5	5⅚	6⅔	7½	8⅓	9⅙	10
1 by 6	5	6	7	8	9	10	11	12
1 by 7	5⅚	7	8⅙	9⅓	10½	11⅔	12⅚	14
1 by 8	6⅔	8	9⅓	10⅔	12	13⅓	14⅔	16
1 by 10	8⅓	10	11⅔	13⅓	15	16⅔	18⅓	20
1 by 12	10	12	14	16	18	20	22	24
1 by 14	11⅔	14	16⅓	18⅔	21	23⅓	25⅔	28
1 by 16	13⅓	16	18⅔	21⅓	24	26⅔	29⅓	32
1 by 18	15	18	21	24	27	30	33	36
1 by 20	16⅔	20	23⅓	26⅔	30	33⅓	36⅔	40
1¼ by 4	4⅙	5	5⅚	6⅔	7½	8⅓	9⅙	10
1¼ by 6	6¼	7½	8¾	10	11¼	12½	13¾	15
1¼ by 8	8⅓	10	11⅔	13⅓	15	16⅔	18⅓	20
1¼ by 10	10 5/12	12½	14 7/12	16⅔	18¾	20⅚	22 11/12	25
1¼ by 12	12½	15	17½	20	22½	25	27½	30
1½ by 4	5	6	7	8	9	10	11	12
1½ by 6	7½	9	10½	12	13½	15	16½	18
1½ by 8	10	12	14	16	18	20	22	24
1½ by 10	12½	15	17½	20	22½	25	27½	30
1½ by 12	15	18	21	24	27	30	33	36
2 by 4	6⅔	8	9⅓	10⅔	12	13⅓	14⅔	16
2 by 6	10	12	14	16	18	20	22	24
2 by 8	13⅓	16	18⅔	21⅓	24	26⅔	29⅓	32
2 by 10	16⅔	20	23⅓	26⅔	30	33⅓	36⅔	40
2 by 12	20	24	28	32	36	40	44	48
2 by 14	23⅓	28	32⅔	37⅓	42	46⅔	51⅓	56
2 by 16	26⅔	32	37⅓	42⅔	48	53⅓	58⅔	64
2½ by 12	25	30	35	40	45	50	55	60
2½ by 14	29⅙	35	40⅚	46⅔	52½	58⅓	64⅙	70
2½ by 16	33⅓	40	46⅔	53⅓	60	66⅔	73⅓	80
3 by 6	15	18	21	24	27	30	33	36
3 by 8	20	24	28	32	36	40	44	48
3 by 10	25	30	35	40	45	50	55	60
3 by 12	30	36	42	48	54	60	66	72
3 by 14	35	42	49	56	63	70	77	84
3 by 16	40	48	56	64	72	80	88	96
4 by 4	13⅓	16	18⅔	21⅓	24	26⅔	29⅓	32
4 by 6	20	24	28	32	36	40	44	48
4 by 8	26⅔	32	37⅓	42⅔	48	53⅓	58⅔	64
4 by 10	33⅓	40	46⅔	53⅓	60	66⅔	73⅓	80
4 by 12	40	48	56	64	72	80	88	96
4 by 14	46⅔	56	65⅓	74⅔	84	93⅓	102⅔	112
6 by 6	30	36	42	48	54	60	66	72
6 by 8	40	48	56	64	72	80	88	96
6 by 10	50	60	70	80	90	100	110	120
6 by 12	60	72	84	96	108	120	132	144
6 by 14	70	84	98	112	126	140	154	168
6 by 16	80	96	112	128	144	160	176	192
8 by 8	53⅓	64	74⅔	85⅓	96	106⅔	117⅓	128
8 by 10	66⅔	80	93⅓	106⅔	120	133⅓	146⅔	160
8 by 12	80	96	112	128	144	160	176	192
8 by 14	93⅓	112	130⅔	149⅓	168	186⅔	205⅓	224
10 by 10	83⅓	100	116⅔	133⅓	150	166⅔	183⅓	200
10 by 12	100	120	140	160	180	200	220	240
10 by 14	116⅔	140	163⅓	186⅔	210	233⅓	256⅔	280
10 by 16	133⅓	160	186⅔	213⅓	240	266⅔	293⅓	320
12 by 12	120	144	168	192	216	240	264	288
12 by 14	140	168	196	224	252	280	308	336
12 by 16	160	192	224	256	288	320	352	384
14 by 14	163⅓	196	228⅔	261⅓	294	326⅔	359⅓	392
14 by 16	186⅔	224	261⅓	298⅔	336	373⅓	410⅔	448

Shingles for Roofing.—The following schedule will apply to ordinary mill roofs: 250 shingles equal 1 bundle. Using pine shingles with 4 in. exposed to the weather, 1000 shingles per square will be required, weighing approximately 245 lb. If 6 in. be exposed to the weather, 670 shingles per square will be required, weighing approximately 165 lb. Sheathing should be 4 in. wide and spaced 4 in. apart. A square equals 10 by 10 ft., or 100 sq. ft. Labor cost per square is approximately $1.50.

Shakes for Roofing.—There is quite a variation in the size of shakes as furnished by the different mills, but the ordinary shake may be considered to be 6 in. wide and from 32 to 36 in. long. With 10 in. exposed to the weather, 250 shakes per square will be required. Sheathing should be 6 in. wide and spaced 5 in. apart. Labor cost per square is approximately $1.25.

Iron Buildings.—In many localities, particularly the desert country, where lumber is scarce and the cost is correspondingly high, galvanized corrugated iron, and sometimes flat painted iron sheets, are used for the sides and roofs of buildings. The price of this material varies with market conditions and locality. The following table will be of assistance in making calculations as to the quantity required.

NUMBER OF CORRUGATED SHEETS PER SQUARE

Length of sheet, inches.	3-in. corrugations. Width flat, 31 in. Width after corrugating, 28 in. Net covering width, 24 inches	2½-in. corrugations. Width flat, 30 in. Width after corrugating, 27 in. Net covering width, 24 inches	1¼-in. corrugations. Width flat, 30 in. Width after corrugating, 26 in. Net covering width, 24½ inches
60	8.572	8.888	9.231
72	7.143	7.407	7.692
84	6.122	6.349	6.593
96	5.357	5.555	5.769
108	4.762	4.938	5.128
120	4.286	4.444	4.616

If material is painted, add 20 lb. per square to allow for paint. No. 26 is the gauge usually used for both roof and sides, although No. 28 sides are sometimes deemed heavy enough. The labor cost for fastening roof and sides is approximately $1.25 per square.

WEIGHT OF CORRUGATED SHEETS PER SQUARE

	Black			Galvanized		
Gauge.	3-in. cor.	2½-in. cor.	1¼-in. cor.	3-in. cor.	2½-in. cor.	1¼-in. cor.
20	166	167	170	183	184	187
21	152	153	156	170	170	173
22	138	139	142	156	156	159
23	125	125	127	142	142	145
24	111	111	113	128	128	131
25	97	97	99	114	115	117
26	83	83	85	100	101	103
27	76	76	78	93	94	96
28	69	69	71	86	87	88

Doors and Windows.—The ordinary 12-light, 10 by 12-in., single windows are ordinarily used, the price varying according to local conditions. Labor cost of setting windows is approximately $1.50 each. Plain doors, 2 ft. 8 in. by 6 ft. 8¾ in. will vary in cost according to local conditions. Labor cost of setting is approximately $1.50 each. Ordinary plain hardware used on windows and doors should not cost to exceed $2.50 per door or window.

Nails.—The quantity of nails of each size required for each class of work may be fairly accurately calculated, provided that there is no excessive waste, and the following tabulation will be found to be close enough for all ordinary purposes:

	Use:	
For each:	Pounds.	Size.
1000 shingles	4	4d
	3½	3d
1000 laths	6	3d
1000 ft. clapboarding	18	6d box nails
1000 ft. siding	20	8d
	25	10d
10 ft. partition shedding	1	10d
1000 ft. 1 by 3 flooring..........	45	10d
1000 ft. 1 by 2 flooring..........	65	10d
1000 ft. pine finish	30	8d
250 shakes	2½	5d

STANDARD STEEL WIRE NAILS

Size.	Length.	Gauge No.	Approx. No. per lb.
2	1	15	876
3	1¼	14	568
4	1½	12½	316
5	1¾	12½	271
6	2	11½	181
7	2¼	11½	161
8	2½	10¼	106
9	2¾	10¼	96
10	3	9	69
12	3¼	9	63
16	3½	8	49
20	4	6	31
30	4½	5	24
40	5	4	18
50	5½	3	14
60	6	2	11

(Note.—100 lb. equals 1 keg.)

SHINGLE NAILS

Size.	Length.	Gauge No.	Approx. No. per lb.
3	1¼	13	429
4	1½	12	274
5	1¾	12	235
6	2	12	204
7	2¼	11	139
8	2½	11	125
9	2¾	11	114
10	3	10	83

A special barbed galvanized nail is used for attaching corrugated or painted sheets to wood-frame buildings, and is driven first through a lead washer, then through the iron into the wood frame. In this work 1½ lb. of 2-in. No. 9 galvanized barbed nails are sufficient for one square; 325 lead washers, weighing 1 lb., are sufficient for about two squares.

Building Bolts.—As this item is one that is subject to great variation, depending upon the ideas of individual mill designers, it is difficult to give information that will be even approximately correct without publishing mill drawings also. Keeping in mind the fact that the scope of this article covers the stamp-mill as applied to the treatment of free-milling gold ores by amalgamation only, the building bolts for a 5-stamp mill will weigh approximately 500 lb.; a 10-stamp mill, 1000 lb.; a 20-stamp mill, 2000 lb. It is quite possible to design an excellent building in which building bolts are almost entirely done away with and it should be understood that the above information should be used for what it is worth and no more. It is a comparatively simple task to calculate the number and cost of bolts required when drawings are made and submitted by the designer.

Grading and Excavating.—This is the most difficult of all to treat in generalities, as the following factors, (*a*) cost of labor, (*b*) character of the ground, (*c*) cost of powder, fuse, and caps on the ground, (*d*) whether machine drills or hand drills are to be used, are commonly all vital as far as costs are concerned, and vary widely in each locality. The average millsite has an overburden of earth of varying thickness which can ordinarily be moved by hand-picking and shoveling with possibly a few shots to loosen it thoroughly. On ground of this nature one man can remove about 10 yards in an 8-hour day, but if it must be handled in wheelbarrows for any considerable distance, the cost will probably equal from $1.50 to $1.25 per yard. On solid rock work, however, where the rock is hard and tough and does not shatter readily, and where hand-drilling is necessary, one yard for two men per day will be as much as could be expected; especially if the rock must be bulldozed after breaking in order to get it down to pieces small enough to be shoveled by hand and hauled away in wheelbarrows. These two cases illustrate the extremes in the cost of grading, and costs covering average conditions will be somewhere between these two. A mill grade of large size has been made as cheaply as $1.50 per yard for the shooting ground where all conditions were exceptionally favorable.

Powder Required.—In one specific case shooting fairly hard rock, 3420 yards, required 750 lb. of 40% giant and 800 lb. of 60% giant for bulldozing. The fuse cost about 2c. per yard and caps 1c. per yard. When the mine-owner has carried his underground development far enough along to warrant fully his considering the purchase and construction of a mill, he will have had sufficient experience in breaking his own ground to calculate the cost of his mill grading accurately.

Retaining Walls and Foundations.—Retaining walls are not required unless the ground is of such a character that it will not stand without them. They may be built either of masonry or concrete, depending entirely upon the material available on the ground. That required for concrete walls is rock (hard, and sharply broken, absolutely free from dirt, clay, or other foreign substances), clean sharp sand, first quality portland cement, and water. Another combination sometimes used is broken rock, sand, gravel, cement, and water, and while this latter will answer for retaining walls, it is not as satisfactory for machinery foundations or mortar blocks as the first combination given.

Walls are calculated by the perch, a perch being 16½ by 1½ by 1 ft. and containing 24¾ cu. ft. To make one perch, use 2500 lb. of broken rock, 1250 lb. of sand, and 625 lb. of cement. The proportions ordinarily used are 1:2:4 for cement, sand, and broken rock, and 1:2:4:8 for cement, sand, gravel, and broken rock. Lime is sometimes used instead of cement on account of its cheapness.

but it does not give nearly as great strength or permanency as cement.

The following cost of retaining walls for a 40-stamp mill built in Arizona will give an idea of the cost of this type of construction:

	Perch.
Concentrator room wall contained	135
Battery-room wall contained	371
Total	506

Cost of the above was made up as follows:

68½ bbl. of lime cost, delivered	$157
63 cu. yd. of sand cost, delivered	50
Labor: mason 59 days, helper 161 days, cost	668
Total	$875

Cost per perch, $1.72.

(Note.—Broken rock was available on the ground without charge.)

Concrete foundations ordinarily cost from $6.50 to $7.50 per cubic yard finished, when cement costs $3.50 per barrel delivered; labor, $2.25 per yard; and boxes, $0.40 per yard. A barrel of cement weighs 400 lb., and is equivalent to 4 sacks containing 1 cu. ft. each.

A man inexperienced in concrete work should not attempt to select rock, sand, or gravel for this purpose, but should obtain the advice of some one familiar with the requirements of this work. Otherwise failure is altogether likely to follow. Not all rock is suitable, by any means, and the expenditure of care in selecting raw material will be repaid in the superior quality of the finished product.

Concrete Floors.—Concrete floors are generally made 4 in. thick and require no forms or boxes, but are made from the regular concrete mixtures already mentioned, with a thin top-dressing of a thick cement grouting to give a smooth finish. The following case will give a fair general average idea as to what may be expected for cost of concrete floors:

Floor contained 6680 sq. ft., 4 in. thick.
To make this floor were required:

76 bbl. of cement costing delivered	$406
Labor: mason 40 days, helper 80 days, costing	375
Total	$781

Average cost per 100 sq. ft., $12.

(Note.—Broken rock and sand were available on the ground without charge.)

Concrete Mortar-Blocks.—As there are many different ideas as to method of construction and proportions of material to be used, I will give three specific instances of blocks which have been built and in use for a sufficient number of years to determine their practicability. They represent what may be considered as typical cases, and will give fair average conditions between the cheaper and simpler forms of blocks and the more elaborate and expensive.

The first case to be given covers the blocks used for a 40-stamp mill, which after ten years' continuous operation have proved perfectly satisfactory. The stamps weighed 1000 lb. each when new and dropped 100 times per minute. The blocks themselves were not monolithic, but were divided, the type of construction being the usual one with battery-posts going down beside the blocks and setting on short wooden streak sills. The monolithic type of block, however, in which the mortar foundation for the stamp-mill, regardless of the number of stamps, is in one piece and flush all along the top and having the battery-posts setting in cast-iron shoes, is preferable. In the case cited, each block contained 6⅔ cu. yd. The concrete was mixed in nine batches, the first eight in the proportion of 12 cu. ft. of broken rock, 9 cu. ft. of sand, and 3 cu. ft. of cement. The ninth batch, forming the top, was slightly richer and was mixed in proportion of 12 cu. ft. of broken rock, 9 cu. ft. of sand, and 4 cu. ft. of cement. For reinforcing, old wire cable was used, it being wrapped around the mortar foundation bolts for each batch of concrete. Cost was made up as follows:

Cement, 55½ bbl., cost delivered	$296
Handling sand and stone	16
Labor: mason 8 days, helper 28½ days	115
Total	$427

Cost, each, average, $55.

(Note.—Sand and broken rock were available at the mill-site without charge.)

Had wooden blocks been used, the cost under the same circumstances would have been as follows:

Lumber, 13 M ft., cost delivered	$481
Planing and setting	200
Total	$681

Cost each, average, $85.10.

For the second case, the data following cover mortar-blocks for a 100-stamp mill, which at the present time is considered to be one of the best, if not the best, built mill in the United States, everything being built and designed with the idea of absolute permanency:

A 2-horse team at $8.50 per day hauled 1 yd. of broken rock or sand per load. A 4-horse team at $14 per day hauled 3 yd. of broken rock or sand per load. Eight loads in either case constituted a day's work. Proportions used for the concrete mixture were 1 part cement, 3.6 parts sand, 3.67 parts broken rock. The battery-blocks contained a total of 108 yd. and cost $11.82 per yard, the cost being made up as follows:

Cement	$ 5.03
Rock	1.06
Rock sand	0.67
Pit sand	0.45
Labor	1.32
Forms	2.76
Engineering and superintending	0.15
Reinforcing	0.38
Total cost per yard	$11.82

The third case covers modern South African practice, the proportions used being 22½ cu. ft. of 2-in. broken rock, 7 cu. ft. of ½-in. broken rock, 13 cu. ft. of washed sand, and 1⅛ bbl. of cement, making 1 yd. of concrete. For the last 2 ft. from the top, 1¾ bbl. of cement was used, the other proportion remaining the same.

Steam-Boiler Setting.—Every boiler manufacturer has his own designs for boiler setting and publishes a schedule of the number of red brick and fire-brick required, but the following table will answer for approximate estimates to cover the setting of single tubular boilers with half fronts:

Diameter, inches.	Length, feet.	Horse-power.	No. red brick.	No. Fire brick.
30	7	10	6,000	550
30	8	12	6,200	550
36	8	15	6,700	650
36	10	20	7,050	720
42	10	25	8,700	770
44	10	30	8,800	880
44	12	35	9,300	940
44	14	40	10,800	1020
48	14	45	12,900	1140
48	15	50	13,700	1140
54	15	60	14,200	1270
54	16	70	15,000	1270
60	16	80	21,500	1540
60	16	100	25,000	1900

In making comparisons between boilers designed for a brick setting as compared with the locomotive fire-box and the internally fired types, the latter should always be considered as requiring a covering of asbestos 2 or 3 in. thick in order to reduce the radiation losses and keep the fuel consumption down. Common red brick weigh 5 lb. each and standard fire-brick weigh 7 lb. each. A 4½-in. wall equals 7 brick per square foot of surface; a 9-in. wall equals 14; a 13-in., 20; 18-in., 26½; 21-in., 33; 27-in., 39½ brick. The weight of walls is 112 lb. per cubic foot in red-brick work and 150 lb. in fire-brick work. A cubic foot of red-brick work equals 17 9-in. straight brick, and 1 cu. ft. of silica-brick work weighs 130 lb. In making estimates on red-brick work, consider that 9 cu. ft. of sand and 3 bushels of lime will lay 1000 brick, and that 250 to 350 lb. of fire-clay or silica cement will lay 1000 fire-brick. A bricklayer will ordinarily lay from 1200 to 1500 brick per day of 8 hours.

Unforeseen Contingencies.—This is an item for which no arbitrary method of figuring can be given, but which, nevertheless, forms an essential point to be considered in making up an estimate. The unforeseen always happens, and, incidentally, invariably adds to construction costs. The estimator must make an allowance to cover the unexpected happening, according to the situation on the ground in each particular case. When mill construction commences late in the season, allowance should be made for increased cost of working in stormy weather. An early rainstorm plays havoc all around, holds up freight teams, damages material not under cover, keeps men from their work in the open, and in other ways increases costs. The matter of systematic handling of shipments and material has already been mentioned, and figures given for construction costs have been based upon the intelligent and systematic handling of all work.

By way of illustration of adverse conditions, take the case of figures given on framing mill building, $25 per M board feet. Assume that the wagon-road terminates at the bottom of a hill and that the lumber and material has to be carried up the hill to the millsite for a distance of 500 ft.; 1000 ft. of dry lumber weighs approximately 3250 lb.; one man could handle about 100 lb. by hand and carry it up a 20 degree slope at the rate of 50 ft. per minute; 20 minutes would be consumed on a round trip, and counting the time lost by resting, etc., two trips per hour would be about the average for an 8-hour day. The cost, therefore, of getting the lumber to the millsite after the teams had discharged their load would be about $6 per M ft., which is about 25% increase in the total amount allowed for framing and erecting; and if such a condition as outlined should exist, 25% would have to be added to the estimated total cost of framing to cover this contingency. The same condition would obtain should the situation on the ground prevent the machinery from being hauled any closer to the millsite, and, as the figures given do not cover any such unusual contingency, it is obvious that a careful study of local conditions must be made in each individual case to arrive at a reasonably close estimate as to what the extra cost will be to cover the handling of the material on the ground as an item separate and apart from the cost of construction and erection.

On small mills up to 20 stamps in size, the amount of material to be handled would hardly justify the purchase of an elaborate outfit of construction tools and apparatus, such as power-operated derricks. Therefore appliances for lifting machinery and building material in general would consist of the usual block and tackle, gin pole, a good hand-winch, chain-block, timber dollies, and rollers. Everything would have to be man-handled from the time it is dumped off the teamster's wagon to the time when the mill is ready to start operating.*

SUMMARY

In summing up what has been written it will be noted that the greater part of the statements made are qualified by exceptions, and in fact that the exceptions seem to predominate. It is a physical impossibility to do any more than approximate labor costs when discussing conditions governing mill construction in a general way, and the best advice that could possibly be given to a man who is contemplating the construction of a mill and who has not made a profession of such work himself, is to hire a man who has. Get the best man that it is possible to obtain; get his references and then run them down thoroughly; satisfy yourself that he is honest, competent, and reliable; put him in charge, and give him your hearty co-operation and support. Do not try to induce him to work for you for less than his regular wage—you may succeed in doing this if the man has been out of work for a long time and is in need of money, and you may think that you have achieved a saving by doing so. But you will lose his respect and miss entirely the spirit of enthusiasm with which a man who has been fairly treated will use his best initiative and apply all of his energies toward the solution of the various problems and difficulties that are of daily occurrence in work of this kind.

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*A convenient portable saw-horse that can be used under some conditions was described by Corey C. Brayton in the *Mining and Scientific Press*, August 6, 1910.

The Tertiary Gravels of the Sierra Nevada of California

By WALDEMAR LINDGREN

*Studies by the United States Geological Survey on the Tertiary placer deposits of the Sierra Nevada, California, began in 1886 and were concluded about fifteen years later. During this period topographic surveys of 22 quadrangles have been made and 14 of the quadrangles were mapped geologically. The Tertiary history of the Sierra, especially the development of the broad monocline recorded on its summits, is of great interest. A basement of closely folded Paleozoic and Mesozoic sediments was intruded and elevated near the close of the Mesozoic by granitic magmas, followed closely by the introduction of veins and seams of gold-bearing quartz. The resulting highland was planed down by erosion in early Cretaceous times. When reduced to gentle outlines deep rock decay took place and much gold was freed from its matrix. Renewed uplift quickened erosion, which concentrated the loosened gold along definite channels. During this period of most active gold concentration faulting movements with downthrow on the east side, had transformed an approximately symmetrical range to a monoclinal one with steep easterly slope.

Toward the end of Tertiary time long quiescent volcanic forces asserted themselves. Rhyolite flows filled the valleys, covered the auriferous gravels, and outlined new stream courses in the old valleys. Renewed disturbance began along the scarcely healed eastern breaks, resulting in a westward tilting of the main blocks. This encouraged deeper cutting by the streams which repeatedly crossed their old courses, and concentration of gold proceeded under less favorable torrential conditions. Volcanoes sent forth immense volumes of tuff, filling many of the valleys to their rims and converting almost the whole of the northern Sierra into a desolate, steaming expanse of volcanic mud. Storm-waters now began the canyon-cutting epoch, amazing in its results as we see them today. In many places the old rivers of the Tertiary were exposed, and cross-sections of their valleys are now seen on the steep canyon slopes high above the present river beds; but large stretches of the old channels remained secure below their blanket of a thousand feet of hardened volcanic mud.

An army of gold-seekers invaded the mountains in 1849. They worked first along the present streams, but gradually the metal was traced to the old Tertiary river beds on the summits of the ridges, and to the quartz veins, the primary sources of all gold in the Sierra Nevada. Millions of dollars were produced annually up to the seventies of the last century, but since, owing to the prohibition of hydraulic mining and the gradual exhaustion of the richer channels suitable for drift mining, the industry has slowly diminished, until now less than $1,000,000 is produced annually. Gold still exists in the Tertiary channels, much of which is yet unworked, but the problems now are to extract it without damage to other property from the débris and to reduce the cost of drift mining so as to permit the exploitation of the less remunerative deep gravels. To compensate for this decrease a new industry, that of dredging, has been developed along the bottom lands flanking the range, and from this during 1910, gold valued at $7,550,000 was recovered.

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*From Professional Paper 73, which can be obtained on request to the Director of the U. S. Geological Survey.

Manufacture of Superphosphate in Western Australia

By M. W. von Bernewitz

The addition of a small amount of superphosphate to the wheat and other lands of Australia shows a marked response in increased yields, even when the season is somewhat dry. For many years it was thought that there was no great area in Western Australia suitable for wheat, because of the poorness of the soil and the lack of rain. That this idea has been exploded is shown by the fact that, in 1901, 74,308 acres produced 774,653 bushels of wheat, and in 1910 580,568 acres yielded 5,885,877 bushels, and 69,265 acres of oats produced 1,121,865 bushels. This has been brought about by scientific farming, and the use of superphosphates. These areas have an annual rainfall of from 10 to 18 in. The use of from 30 to 100 lb. per acre of superphosphate has made it possible to grow wheat upon the border of the eastern goldfields, where there is only 10 to 14 in. of rain yearly, with high yields. At one time our wheat and flour was imported from the eastern States; but now steamers call at Fremantle and are loaded by mechanical elevators and conveyors, and Western Australian wheat is exported throughout the world.

MT. LYELL SUPERPHOSPHATE WORKS.

Superphosphates have been made in Australia for many years, the first works being built near Melbourne, in Victoria. About eight years ago, the Mt. Lyell Mining & Railway Co., of Tasmania, decided to enter the field of manufacturing superphosphate, and erected its first unit at Yarraville, near Melbourne, with great success. F. J. Howell was appointed to advise the company on agricultural matters. Later on, works were erected at Port Adelaide, in South Australia, to supply the farmers of that section, and, two years ago, recognizing the future possibilities of Western Australia as an agricultural country, works costing $450,000 were built at Fremantle. All these plants can produce 100,000 tons of superphosphate yearly. About 265,000 tons is annually used in Australia.

Last January I visited the Fremantle works, and was afforded every facility for noting the process of manufacture by the works manager, A. D. Ferguson. This was the busy time of the year, preparing for the next crop. The plant is situated high up in Rocky bay, on the Swan river, two miles out of Fremantle, being connected by rail with the port, and all other lines to the farming districts. Being used to following the treatment of an ore in a mill, one process after another to the end, it impressed me that in the Mt. Lyell plant the raw materials entered at opposite ends and the treatment was completed in the middle, as it were.

The whole plant is driven by motors, from power generated in the company's own power-house, which comprises the following: Two Babcock & Wilcox boilers fitted with chain grate stokers, fed by an automatic coal-handling plant; superheaters, economizers, and induced draft by a Sirocco fan; boilers fed by a motor-driven pump, with a steam pump as a stand-by, the water being measured by a meter, while a CO_2 recorder keeps a check on the firing. The generating plant consists of two Allen engines of 220 and 250 hp., running at 128 r.p.m., direct connected to Swedish General Electric generators of 180 and 270 amp., 460 v., 50 cycles, respectively, each having an overhung exciter. Steam is condensed by a Relly & Lewis (Melbourne) condenser, with a motor-driven pump. The switchboard is equipped with the usual voltmeters, ammeters, and voltage regulator. The railway workshops nearby are supplied with power from the Mt. Lyell company.

Pyrite, for acid making, comes from the Mt. Lyell mine, on the company's leases at Chester, in Tasmania, and contains 45 to 50% sulphur. From the railroad cars it is tipped onto an 18-in. belt-conveyor which elevates it to the private storage building, which has a capacity of 8000 tons. This building is constructed of steel and corrugated iron, and is shown in the illustration. From the pile, the pyrite is shoveled upon a short belt which feeds a jaw-breaker. The crushed mineral is elevated to a revolving screen, the oversize passing to a pair of rolls; the product from this machine is also screened, all oversize being returned to the rolls, while the final product, about $^3/_8$ in., is elevated to a storage bin. From this it is taken by a push-conveyor to the eight Herreshoff mechanical roasters. These are automatically fed from a small hopper by a push feeder.

CRUSHING DEPARTMENT.

There are three hearths in each furnace, and four rabbles on each, with shoes set at different angles, each set cutting diagonally across the track of the preceding one. The rabbles are fixed to a central gear-driven spindle. The furnaces roast about three tons each daily, the discharged pyrite averaging 2 to 3% sulphur. No fuel is used once a furnace is hot, the sulphur in the ore being sufficient to keep the charge burning. The residue is wheeled out to a dump. The sulphur fume is drawn by a fan through a lead pipe, 30 in. diameter, to the acid chambers. These consist of 6 chambers with the necessary Glover, Gay-Lussac, and contact towers. Automatic lifts are used for pumping acid over the tower, the acid to the superphosphate milling plant flowing by gravitation. The acid building is 240 ft. long by 88 ft. wide by 56 ft. high, and has a capacity of 15,000 tons of H_2SO_4 annually.

The phosphate rock, which comes from Christmas island in the Indian Ocean, comes in at the far end of the works, and is fed into a large jaw-breaker, and by belt-conveyor fed into a smaller breaker and crushed to about 1-in. size. This is elevated to a hopper above the ball-mill. This is a No. 8 Humboldt type, and is fed by a shaking feeder worked by cams. The rock is crushed through 16-mesh screen, and is elevated to a bin. From here a certain amount is automatically weighed and run into a revolving mixer with the requisite quantity of sulphuric acid. When mixed the pulp is run into a car below, which is pulled to the end of the plant by a wire rope and discharged upon a floor below. Here it dries, and is then elevated, bagged, weighed, and stacked in cars for shipment to the farming districts of Western Australia.

Slime Filtration

By George J. Young

*Much has been written concerning an accurate definition of the term 'slime,' but no comprehensive definition seems to be generally accepted. An excellent study of the nature of slime, by R. E. Ashley, was published in the *Mining and Scientific Press* of June 12, 1909. The accepted present practice in milling work is that all material in a pulp finer than a 200-mesh screen is considered as slime. The definition that a slime is the unleachable portion of a mill-pulp is also in use. A more comprehensive definition than the foregoing is that a slime consists of a mixture of sand finer than 150 or 200-mesh screen with an amorphous clay-like material, consisting principally of hydrated aluminum silicate.

The general method of slime-treatment is to agitate the slime with a cyanide solution for a sufficient time to dissolve the gold, and then, either to filter off the surplus solution and displace the remainder with water, or to thicken the slime by settlement and decantation, and then to filter and displace the remaining solution by water. The mechanical appliances in use for filtration are grouped as follows:

These filters are continuous in action.

I. Suction-filters, or filters in which a vacuum is used to accelerate filtration.

A. Appliances using a thin slime-cake and practically continuous in their action. (Oliver and Ridgway filters.)

B. Appliances using a thick slime-cake and intermittent in their action. (Moore and Butters filters.)

II. Pressure-filters, or filters in which hydrostatic head, compressed air, or pumps are used in order to secure greater pressures than are possible with a vacuum-pump.

These filters are intermittent in their action.

C. Ordinary filter-presses.

D. Sluicing filter-presses (Merrill filter-press).

E. Filtering-chambers or cylinders; filters in which the filtering-basket is enclosed in a cylinder. (Burt, Kelley, and Sweetland filter-presses.)

III. Centrifugal filters, or filters in which centrifugal force is used to separate solution from slime.

The filters in sections I and II, with the exception of the Ridgway, employ vertical filtering-surfaces. The Oliver makes use of a revolving cylindrical surface as a filtering surface. Centrifugal filters are in process of development and have not as yet secured any foothold in gold and silver metallurgy. It is not improbable, however, that some comparatively simple filter based on the use of centrifugal force will be perfected, and will successfully compete with the other forms. At present the suction filters are in greatest use. Of the pressure-filters, the ordinary filter-presses have gone out of use, except as clarifying presses, and filters of groups *D* and *E* only are in use.

The development of slime-filtration is of interest. Filter-presses and filtering-beds in vats were first used. The filtering-beds were soon discarded and the filter-press systematically developed. The size of the press was increased, mechanical devices to facilitate discharge and decrease the proportion of labor required were invented and introduced; but in spite of all this the cost of treatment in filter-presses remained high. In western America the filter-press never received much recognition, but in Australia filter-pressing was extensively introduced, and slime was successfully handled by this method. It remained for an American, Charles W. Merrill, to complete the last improvement in the filter-press. By the introduction of the sluicing system the slime-cakes can be washed out of the filter-cells and the press operated without opening or separating the filter-plates for each charge. This improvement reduced the labor and cost, and increased the effectiveness of the filter-press. The Merrill press represents the culminating point in the filter-press line of development in slime filtration.

The Moore filter was the first suction-filter in the field, and introduced the idea of the canvas-covered filtering-cell immersed in the slime-pulp and utilizing suction to draw the solution through the walls of the cell and to build up a cake. The necessary transfers are made by lifting the filtering-basket out of the pulp. The Butters filter introduced the idea of a stationary filtering cell, and effected the transfers by pumping the slime-pulp and wash-water from the vat in which the filtering-cells were immersed. The relative merits of the two systems have been sufficiently discussed in the technical literature. Both the Moore and the Butters filters have reached a point where little or no further improvement seems possible. Like the Merrill, either one of these systems will satisfactorily meet the requirements of slime-filtration. The combination of the ideas involved in the filter-press and the suction filter is seen in group *E*, or the filtering-chambers. The Kelley, the Burt, and the Sweetland may be compared to a Butters filter installed in a pressure-tank.

The effort to secure a continuously-acting filter has resulted in two important types being developed, of which the Ridgway and the Oliver are the best known. Both of these filters utilize a comparatively thin slime-cake. Both operate very successfully, and compared with the thick-cake machines have decided advantages, briefly stated as simplicity of design; probably lower capitalization-charges for equal capacities; lower operating costs; and less attention required in the operation.

With the exception of the Oliver filter, the general method of operation of both suction and pressure-filters is the same. The slime-pulp is delivered to the filter in the proportion of one of dry slime to from three to one of solution. The pulp is forced into the cells of the pressure-filters and a cake formed against the canvas walls of the cells, the surplus pulp, if any, is withdrawn, and wash-water forced in until the contained solutions are displaced. The cake is then forced off from the canvas surface, either by water or air, or a combination of both, and sluiced out. In the vacuum-filter the filtering-cells are immersed in the pulp, a vacuum is formed, and a cake built up; the surplus pulp is then withdrawn either by lifting the filtering-cells out or by withdrawing the pulp by pumps, and the cakes are immersed in water for washing. In the Moore filter the cakes are discharged by forcing them off from the cell by water or air and dropping into a hopper for sluicing away; in the Butters the cake is forced off in the same way, but while still immersed in the wash-solution. The wash-solution is then withdrawn, either by decanting or pumping, and the slime-cake and surplus wash sluiced out. The Oliver filter performs the operations of cake-formation, washing, and discharge in continuous sequence. Three steps may be designated as common to all these filters: cake-formation, washing, and discharge. The cycle of operations of the more common forms of filters is shown in the accompanying figure. Typical examples have been taken in each case.

The condition under which slime-cakes are formed and washed are the critical points to be considered; the discharge and sluicing away of the cake is a comparatively simple matter and requires no special comment. My experimental work was largely confined to suction-filtration, and pressure-filtration was only briefly studied. Experiments on the variation of the filtering rate with variable thickness of slime-cake both while building up and in clear water, indicate that the filtering rate during building up a cake is greater in the pulp then in clear water for thin cakes, while for the thicker cakes the reverse is true. The general effect of increase of pressure upon the filtering rates of cakes of varying thickness is to increase the filtering rate. This is more marked with the thin cakes, while with thick cakes the effect of an increase of pressure is to increase the density of the cake and thus reduce its permeability. With higher pressures this effect is more marked, and indicates that a point would soon be reached where the increased pressure would result in decreased filtering rate. This is particularly true of slime containing a small proportion of sand, and much less so with slime containing a large proportion of sand. In the use of both the Moore and Butters systems, experiments should be made with different intensities of vacuum, for it may be found that a vacuum lower than the maximum obtainable with the available apparatus will give a higher filtration rate, and thus decrease the time for both building up and washing. Many experiments were made upon the effect of temperature on filtration, the character of the slime-cake, the effect of the character of the filtering surface and the method of its support, the rate of building up the cakes, and washing the cake. For details of these experiments and the curves showing the results attained, reference should be made to the original paper.

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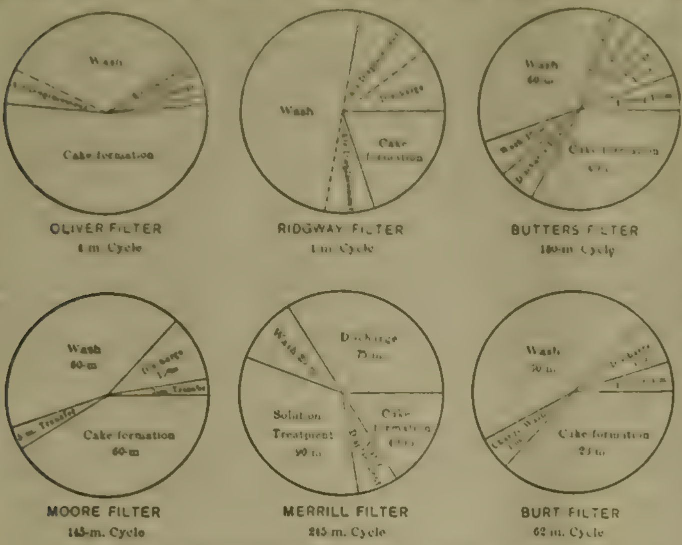
*Abstract of a paper presented at the San Francisco Meeting of the American Institute of Mining Engineers.



OLIVER FILTER
4 m. Cycle

RIDGWAY FILTER
1 m. Cycle

BUTTERS FILTER
180-m. Cycle

MOORE FILTER
145-m. Cycle

MERRILL FILTER
245 m. Cycle

BURT FILTER
62 m. Cycle

CYCLE OF OPERATION OF VARIOUS TYPES OF FILTERS.

Physical Analysis.

		Type	Sand-slime 50 Per cent of sand	Fire-clay clay slime	A	B	C	D	E	F	Size
					Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	mm.
Less than 2 min. settlement	+100 mesh	0.12	0.42	22.1	4.5	1.70	2.1	6.2	2.3	6.6	0.17 – 0.22
	-100 +150	1.20	2.65	14.0	6.2	9.0	12.30	11.3	4.46	6.8	0.11 – 0.17
	-150 +200	1.20	6.80	4.6	7	9.0	11.07	8.35	7.0	10.7	0.05 – 0.11
	-200	24.0	13.80	3.3	39.2	43.70	34.0	38.05	49.54	68.5	0.01 – 0.05
More than 2 min., less than 4 min.,		8.5	6.3	2.0	4.25	4.30	11.0	5.5	3.6	0.7	0.005 – 0.02
More than 4 min., less than 8 min.,		[illegible]	8.4	2.2	3.6	4.60	6.7	6.2	3.8	0.65	0.005 – 0.01
More than 8 min.,		56.3	20.8	51.6	34.25	27.10	22.7	24.1	29.3	7.05	0.0 – 0.005
Thickness of cake, inches,		1.00	1.00	1.00	1.00	0.75–1.0	1.25–1.75	1.25	1.75	1.5–2	
Filtering rate, Building,		2 lb.	10	1	11.6	26	8.3	7.25	30		
Washing, lb. per 100 sq. ft.					10.0	16					
Sp. gr. dry slime,		2.62	2.67	2.57	2.58	2.62	2.62		2.654		

Chemical Composition.

	Type	Fire-clay	A	B	C	E
	Per cent	Per Cent	Per cent	Per cent	Per Cent	Per cent
Silica,	74	68	74	77.2	68	61.4
Alumina,	10.9	22.9	12.4	13.9	15.4	13.5
Ferric oxide,	1.1	1.1	1.4	1.9	2.0	2.9
Lime,	1.0	0.0	0.8	1.0	1.0	5.2
Magnesia,	0.5	tr	0.0	0.5	0.0	1.2
Aluminum silicate $Al_2O_3 \cdot 2SiO_2$ calculated,	23.6	49.9	27.9	30.3	34.4	29.43

	A.	B.	C.	D.	E.	F.	G.
Type of filter,	Butters.	Butters.	Butters.	Butters.	Merrill.	Kelley.	Butters.
Number of units,	2	2	2	2	3	1	1
Number of leaves per unit,	60	95	168	72	64	10	100
Number of leaves,	120	190	336	100	192	.....	100
Area of leaf, sq. ft.,	100	91	100	92.6	41.4	....	100
Total filtering-area,	12,000	17,290	33,600	9.262	7,980	360	10,000
Tons slime per 24 hr.,	175	250	1,000	150	216	100	150
Tons slime per 100 sq. ft. per 24 hr.,	1.4	1.44	2.97	1.62	2.72	27.7	1.5
Slime-pulp consistency, water : slime,	3:1	3:1	1.5:1	2:1	2:1	1.1	2:1
Filter-support,	slats	slats	matting	slats	plate	wire netting	slats
Thickness of cake, in.,	1	0.75–1	1.25–1.75	1.25	1.75	1.5–2	1.5
Moisture in cake, p.c.,	38	35	35	33	......	12	29
Time forming, hr.,	1	0.5	1–1.33	1	0.66	0.03	2
Time washing, hr.,	1	1.0	1.41–1.66	1.25	0.41	0.20	2
Time transfers, hr.,	0.75	0.83	0.59–0.51	0.5	3.01	......	1.83
Total time-cycle, hr.,	2.75	2.33	3–3.5	2.75	4.08	0.5–0.75	5.88
Filtering-rate per 100 sq. ft. per min.,	11.6	26	8.3	6.83	30	......	......
Filtering-rate per min. for wash,	10	16.3	......	.....	......	......	......
Tons of solution and wash per 24 hr.,	848	1.356	2,000	350–400	328 340	a75	484
Canvas used, oz.,	12	12	12	12	16	12	10
Life of canvas, months,	8	6	41 est.	18	12	0.5–1.5	......
Frequency of acid-wash, days,	20	21	30	21	60	15	30
Approximate cost per ton slime,	$0.18	$0.27	$0.075	$0.25	$0.238	$0.35	$0.119

a 8 to 12 hours

DETAILS OF FILTER PLANTS.

Data were secured from a number of slime-plants in Nevada through the courtesy of the different managers. The table shows the results of a number of physical analyses of slimes obtained from these plants. For purposes of comparison the type slime, the sand-slime mixture, the clay slime, and the filtering rates are included. The lower table gives the data of the slime-plants from which the mill-slimes in the upper table were taken.

The practical conclusions which may be drawn from the experimental work may be summarized as follows: 1. The proportion of clayey material in ores which are to be subjected to 'all-sliming' and filtration should be maintained at a minimum. 2. The slime-pulp should be as free as possible from sand coarser than 150-mesh, and as large a proportion of the pulp as possible should consist of material passing 200-mesh. 3. The slime-pulp before filtration should be settled as thick as possible consistent with ready handling by pumps and in pipes. 4. The temperature of the slime-pulp should be maintained between 20 and 30°C., or higher. 5. The temperature of the wash-water and the pulp should be the same. 6. Vacuum-pressures should be varied until the proper intensity for the given slime is obtained. 7. Where the very clayey slime is to be filtered, as much fine sand should be crowded into the pulp as it will carry without undue settling and clogging. 8. No. 10 canvas supported by slats gives the best all-round service for the thick cake, and No. 12 canvas on wire netting answers the requirements for the thin-cake filtering machines. 9. With slime containing a large proportion of colloid or clayey material pressures greater than those obtainable with vacuum apparatus are of questionable advantage. 10. With slime containing a large proportion of clayey material the vacuum-filters should be used. 11. With slime containing a small proportion of clayey material and much fine sand both vacuum-filters and pressure-filters could be used with perhaps equally good results. 12. With slime containing much coarse and fine sand the chamber-filters with air-agitation and high pressure would perhaps give the best results. 13. Of the vacuum-filters, the thin-cake continuous filters are a decided improvement over the thick-cake filters.

Pure sulphur is obtained directly from wells in Louisiana by the Frasch process. A well is driven in much the same manner as a gas or oil well is sunk, and into it are placed several concentric lines of pipe. Superheated water, introduced through the outer pipe, melts the sulphur, which may be several feet below the surface. Hot compressed air is then forced through the smallest of the pipes. This forms an aerated emulsion with the molten sulphur, which is forced out by hydrostatic pressure between the remaining pipes and discharged in a purified form into large vats, where cooling, solidification and feeding go on simultaneously.

Metal Production of Idaho, 1910

The value of the mine output of gold, silver, copper, lead, and zinc in Idaho in 1910, according to C. N. Gerry, of the United States Geological Survey, was $16,316,196, against $15,660,849 in 1909, an increase of $655,347. There was a decided decrease in the yield of gold from both placer and lode mining, also in the production of copper. The largest increases in production were in lead, in silver from lead ores, and in zinc. Shoshone county mines yielded 88% of the value of the State's total output of the metals.

The total production of gold was $1,096,842, a decrease of $356,980 compared with 1909. Of the gold output, $242,546 was derived from placers, of which Boise county produced $129,663 and Nez Perce county $40,699. Of the gold from lode mines, about 10% was derived from copper, lead, and zinc ore and 90% from silicious ore. From bullion in gold and silver mills 32,626.21 oz. was recovered; concentrate produced 5936.67 oz., and crude ore shipped to smelters contained 2763.69 oz. The largest producer of gold was Owyhee county, which yielded $388,728, against $425,305 in 1909. Boise county produced $199,430 in 1910, against $216,031 in 1909, a decrease of $16,601, occasioned almost entirely by a lessened output from placer mining.

The silver production of Idaho in 1910 was 7,369,742 oz., valued at $3,979,661, against 7,041,633 oz., valued at $3,661,649, in 1909. Of the 1910 output, 6,479,636 oz. came from lead ore. Bullion at gold and silver mills produced 315,356 oz., concentrate gave 4,463,517 oz., and crude ore sent to smelters contained 2,588,431 oz. Shoshone county (in the Coeur d'Alene) produced 6,703,080 oz., or nearly 91% of the silver output of the State. Of this, the Hunter district produced 1,208,958 oz., the Lelande district 2,822,789 oz., and the Yreka district 2,629,802 ounces.

The production of copper in Idaho decreased from 9,115,489 lb., valued at $1,185,0[illegible]4, in 1909 to 7,037,292 lb., valued at $893,736, in 1910, but the production of Custer county increased from 90,461 lb. to 919,648, as a result of the operations of the White Knob mine. True copper ore yielded 5,912,392 lb., and nearly all the remainder was derived from the lead ores of Shoshone county.

The output of lead in Idaho in 1910 increased 12,272,554 lb. over that of 1909. The value of the lead produced in 1910 was 61.5% of the value of the total metal production. Crude ore shipped to smelters contained 50,084,367 lb., and concentrate (of which all but 704,652 lb. came from Shoshone county) yielded 178,174,472 lb. The production of Blaine county decreased 477,302 lb., while Lemhi county showed an increased yield of 6,394,403 lb., or nearly half of the State's increase, owing to the completion of the Gilmore & Pittsburg railroad from Armstead, Montana, to Salmon, Idaho. The Yreka district, with a yield of 109,899,539 lb., was much the largest producer in Shoshone county and in the State. The lead output of the Hunter district was 34,319,319 lb., and that of the Lelande district 72,840,963 pounds.

The zinc production of Idaho was 4,252,104 lb. greater in 1910 than in 1909. With the exception of a small quantity of zinc produced in Blaine county the output was derived from concentrate shipped from the Success mine, in Shoshone county. There were 417 mines producing gold, silver, copper, lead, and zinc in Idaho in 1910, compared with 324 in 1909. Of these 417 producing mines, 262 were placer mines, many of which made small outputs. The total quantity of ore treated or sold in Idaho in 1910 was 1,786,174 short tons having an average value per ton of $8.99, an increase of 13,791 tons and of $0.31 per ton over 1909.

MINE PRODUCTION OF GOLD, SILVER, COPPER, LEAD, AND ZINC IN IDAHO IN 1910, BY COUNTIES.

[By Clarence N. Gerry, U. S. Geological Survey.]

Counties	Ore treated. Tons.	Gold.*	Silver.* Fine ounces.	Copper. Pounds.	Lead. Pounds.	Zinc, Pounds.	Total Value.
Ada	131	$1,430	262	4	100	....	$1,577
Bannock	52	....	11	1,114	....	....	147
Bingham	....	1,343	1	....	....	....	1,344
Blaine	17,042	42,335	92,596	20,018	1,284,966	76,397	155,543
Boise	11,444	199,430	14,443	5,957	3,001	....	208,117
Bonner	227	844	14,572	5,646	7,218	....	9,748
Canyon	....	85	....	....	....	....	85
Cassia	44	1,299	351	133	25,485	....	2,626
Custer	9,973	23,057	31,269	919,648	19,086	....	157,577
Elmore	34,301	180,282	16,854	15	....	....	189,385
Fremont	557	69	2,195	73	633,102	....	29,120
Idaho	6,351	63,885	1,744	....	....	....	64,827
Kootenai and Latah	66	13,594	81	6,166	....	....	14,420
Lemhi	15,392	66,961	150,185	54,887	6,526,474	....	442,197
Lincoln	....	352	1	....	....	....	353
Nez Perce	12	40,831	466	....	....	....	41,082
Oneida	....	2,082	10	....	....	....	2,087
Owyhee	50,297	388,728	341,494	....	1,365	....	573,195
Shoshone	1,639,781	65,076	6,703,080	6,018,688	219,753,042	5,526,717	14,416,910
Twin Falls	....	1,559	3	....	....	....	1,561
Washington	504	3,600	124	4,943	....	....	4,925
	1,786,174	$1,096,842	7,369,742	7,037,292	228,258,839	5,603,114	$16,316,196

*Includes placer production.

COPPER PRODUCTION was reported from 23 counties in Colorado in 1910, and of these Lake, San Juan, Ouray, Cleark Creek, San Miguel, Gilpin, Hinsdale, Chaffee, and Eagle counties, in the order named, were the most important producers, Lake county alone furnishing 43.6% of the total output, San Juan county 14.5%, and the 9 counties combined 96%. Copper mining in Colorado is of secondary importance compared with that of gold, silver, lead, and zinc, but is of considerable importance in bringing the mixed ores of the State to a total value commercially profitable.

L. VOGELSTEIN & CO. give the following figures of German consumption of foreign copper for the months January to August 1911:

	Tons.
Imports of copper	125,298
Exports of copper	5,793
Consumption of copper	119,505

as compared with consumption during the same period in 1910 of 108,876 tons. Of the above quantity 109,441 tons was imported from the United States.

The Marketing of Copper

The marketing of copper is an important step in the production of that metal, and the following taken from *The Boston News Bureau*, will interest our readers. The past year did not witness any important changes in the copper selling industry. Today the refining and selling of the metal is controlled by less than a dozen interests. Excluding foreign ores, the agencies of this country have for some time past been marketing in the aggregate more than 1,000,000,000 lb. of copper per annum, representing on present market a gross value of $122,000,000. The selling contracts are not uniform. Rates of commission on sales vary from 1 to 1½%. Many of the companies which sell their output direct to the trade frequently give the buyer the advantage of an amount equal to what an agent or broker would receive were the transaction handled by a third party.

The United Metals Selling Co., now owned by the Amalgamated Copper Co., has retained its position as the largest individual seller of copper in the world. The margin between this agency and its nearest competitor, the American Smelting & Refining Co., has, however, lessened considerably during the past few years, or since the Guggenheim properties withdrew from the United Metals company some of their output. The Guggenheim interests were fortunate in securing during the year two new contracts for treating and selling the product of the Ray and Chino copper companies. This agency will likewise handle the output from the Braden Copper Co. The output from the Utah Copper Co. will be increased this year to 100,000,000 lb. and next year by an additional 25,000,000 to 30,000,000 lb. Ray should produce next year 50,000,000 and Chino 30,000,000 lb., but not all of this may be in marketable form during the calendar twelve months.

Adolph Lewisohn, who headed the United Metals Selling Co. until its recent absorption by the Amalgamated Copper Co., has again become a factor in the selling of copper, as he will take charge of the Miami Copper Co. product. By shut-downs of various properties during the year the American Metal Co. lost heavily. The Imperial Copper Co. ceased operations months ago, eliminating 10,000,000 lb. annually from this agency's tonnage. A few weeks ago Granby was forced to close its smelter by reason of fuel shortage which will 'cost' the American Metal Co. another 10,000,000 lb. for the balance of the year. The Phelps-Dodge agency, in addition to marketing its own product, has also been selling the output of new Calumet & Arizona Co. Much of the falling off in amount to be sold through this agency is accounted for through cessation of shipments by the Shattuck-Arizona property, the product from which was treated at the Copper Queen smelter. In 1910, 14,751,000 lb. was produced by this company, and until smelter shipments stopped last June, 4,111,000 lb. had been brought to market in 1911.

The United Metals lost one contract—that of the Tennessee Copper Co.—and this loss was the Guggenheim's gain, for a new contract was entered into with the American Smelting & Refining Co. Commencement of operations by the Electrolytic Refining Co. of Australia caused some little readjustment in contracts relating to the producers of Australia, most of whom sent their copper to United States refiners for treatment and sale. The new refinery is owned and operated by the Aron Hirsch & Sohn—L. Vogelstein & Co. interests. One of the losers through the opening of this plant was Beer, Sondheimer & Co., a German concern which for several years has maintained a New York office. The firm has never become a large factor in the copper trade, however. It formerly imported the product of the Mt. Lyell company from Australia and sold it to refiners here, but this has ceased. The firm did, however, secure a contract for selling the British Columbia Copper Co.'s output and the refining contract went to the International Smelting & Refining Co. This firm also imports the Cuba Copper Co. product, but sells the ores to a refinery.

The action of the International Smelting & Refining Co. in agreeing to refine the British Columbia output when its agency, the United Metals, did not secure the selling contract, has caused much comment and criticism among the other selling interests, on the ground that each refinery should sell all the copper it makes and thereby obviate the possibility of some of its own product being met in the market in competition. Another such instance was the acceptance by the International company of the South Utah Mines & Smelters contract when E. P. Earle secured selling of the copper. Mr. Earle has added considerably to his copper sales during the year by importing Japanese copper, which he refines and then sells to the trade.

Japanese importations are distributed among the various refineries, which sell the refined product. Spain has been sending considerable Rio Tinto copper for treatment, while South African mines have been shipping copper to the A. S. & R. plant at Perth Amboy. Other foreign countries have been adding largely to the imported tonnage, and these imports have to some extent neutralized the effects of curtailment among the American copper mines. Based on present production the volume of copper which each of the selling agencies in the United States will handle in 1911 will be approximately as follows:

United Metals Selling Company

	Pounds.
Amalgamated and North Butte (includes smelter product)	264,000,000
Lake mines (Copper Range and Calumet & Hecla sudsid.)	90,200,000
Arizona Copper Co.	34,000,000
Utah Consolidated Mining Co.	8,000,000
Greene-Cananea	46,000,000
Pennsylvania Salt Mfg. Co.	5,000,000
Total	447,200,000

American Smelting & Refining Company

Cerro de Pasco	48,000,000
Tacoma refinery and smelter products (includes Alaskan Copper)	*100,000,000
Utah Copper Co.	100,000,000
Nevada Consolidated	65,000,000
First National Copper Co. (closed July 1)	5,000,000
Tennessee Copper Co.	14,000,000
Ray Consolidated	10,000,000
Total	342,000,000

*Includes miscellaneous imports and Ohio Copper Co. output.

Phelps, Dodge & Company

Copper Queen smelter	112,000,000
Detroit Copper Co.	23,000,000
Calumet & Arizona	48,000,000
Total	183,000,000

American Metal Company

Old Dominion Copper Co.		27,000,000
Shannon Copper Co.		14,000,000
Great Fitzroy (imported)	6,000,000	
Granby	10,500,000	
Smelter and misc., inc. Ducktown	45,000,000	61,500,000
East Butte		10,000,000
Teziutlan Copper Co.		12,000,000
Torreon smelter		6,000,000
Total		130,500,000

L. Vogelstein & Company

United States S. R. & M. Co.	24,000,000
Matte, smelter material, and imports	40,000,000
Orford Copper Co.	20,000,000
Consolidated Arizona	6,000,000
United Verde Copper Co.	40,000,000
Total	130,000,000

E. P. EARLE

South Utah Mines & Smelters	4,000,000
Japan imports	5,000,000
Total	9,000,000

BEER, SONDHEIMER & COMPANY

British Columbia Copper Co.	7,200,000

W. PARSONS TODD

Winona Copper Co.	1,800,000

[illegible]

Calumet & Hecla	70,000,000
Ahmeek	4,000,000
Superior	3,000,000
La Salle	245,000
Victoria	1,000,000
Total	78,245,000

DIRECT TO TRADE

[illegible] Copper Co.		6,000,000
Quincy Mining Co.		22,500,000
Smelting plants:		
Wolverine	9,500,000	
Mohawk	12,000,000	21,500,000
Franklin		2,200,000
Mass		1,400,000
Centennial		1,500,000
Miscellaneous		60,000,000
Total		114,100,000

While over 300,000,000 lb. of copper produced outside the United States comes to this country for refining and sale, over 200,000,000 lb. of foreign production is sold for the most part in Europe and by no way figures in American statistics. The largest of foreign producers, Rio Tinto, markets its own output. A small portion of this production finds its way to the United States. Of foreign production 265,000,000 lb. annually is sold as follows:

Mine	Production (lb.)	How Sold.
Cape Copper	18,000,000	Direct
Great Cobar	14,000,000	Merton & Co.
Mansfeld	40,000,000	Direct
Mason & Barry	7,000,000	Sells ores
Rio Tinto	75,000,000	Direct
Spassky	7,000,000	"
Tharsis	4,000,000	"
Wallaroo & Moonta	11,000,000	Aron Hirsch & Sohn
Mt. Lyell	17,000,000	"
Boleo	24,000,000	Direct
Mt. Elliott	12,000,000	Brandeis Goldschmidt
Chillagoe	5,000,000	H. R. Merton
Total	265,000,000	

The unrefined copper below goes to America to be refined and sold:

	Pounds		Pounds
[illegible]	45,000,000	[illegible]	100,000,000
Rio Tinto	25,000,000	Japanese mines	25,000,000
British Columbia	8,000,000	Chilean mines	15,000,000
Great Cobar	4,000,000	Miscellaneous	10,000,000
Mt. Lyell	4,000,000		
Greene-Cananea	50,000,000	Total	291,000,000

The year's imports should reach [illegible] lb., as follows:

	Pounds
Pig copper	270,000,000
Ores and matte	90,000,000
Total	360,000,000

The production of manganese ore in the Nikopol district, South Russia, [illegible] pounds [illegible] the first half of 1910, a decrease of [illegible] pounds. The quantity [illegible] pounds, [illegible] pounds in 1910. The difference, [illegible] pounds, was taken from reserve.

Eucalyptus Oil for Mineral Flotation

In the course of experiments conducted at the Central mine, Broken Hill, New South Wales, on the separation of sulphides by flotation, Henry Lavers, metallurgist for the Minerals Separation Ltd., discovered that eucalyptus oil gave the best results, only 6c. worth per ton being required to effect the desired separation. Further experiments have shown that flotation processes employing eucalyptus oil may be used for the separation of a variety of sulphide minerals, so that the supply of this oil becomes a matter of interest. Practically all the eucalyptus oil now consumed in the United States is employed for medicinal purposes, selling for about 35c. per pound. Nearly all of this is imported from Australia, small amounts being produced in California. The most important factor in the production of the oil is the cost of collecting the leaves, and the difficulty of securing a sufficient supply of labor for this purpose. It has been suggested that machinery be employed for the work, and that larger stills be used for the distillation. H. G. Smith was appointed by the Minister of Public Instruction and Labor to investigate the eucalyptus-oil industry of Victoria, South Australia, and New South Wales, and the following is taken from his report.

"The demand for eucalyptus oil for mineral separation is likely to increase, particularly if it can be cheapened so as to prevent competition from other sources. By working in a large way and collecting the leaves by machinery, the cost of the oil should be much less than at the present time. The required species must be concentrated over a considerable area—in fact, some form of cultivation and preparation is needed. If this were done the price of the oil would be reduced considerably. Some form of Government control is needed, and areas for eucalyptus oil distillation granted to manufacturers, as is done in Victoria. Without this security, it is hardly likely that people will embark capital to further the industry. It is not probable that the crude 400-gal. tank method will be readily superseded, because it provides a living for individual families; nor is it desirable that such individual effort should be discouraged, but the force of competition will eventually render such effort unremunerative as at present carried out. By some system of coöperation any ill effects in this direction might be obviated, a party working a specific area together, as in the old mining days. The high lands of the Dividing Range, starting from, say, Crookwell to the Victorian border, where the peppermint species grow so plentifully, might well be set apart for eucalyptus oil distillation (Crown lands), as this country is of little use for agricultural purposes. By planting in this area species like *E. amygdalina*, *E. dives*, etc., considerable employment might be found in the industry, and, under systematic control, become of some importance. The success of eucalyptus oil in foreign countries will depend entirely on its cheapness, because local demands will be met by the distillation of local material, which, though not so good for the purpose, yet would answer fairly well if eucalyptus oil were too dear."

A small amount of eucalyptus oil is now being produced in California, and in the event of the development of a market for the crude oil it is not improbable that the local output could be greatly increased.

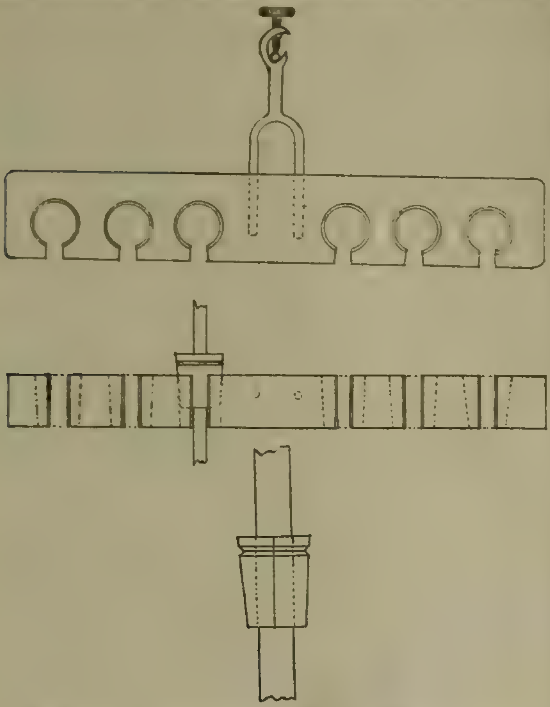
The Mount Bischoff Tin Mining Co. does not distribute its report broadcast, because it is still a close corporation, with a capital represented by the original expenditure and not watered for Stock Exchange purposes. This company is also suffering from scarcity of labor, so much so that it has been impossible to proceed with the erection of the additional treatment-plant, while prospecting and development work has been suspended. The report for the first six months of the year shows that 15,641 tons of ore yielded 156 tons of tin concentrate. The total yield was identical with that of the previous half-year, but the yield per ton was rather higher. In addition to this production, the smelter at Launceston treated 1041 tons of custom ore. The dividend absorbed £22,500.

A Handy Burette Holder

By N. Roberts and F. A. McDermott

Being obliged, on an occasion three years ago, to work with a small traveling outfit forty miles from a base of supplies, it became necessary to improvise a compact support for a considerable number of burettes. The resulting device was more satisfactory than the conventional article, and is now in constant use.

A piece of board of suitable size (50 by 8 by 2.2 cm.) is bored, a little in front of the middle, with a row of holes about 2.5 cm. in diameter and 5 cm. between centres. These holes are then connected with the front of the board by saw-cut slots about 1.7 cm. wide. All edges are rounded and sandpapered, the bored holes being filed out so as to be slightly conical, with the base up. Conical corks are then selected to fit the holes so that about 1.5 cm. of the upper end of the cork will project when snugly pushed down. The corks are bored with borers slightly smaller than the burettes they are to carry, and then split longitudinally with a knife into two equal parts. When the two halves of the cork are placed around a burette and wedged snugly down into a hole in the board, the burette will be held securely, but at the same time may be slid up and down much more easily than if held in rubber. There are no screws to rust or strip, and the burette is much easier to insert and remove (through the slot) than in a screw clamp. The burettes being held in a regular row at the most convenient intervals, a single stand will hold many more than is convenient with screw clamps. The arrangement may be further improved by cutting a shallow groove around the cork, before splitting, about 0.5 cm. from its larger end; in this groove are placed two or three light rubber bands. This arrangement adds to the ease of operation, as the cork is held on until deliberately removed and yet permits the burette to slip up and down easily; one also does not have to be so careful in placing the cork in the slots as when the bands are not used. The perforated board is supported by some form of bracket; we use a metal clamp sliding on an ordinary vertical support with a heavy base. A burner fork makes a convenient bracket, it being only necessary to bore two holes horizontally into the back edge of the perforated board at the proper distance apart to receive the prongs of the fork. The support may also be used with small funnels, and a similar device with larger holes for larger funnels. The slot in the front makes it possible to easily remove the funnel from the support without loss while it is still dripping rapidly, the stem of the funnel passing out through the slot while its lower end is kept in the receiving vessel.—*Jour. Amer. Chem. Society.*



SKETCH OF A CONVENIENT FORM OF BURETTE HOLDER.

Goldfield Consolidated Report

During the month of September, according to the report of J. F. Thorn, general superintendent of the Goldfield Consolidated, the total production was 26,760 tons, containing $676,383, or an average of $25.28 per ton, of which 26,679 tons was milled with an average extraction of 94.11%, and 81 tons of an average value of $77.12 per ton was shipped; the net recovery from all ore being $23.80 per ton. The total net profit of the company was $444,366, or $16.60 per ton. During the month 3192 ft. of development work was performed. The total cost of mining, development, transportation, milling, office, and general expense was $7.28 per ton, distributed as follows:

Mining:		
Development	$0.88	
Stoping	2.34	$3.22
Transportation		0.07
Milling		2.22
Marketing		0.93
General expense		0.42
Bullion tax		0.19
Marketing ore shipped		0.05
Construction		0.18
Total cost of operation		$7.28
Miscellaneous earnings		0.08
Net cost per ton		$7.20

In the Clermont the 466-intermediate between the 600 and 750-ft. levels, and just south of the 428 and 401 stopes, has been extended 80 ft.; cross-cuts driven in two places to the hanging wall, exposing 20 ft. of ore, and a raise started near the present face. This work produced 707 tons averaging 4.77 oz. This orebody has been cut by a raise from the 483 cross-cut, 16 ft. above the 750-ft. level. The 420-H raise has broken into the 413 sill floor. It intersected the 413 ore at a point 30 ft. vertically under the sill and produced 267 tons, containing 2.93 oz., through to the sill. The 488 cross-cut into the foot-wall under 428-C stope has exposed 6 ft. of 2-oz. ore. A new stope, 408-D, southeast of the old 428, has been opened and produced 215 tons containing 1.42 oz. The Grizzly Bear shaft has been cleaned out and equipped, and sinking is now in progress.

In the Mohawk the new 150-ft. level has been completed, and provides an efficient means of working the new ore uncovered in the upper workings. No. 21 cross-cut from No. 3 drift produced 103 tons, containing 1.31 oz. The new stope started from No. 13 drift produced 350 tons, containing 2.03 oz. The new sill floor on the 490 intermediate produced 101 tons containing 1.54 oz. The 490-A raise produced 309 tons of an average 1-oz. content.

At the Red Top the 101 sill, 200 ft. south of the shaft, has been considerably extended and produced 519 tons of 3.28-oz. ore. This connects with the 202 stope from the second level. The 305 drift in the Laguna was advanced and connected with the Hazel shaft. The Hazel shaft has been unwatered and repaired to a point 680 ft. deep. The low tonnage milled for the month was caused by shut-downs for the purpose of re-lining tube-mills, and repairs to Chilean mills. The foundations for the roasting plant and buildings have been practically completed, and the construction work is progressing at a satisfactory rate. Owing to the fact that all working faces in the Mohawk mine dropped below average the production was low for the past month, but the indications now point to the present month being somewhat above average.

Discussion

Readers of the Mining and Scientific Press are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Technical Journalism and ——?

The Editor:

Sir—I wish to express my approval of your editorial in the issue of October 14, entitled 'Technical Journalism and ——?' I have been a subscriber and for many months an interested reader of *Mines and Methods*, and it certainly deserves credit for having induced greater publicity in the reports of prominent mining companies, but its persistent pursuit of the Utah Copper Co., and its monomaniacal harping upon the one subject, of the affairs of this company, has probably defeated the object at which *Mines and Methods* aimed, as do all vituperative publications. I, for one, have become so weary of it, that I discontinued my subscription and do not read that journal any more, because of the very reason you state, namely, that one cannot feel confidence in the statements appearing in a technical journal which is so evidently biased and prejudiced.

F. L. Sizer.

San Francisco, October 25.

Nicaragua and Its Gold Industry

The Editor:

Sir—I must express my appreciation of the charming description of Nicaragua and its advantages and disadvantages, in the story by T. Lane Carter in the *Mining and Scientific Press* of August 12, but must take issue with him on one or two points. Mr. Carter classes the laborers here as "on the whole better workers than the peons of Mexico." I am quite sure he is mistaken; in fact, in a brief description of this labor, presented at the Wilkesbarre meeting of the American Institute of Mining Engineers last June, I took the diametrically opposite point of view, and have had no reason to change my opinion since. I consider the class of labor available in Nicaragua as without doubt or exception the poorest native labor I have ever handled. The following figures are taken from our books:

Ramon Salinas, contractor, with three partners, during February drove 25 ft. in medium soft sulphide ore, breast 5 by 6 ft.; cost, $4 gold per foot, plus board, for labor alone; worked 18 shifts and laid off 38 shifts.

March, with four partners, he worked 22 shifts and laid off 40 shifts; made 38 ft.; same place, same price. Average driving for the two months 0.24 ft. per man per shift.

Juan Ruedes, contractor, and one partner, during February drove 32 ft. in soft oxidized surface porphyry, breast 4 by 6 ft.; cost $3.85 per foot, plus board, for labor alone; worked 18 shifts and laid off 38 shifts.

During March, the two drove 45 ft. in the same place and at same price, worked 29 shifts and laid off 33 shifts. Average driving for the two months, 0.6 ft. per man per day.

It must be borne in mind that these figures are for labor alone; the mine furnishes all tools, powder, fuse, caps, candles, trams the ore or waste, and feeds the men. In contrast to this I have repeatedly let contracts to Mexicans in flinty limestone for an adit 4½ by 7 ft. from $1.80 to $2.50 gold per foot, and they have trammed their own rock, furnished everything, and sharpened their own steel, and worked every day except Sundays, making seldom less than 1 ft. per man per shift. I have not at hand my notes on costs collected during my five years in Mexico.

Mr. Carter's estimate of feeding costs is a little high also; our normal cost is 43c. gold per man per day, which includes the table for the staff; it has been as low as 40c. and never higher than 57c., which it reached one month when a shipment of provisions from the States was delayed and we were obliged to pay exorbitant prices to local merchants.

I[1] have already gone into the metallurgy of these ores at some length in the paper previously referred to; it is but fair to mention that the Bonanza is not at present operating a decantation process, but a modern vacuum filter installation with absolute success. I do not feel at liberty to give the figures from the plant, as the manager, P. A. O'Brien, will probably describe it in the near future. I can not agree with Mr. Carter's ideas of the future metallurgy of these ores. That slime plants must be installed is, of course, obvious, but Mr. Carter attributes the failures he experienced in settling these slimes to the presence of hydrates of alumina as such; with this I do not agree. It is the fact of their assuming the colloidal state in the presence of sodium hydrate that prevents their settling and filtering properly; they settle readily out of distilled water, acid solutions, and solutions of calcium hydrate, but when once rendered colloidal by sodium hydrate they can not be completely ionized by the subsequent addition of an electrolyte such as lime. But the use of lime alone removes all difficulties and these slimes are as easily treated as any other slime. Regarding the comparative costs of lime and soda, the lime costs us 5% more than the soda; this is based on the cost laid down here at the mine, the relative efficiency as a neutralizer of acidity, the loss due to breakage of drums in shipment, and other factors. This difference is but slight and the lime is indispensable to good work; the slimes can not be treated without it.

When Mr. Carter says that tube-mills are not required, as there is no necessity of fine grinding, I presume he refers to the oxidized ore only; fine grinding is the only way the sulphide ores can be successfully treated. We are installing a tube-mill here, and there are two others installed in this district; our ores below the water-level are heavily sulphide and their content in gold is higher than in the oxidized zone.

Lastly, the acid treatment of zinc has been discontinued at this mine and we are employing the Mexican practice of washing the zinc in the boxes and running the sludge into the clean-up tank over 40-mesh screen; everything that remains on the screen is returned to the head-box. We have as yet observed no accumulation of shorts after six months; should they accumulate they will be handled as described by me[2] in the *Mexican Mining Journal*, dissolving them in KCN. Evidently Mr. Carter has been out of touch with Nicaraguan matters for some time, as I notice he speaks of "President Estrada," when as a matter of fact Estrada abdicated the chair many months ago; also many other things Mr. Carter writes of were true a couple of years ago, I am told, but have radically changed by now.

Henry B. Kaeding.

Siempre Viva Mine, Nicaragua, C. A., September 20.

Surface Indications of Ore-Shoots in Depth

The Editor:

Sir—W. H. Storms in his contributions on 'Surface Indications of Ore-Shoots in Depth'—the issue of October 22, 1910, and in later issues—has certainly stirred up a great amount of discussion, and while I believe that his conclusions are true in general, there are scarcely any general laws in nature that do not have their exceptions. That orebodies are found under gulches has been demonstrated a number of times, but the ratio between orebodies found under ridges or hills to those found under gulches is so great that there must exist some definite reason for the exceptions. Every gulch formed has a definite reason for its existence. It either represents a general break in the formation, a faulting, a contact of two formations, or a soft place in ore formation. In many instances the evidence of the original cause for a gulch has been obliterated. After it was started and a water course made, it was continued to increase in size and length by the action of the elements and the original soft strata completely washed away and a hard bedrock of possibly another formation entirely is exposed. But usually a careful study of the topography and geology of the country will indicate the reason for its existence and its age with reference to the surrounding rocks and mineral veins of the district.

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[1] 'Metallurgy of Nicaraguan Gold Ores.' Wilkesbarre Meeting of Amer. Inst. Min. Eng., June 1911.

[2] 'Short Zinc.' *Mexican Mining Journal*, March 1911.

In general, then, when following an ore-shoot in a vein, a change in the vein or a disturbance is unfavorable for a continuance of the ore-shoot, therefore a gulch representing a change in the formation or a disturbance, should certainly mark the end of the ore-shoot or a displacement. However, while the disturbance as evidenced by the gulch is responsible, the end of the ore-shoot does not necessarily occur directly under the gulch line.

The gulch *C*, shown in the sketch, formed on the faulting line *DE* or in the soft vein material between ore-shoots dipping rather flat under the hill *A*. The ore-shoot found in the hill *B* rakes in the same general direction as the fault plane and terminates on it. In this case the ore on the lower levels 3 and 4, would be found directly under the different causes of gulch formation and would probably account for some of the apparent exceptions, as given by F. L. Ransome and others.

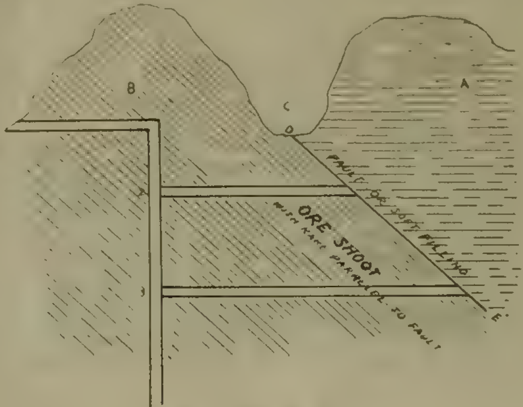
The character of the vein also exerts its influence in the surrounding topography. A hard silicious ore and gangue wears away slower than the country rock and forms a ridge or bold outcrop. On the other hand, a soft ore is eroded more rapidly and the vein is discovered in a depression or gulch. The latter case is the exception to the rule, however, and is seldom met. Occasionally such a case is found in the Tertiary where the vein is a soft talc and the walls hard.

The relation of the topography of the country to veins and ore-shoots can be seen more readily in the desert regions than in a country like California where the surface of the rocks is so heavily covered with loose rock and soil as well as a heavy growth of trees and underbrush. This is one of the reasons that makes prospecting in Nevada easier than elsewhere. In most instances, all of the different formations of an entire mountain range are exposed and the veins, usually outcropping, are easily found and prospected on the surface. Usually the reason for the existence of large gulches can be detected at once. Hills favorable for prospecting show their mineralized character very plainly and the experienced prospector can tell at a glance whether an area is worth prospecting or not. Very few mines have ever been found which did not exhibit some indication of ore on the surface—and the majority of them had 'pay ore' at the start.

In Goldfield I do not know of one pay-shoot that continued across a gulch, and in every case a gulch line is coincident with a fault line. Quite naturally it makes a difference whether the faulting is before or after the formation of the ore. If before, the ore will probably terminate entirely at the fault plane; if after, it often can be picked up again on the other side. There are times again when the merest knife-blade seam crossing the vein appears to have a decisive effect on the content in the ore. An incident of this kind happened to me in the Gold Hill mine in Madison county, Montana. We were driving on a four-foot vein of arsenical pyrite, carrying some chalcopyrite and about $16 in gold and silver. We struck a very narrow seam crossing the vein, showing about $^1/_{16}$ of an inch of oxidized material. The ore from the first round of holes on the other side of this averaged $115 in gold and silver, and from this point we had an ore-shoot several hundred feet in length that averaged throughout better than $40 per ton. There was no faulting of the vein whatever, and this seam continued to the surface. Although I was in the mine nearly every day for a year during this development, I was unable to determine the reason for this condition.

As another instance, I was lately informed by Emmett Boyle, an engineer who was born in Virginia City and has made a life-long study of the economic geology and conditions of the Comstock district, that the ore-shoots not only of the Comstock lode, but also of the Brunswick and Flowry lodes occur at the intersections of these lodes and east and west breaks formed subsequent to the ore deposition, and that these breaks are easily followed by certain topographical features of the country. The large areas of the lodes between these breaks are quite barren and although exploited very thoroughly have never produced ore. There is another series of east and west breaks which is post-mineral, and these breaks are in nearly every instance faults displacing the Comstock lode in several places as much as two hundred feet. These faulting breaks are coincident on the surface with the gulches and ravines on the east side of the mountain range.

At the Windfall mine near Eureka, Nevada, the main vein lies in a contact between the Hamburg limestone and a slate. The ore in this vein is a hard quartz and comparatively low grade. On the limestone side, however, there is a series of cross-fracturing nearly at right angles to the contact. This fracturing is quite prominent at the contact, but gradually fades away in the limestone. Each one of the fractures has been extensively mineralized and large bodies of the limestone replaced by silica forming an ore considerably higher in grade than that in the main vein. Many other instances of the influence of cross-fracturing in almost all formations, could be cited, but the occurrence of ore-shoots at the intersection of pre-mineral breaks is so frequent in the later eruptives, that it can not be attributed merely to coincidence and while, in all probability, no general law can be established, nevertheless, I always consider an intersection of this kind the most likely place to prospect for an ore-shoot if good ore is found in either one of the breaks. All these conditions have an influence in the creating of the topography of the surface, and I believe if it were possible to examine the surface closely enough and to correctly correlate the various exposures, we should find that in the majority of instances, there is a very close relation between the various features of the topography and the position of the ore-shoots beneath.



ORE-SHOOT BENEATH A GULCH.

H. C. Cutler.

Reno, Nevada, October 10.

The platinum market at Ekaterinburg appears as active as before, although there is an idea that such activity is less earnest. The demand on the part of dealers, although apparently as insistent as recently, leaves the price unchanged at 9 roubles 95 kopecks per zolotnik for 83% metal. Osmiridium is in strong demand, and Treuchovy Bros., gold and platinum dealers, have bought a small parcel from the Lower Isset factories at the price of 10r. 80k. per zolotnik. Throughout the Urals only 1½ to 2 funts of this metal is produced per annum. The total production of platinum in Russia in 1910, acording to the figures reported to the Imperial Mint, was 334.575 poods, but the actual production is nearly double this figure.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

TO cement brasswork to glass, mix two parts litharge, one part white lead, **three parts** linseed oil, and one part gum copal. Use immediately.

TO MAKE transfer paper, take 2 oz. tallow, ½ oz. powdered black lead, ¼ pt. linseed oil, and enough lamp-black to give the mixture the consistence of cream. Melt together and rub on white paper while hot.

THE following gives the rate of shrinkage in castings made from various metals: Bismuth, 5/32 in. per foot; tin, 1/12 in.; copper, 3/16; lead, 5/16; zinc, 5/16; thin brass, ⅛ in. per 9 in.; thick brass, ⅛ in. per 10 inches.

EXTREME hardness in steel can be produced by heating slightly, then immersing in a mixture of four parts water, two parts salt, and one part flour, till it is thoroughly coated. Then heat the metal to a cherry red, **and plunge into soft water.**

POLISH for silver, gold, or other fine metals is made by mixing a little vaseline with the ashes of burned-out or broken gas mantles. Apply with a rag or finger and polish with a clean rag. The result is a superb lustre, the best finish being obtained by using a soft rag.

A GOOD copying ink is made by putting into two gallons of clear rain water, ¾ lb. gum arabic, ¼ lb. clear copperas (ferrous **sulphate**), ¼ lb. powdered nutgalls, ¼ lb. brown sugar. Mix well, shake occasionally for ten days, and strain. If it is needed before ten days, steep it in an iron kettle until the desired strength is obtained.

NO MINER should ever start his day's work before he has carefully examined his roof by sounding it with a pick or steel drill. Cap pieces for mine posts should always be cut at least 14 to 18 in. long. It is advisable to have the caps cover the entire surface at the top of the prop. Many experienced timbermen advise placing the large end of the prop next to the roof.

CONTINUOUS elevator buckets, if possible, should be loaded directly from a chute, rather than having to dig the material from the boot. In this way, an even load can be obtained and an excessive strain on the belt is avoided. The intermittent or centrifugal discharge buckets, however, must always dig the material from the boot rather than being loaded by a chute.

ACETYLENE gives the hottest known flame, except that of the electric arc. The following figures for the temperatures of flames are the results of recent experiments: Bunsen burner, 1871°; acetylene flame, 2548°; alcohol flame, 1705°; Denayrouze burner, half alcohol half petroleum, [illegible]°; hydrogen flame in air, 1900°; gas **jet flame with** oxygen, 2200°; oxyhydrogen flame, 2420°. These figures all correspond to degrees Centigrade.

A COAL-DUST extinguisher, consisting of a combination of [illegible] the surfaces to be [illegible] the dust, and the simultaneous [illegible] of the dust by [illegible], has been given a demonstration by a Scottish colliery engineer, following a series of experiments extending during the past summer. The apparatus is designed to be operated either by electric motor or by compressed air. It is said it will soon be introduced in some of the coal mines of the Dunfermline district.

IN mixing plaster of paris, do not pour the water on the plaster, but turn the plaster gradually into the water, spreading it about and shaking it in, and not stirring until all the plaster has been added. If mixed in this manner a smooth cream or thin dough without lumps will result. The proper quantity of gypsum is usually enough to peep out over the surface of the water over the greater part of the area, that is, about equal volumes of each ingredient. The addition of glue water to the mixture retards setting.

THE Loetschberg tunnel is 47,678 ft. long and was first planned to be on a tangent. On July 24, 1898, when the main heading had reached a point 1.6 miles from the **portal, it met a cleft filled with sand, gravel, and water. There was a sudden and violent inburst of these materials,** which in a few moments filled up the tunnel for a length of 5000 ft., burying 25 workmen and all the drills and other installations beyond hope of recovery. It is estimated that about 8000 cu. yd. of sand and gravel entered the tunnel. To avoid any further irruption of the materials, **the tunnel was walled up by a 33-ft. wall at a point** 4075 ft. from the portal. The new line leaves the original line at a point ¾ mile from the north portal. No further serious difficulty was experienced in tunneling through the diversion.

WHEN oil is used for firing boilers, **an average of 4%** of the steam evaporated by the boiler is required for atomizing the oil (minimum, 2.39%; **maximum**, 7.4%). In designing a plant a consumption of 5% should be **assumed. In operation if the amount required is much** in excess of 5%, it may be concluded that the condition can be bettered. In certain metallurgical and industrial operations, especially where high temperatures are desirable, the use of air under pressure for atomizing the oil is to be preferred. A reverberatory copper-matting furnace, hearth 80 by 17 ft., with roof arch 30 in. above the surface of the bath on the hearth, required 36,472 lb. oil for smelting 182 tons. The **air was supplied by a Connersville** blower at 9 lb. pressure, and 1 lb. air was required for each 2 lb. of oil burned.

HANDLING of timber for its many uses in mines entails unnecessary waste. A portion of the material is cut away and lost in the process of framing, and if, through decay or fracture, a part of a piece is injured, the entire set is usually rendered useless. In certain situations the sizes of mine timbers could even be materially reduced provided they are kept sound; under present conditions the timber employed is often so much too large as to be still able to do its work after decay has progressed to a considerable depth. The whole theory of preservative treatment is based on the presumption that if decay may be prevented, the **sizes of mine timbers may be materially reduced without** reduction in necessary strength. John M. Nelson, Forest Assistant, United States Department of Agriculture, estimates that 10% of all the material going into underground operations is wasted.

LAND entered as a millsite must be shown to be non-mineral. **Millsites are simply auxiliary to the working** of mineral claims. To avail themselves of this provision of law, parties holding the possessory right to a vein or lode claim, and to a piece of non-mineral land not contiguous thereto for mining or milling purposes, not exceeding the quantity allowed for such purpose, the proprietors of such vein or lode **may file in the proper land** office their application for a patent, under oath, in the [illegible] manner, which application, together with the plat and field notes, may include, embrace, and describe, in addition to the vein or lode claim, such non-contiguous millsite, and after due proceedings as to notice, a patent may be issued conveying the same as one claim. The owner of a patented lode may, by an independent application, secure a millsite, if good faith is manifested in its use or occupation in connection with the lode, and no adverse claim exists.

Special Correspondence

FAIRBANKS, ALASKA

Chena Mill Makes Test Runs.—Crooks & White Lease McCarty Property.—New Mill on Newsboy.—Tanana Q. & H. Co. Sinks Shaft on Rhoads Vein.

The Chena custom mill has been running lately on several test shipments of ore from various properties. The largest clean-up resulted from 45 tons of rock shipped from the Rainbow quartz claim on Skoogy gulch, owned by Zimmerman & Gordon. About $1640 in free gold was taken from the plates, while the concentrate yielded about $205 per ton. A 10-ton lot of ore from the new find of Graham, Bush & McDonough on Fairbanks creek returned $500. The vein averages between 3 and 4 ft. in width. No further work will be done till pending legislation is settled. The first shipment of ore from the Ryan Lode group on Eva creek, amounting to 9 tons, yielded about $20 per ton in free gold.

The 5-stamp Joshua Hendy mill on the Rhoads-Hall property is busy cleaning up the dump of lower grade ore taken out in development work. As soon as the dump is milled, ore will be drawn from the two years ore reserve in the stopes. Crooks & White have taken a lease on the ground formerly known as the McCarty property. The Fairbanks Core Drill & Mining Co. is prospecting on the Newsboy property. The drill averages 17 ft. per day of one shift, and the 500-ft. level should soon be reached. It is hoped the vein will be cut at that depth. The 5-stamp mill on the Newsboy is almost ready to begin crushing.

A lease on the Rexall group is being worked by Cooper & Stillman. Although only shipping ore is being extracted, a large body of ore assaying about $35 per ton has been opened up that will be available when a mill is placed on the property.

The Tanana Quartz & Hydraulic Co. is opening up the extension of the Rhoads vein on the Bedrock-Chatham divide. The shaft is being sunk by contract. A fault carried the vein out of the shaft at 40 ft., but no cross-cutting will be done till the 100-ft. level is reached.

Jesson Bros., placer operators on Ester creek, have taken an option on the entire holdings of Fred Fay at the head of Chatham creek. These were located by Fay three years ago. Gieske & Nehrland have taken a lease on the Pioneer M. Co.'s property and are already at a good depth. In the effort to sink where water would not bother, two new veins were found. The 3-ft. Huntington mill at the Tolovana mine is crushing steadily, milling about 2½ tons per day of one shift. The rock is of good grade. A mess-house and a bunk-house are being built, and it is planned to do a large amount of development work this winter. Fisher & McGillvray have taken a lease on the supposed extension of the Newsboy vein.

The banner placer property of this season has proved to be the Niggerhead Association at the lower end of Dome creek. Two plants operated by Walter Fisher and Barney Sandstrom have been cleaning up from $15,000 to $25,000 per week each. Fisher has a 150-hp. plant. Hughie McDonald has taken a lease on 17 Goldstream and a 60-hp. plant has been erected. The ground to be worked has just been prospected by the Esby-Crooks Keystone drill. Another boiler of 40 hp. will be used during the sluicing season. Pay has been found on Eva creek and a large plant is working. The extension of the pay-ore has been found by Henry Crooks with a drill, and a plant will be erected there this winter. The dredge managed by Lemmons & Powell is handling a large amount of material. The dredge is on Fairbanks creek and will run until cold weather interferes.

The feature of the annual Tanana Valley fair, held here in September, was the exhibit of rock and minerals from the different quartz claims. All specimens were shipped for exhibition at the Land and Irrigation Exposition in New York. The low water in the rivers is causing great difficulty in landing late freight.

NEW YORK

Financial Uncertainty Depressing.—U. S. Steel Gives Up Lease.—Ray Cons. Copper Co.'s Large Output.—United Verde Reorganizing.—Rumor Goldfield Cons. Is to Reduce Dividends.

There is no occasion for surprise at the lack of interest in mining throughout Eastern financial centres. The uncertainty of the business situation has for the present halted the launching of nearly all kinds of constructive enterprise. This means not only that the promotion of new mining ventures is not being attempted, but that electrification of transportation lines, the construction of new inter-urban lines of transportation, new telephone lines, new hydro-electric power-plants, and countless similar lines of industry which consume copper and other metals are not making the usual demands made by healthy growth and expansion. The unsettlement of the corporate status of so many large organizations has brought about a strange condition of affairs, and the uneasiness which has prevailed for months has not been in any way allayed. The determination of the United States Steel Corporation to give up its lease on the ore lands acquired from the Great Northern railway is the strongest effort yet made by any of the corporations to come within the pale. Were our currency system operated on a different plan, or if we had in this country a system of discounts, it would in part relieve the present tension by allowing the fundamentally good conditions to exert their influence, and the commercial life of the nation would not be obliged to wait for the market pyrotechnics to entirely subside before gaining independent headway once more.

GREENE-CANANEA MILL.

Copper, both the metal and in the share market, has developed a distinctly bearish tone during the week, and it is apparently conceded on all sides that copper must work to lower levels and that nothing can now prevent a closing down of some of the higher-cost producers. There is a good deal of discussion of the commanding place achieved by the low-grade milling coppers, due in part to the new records made by the Utah Copper. The action of Utah shows how the handling of immense tonnages reduces cost and increases profit even on the present metal market. The August output broke all previous records for a single month, while September established a new high record of a little more than 9,250,000 lb. The present output is at the rate of 112,000,000 lb. per year. Not all of the improvements under way at the company's two mills are completed; when they are, a further increase in output is expected. The plants are now handling an aggregate of 15,000 tons of ore per day. The eventual capacity will be 20,000 tons per day. While the development of Utah and the similar properties must be acknowledged as mechanical and metallurgical wonders, it is to be regretted that such mines should be brought to perfection just at a time when the metal market is declining, consumption decreasing, and that the weight of the production so achieved should fall so heavily upon the world's markets.

Ray Consolidated, now recognized as soon to stand second only to Utah Copper in volume of output, is handling 3500 tons of ore per day, and the saving of copper is said to be all that can be asked. There seems to be something of a coincidence in the recrudescence of so many copper properties just at this time. Utah Consolidated, recently the subject of a drastic report by eminent engineers, is again a dividend payer. Granby has developed a fair ore reserve, has bought two properties, and is now held in check only by the strike in the British Columbia coalfields. Calumet & Arizona, once a sensation, then reported to have reached practically the limit of profitable operations, has consolidated with Superior & Pittsburg and has recently opened a large orebody. The old scrap heap of the Arizona Copper is to be replaced by a modern plant. Greene-Cananea has a new plant ready for immediate operation at capacity, and is now expected to pay a semi-annual dividend of 20c. per share about the first of the year. North Butte is developing on a large scale. Shattuck-Arizona is building a smelter. The United Verde is rebuilding on account of cave-ins. To say nothing of the new production, it is easy to see that the older properties could turn out a flood of red metal if the market demanded it. New mines in foreign countries are figuring more and more largely each year in the world's supply of copper; Russia's output has trebled in the past ten years, having increased from 18,681,000 lb. in 1901 to 54,302,080 lb. in 1911, which makes Russia nearly independent of imports, and, what is equally important, reduction works have been built with a view to increased production, prepared to handle all the metal produced without depending on foreign refineries. The product of Japan is increasing. American interests in South America are seeing the turning point in their investments. The vast amount of copper that could be produced almost immediately is stupendous. It would be a bold hazard to even attempt an estimate of the amount of copper that could be won from the earth in a twelvemonth under stimulus of high prices. Between the revamping of old properties and the creation of new ones, there is a staggering amount of copper awaiting a market.

Consolidation of copper properties is no longer the fashion. The Superior & Boston and the Arizona Commercial are to travel separate paths. The Arizona Commercial reorganization is to be effected independently, and Charles Sumner Smith, president of the Old Dominion company, will act as president and direct future operations. Ohio Copper is still suffering from too much Heinze, although the mill is handling 4500 tons of ore daily and apparently is winning a reasonable profit from its operations, the issue is dead and without any following. E. A. Wall, who has become something of a factor in Ohio Copper, has acquired control of the Daly Mining Co. at Park City, Utah, and has vetoed the merger of that property with the Haggin-Hearst mine, the Ontario Silver. Ontario is one of the few mining properties that has maintained a place on the New York Stock Exchange for many years. Homestake, also a Haggin-Hearst property, is on the 'big Board', but, like Ontario, trades are not recorded, except at rare intervals.

The market action of Goldfield Consolidated during the week has been much commented upon as foreshadowing a reduction in dividend rates. All surmise is based upon the only question involved, the actual ore reserves in the mine. The recent reduction in quarterly distribution made by the Kerr Lake, which, like Goldfield Consolidated, paid 50c. per share quarterly, has made the public uneasy as the impossibility of holding out to the last large dividend and getting out of the stock at the same time is gradually realized. A large part of the public, which follows mining enterprises, would continually enjoy eating its cake and keeping it at the same time.

The recent corner in tin has been a sore spot with the London Metal Exchange, and a new rule has been passed defining standard tin, which must be accepted as delivery as against sales of tin from the Malay Straits. The regulation is similar to that which exists in regard to copper and is expected to make it much more difficult to successfully engineer a corner in the metal. It is not only in the matter of production that the Guggenheim interests are assuming a commanding place. The American Smelters Securities Co. is encroaching steadily upon the United Metals Selling Co. in the matter of selling contracts, and in all probability will handle some half million pounds of metal in 1912, which will make this agency the largest copper broker in the world.

A special meeting of the directors of the La Rose Consolidated Mines Co. has been called for next week, and the shareholders are anticipating some definite action in regard to the distribution of the treasury's present cash surplus of about one and a half million dollars. Wettlauter, the silver property at South Lorrain, operated by the Lewisohn interests through Canadian Silver Mines Exploration Co., is building a mill to handle its low-grade ores, while continuing to ship its high-grade output as heretofore. Wettlaufer ores run from 2500 oz. for the high-grade ore to 200 oz. for the concentrating ores. The Porcupine Central fiasco seems to have been about the last gasp of the Porcupine market activity. So far as the market is concerned, the excitement is evidently all over. The era of exaggeration having passed, it remains to be seen what will be done in the way of actual mine development and making.

LONDON

Treasury Reserve Planned for the Levant.—Proposed Importation of Foreign Miners to Cornwall.—Botallack Mine Finds Forgotten Ore-Supply.

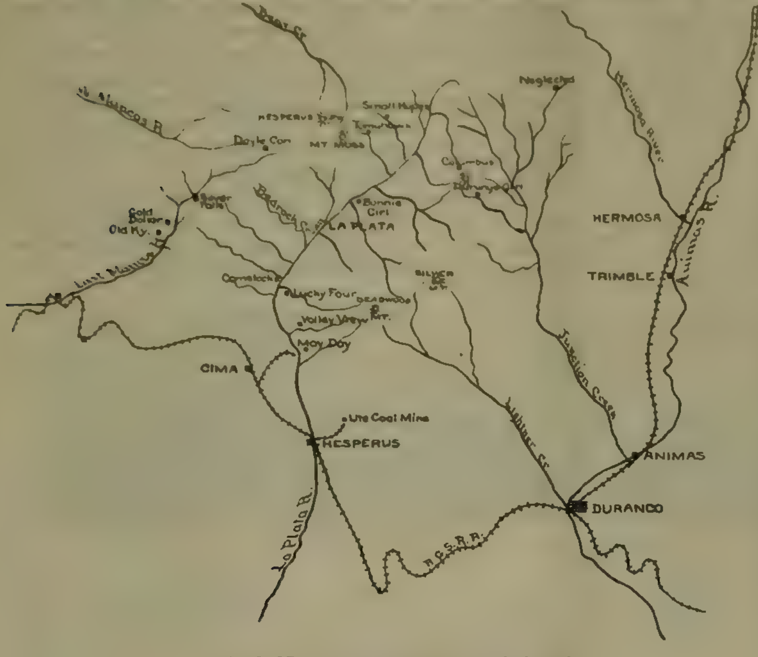
It has been proverbial during recent years that the Levant mine, near Land's End, has a more old-fashioned set of directors and shareholders than any other mine in Cornwall, not even excepting East Pool. To speak a word against the cost-book system within a mile of the count-house would entail serious physical consequences to the rash adviser and critic. There are indications, however, of the first faint dawn of a new era, and within the next four years great changes may be expected. The present guiding influence comes from Francis Oats, the chairman of the De Beers Diamond company, and from his son, F. Freathey Oats, the chairman of the committee of management of the Levant. For years it has been the practice to divide all the profits, and leave no margin for a rainy day or for the provision of extra capital expenditure. At the regular quarterly meeting held last week, Mr. Oats, senior, delivered an impressive address to his fellow shareholders, and recommended that quite half of the profit should be kept in hand. He pointed out that the lease of the mine expires in four years, and in negotiating for a renewal, plans necessitating the spending of much capital will be demanded by the lords. Many things are required urgently even now. A new shaft ought to be sunk vertically to meet the main vein at 2400 ft., and, from there, inclines sunk to follow the vein underneath the sea. Then a system of ventilation must be adopted, for the air in the lower levels is stagnant and humid, and work is done under depressing circumstances. Quite £50,000 will be required for this new work. But a further question at once arises, whether it will be worth while doing all this unless steps are taken to provide sufficient labor. It is the cry made by everybody desirous of reopening or extending the operation at Cornish tin mines, that sufficient skilled labor is not available. Twenty to thirty years ago, when the permanent depression set in, the miners emigrated in a wholesale way, and are now scattered over the face of the earth, doing better than they ever did or ever could in the old county. They will never return, and more will follow them abroad. Mr. Oats proposes that foreign labor be imported, and he braves local opposition by showing that the Cornishman is a foreigner when he is in another country. He argues that all sorts of heterogeneous communities prosper abroad in the mining districts, and that the founding of an Italian or Hungarian colony at Pendeen would be nothing very dreadful. There will, at first, be an almost unanimous opposition to the introduction of foreign miners, but the company will probably introduce the new idea gently, without raising unnecessary friction. The Levant mine has been working continuously since 1820.

The Botallack mine, adjoining the Levant, has apparently had a stroke of good luck recently, and it certainly wanted it. For three years, since its reopening by the Allen Meyerstein group, the results have been disappointing and the new stamps are only partly employed, working only on low grade dump material and cleanings from old workings. The average recovery is only about 12 lb. black tin per ton, which of course does not pay. It is now reported that in reopening one of the levels, a large amount of broken ore has been found, left behind as filling in days when copper was being followed chiefly. Frank Merricks, the consulting engineer, is making an examination. I am given to understand that there is a great deal of this ore, and the local opinion is that its presence will afford some indication of a workable lode. In all probability, important news on the subject will be published before long.

The news from the St. Agnes district of Cornwall is both good and bad. The pleasant event is the discovery of ore averaging 100 lb. of black tin per ton over a stoping width of 6 ft. at the Wheal Friendly section of West Kitty. This mine has had many misfortunes during recent years, and the production has fallen seriously. A year ago the property was provisionally acquired by the Schiff group, and their exploratory work was disappointing for a long time. The manager, T. H. Prisk, Jr., has made a close study of the geology and ore deposits of the district, and he decided to cross-cut at 320 ft. below the adit to intersect the West Kitty lode. The result was as described. The country at this point is dislocated by a cross-course, and in all probability the continuation of the lode will have to be sought at a lower level. For this purpose the shaft is being sunk deeper. The discovery will have a most encouraging effect on St. Agnes people. The bad news referred to at the beginning of this paragraph relates to the neighboring mine, Wheal Kitty. This has been worked successfully for several years on a small scale under the direction of J. H. Collins, and the prospects of continuing to obtain a regular supply of good quality ore have been consistently bright. It is disappointing, therefore, to hear that at all the working faces the content has decreased and that the average extraction is not higher than 20 lb. per ton. At this figure the balance between profit and loss will depend entirely on the price of the metal, and unfortunately this shows signs of falling from the high level to which we have been accustomed during the past year or so. The discovery at West Kitty will help to put heart into Mr. Collins and his friends, because it is for the express purpose of tapping this particular lode that they are now sinking the new Sara's shaft.

LA PLATA, COLORADO

Many Properties Active. Mines Tied Up by Litigation. Cumberland to Build Pipe Line.



MAP OF LA PLATA DISTRICT, COLORADO.

About 200 pack-animals are constantly employed transporting ore to the May Day spur, averaging two trips per day, from the various mines along La Plata gulch and its tributaries; and about 250 miners are engaged in actual production in this district, while many others are prospecting and doing a large amount of dead work in the old mines which are being reopened and explored. The Neglected, May Day, and Idaho, the three largest producers in the La Plata district, are still closed down.

Evidence is being taken before Judge Hinsdale at Denver in the suit between the May Day and the Idaho over the ownership of 300 ft. of rich vein from which the Valley View M. Co., owning the Idaho, has extracted a large amount of ore. One shipment of 11 tons from this vein is said to have brought $40,000 at the Durango smelter. Payments amounting to about $80,000 which were due the Valley View company at the commencement of litigation are still tied up at the Durango smelter pending the result of the suit. The suit is, of course, a decided detriment to the camp, for these two mines if worked to capacity would easily have produced $1,000,000 during this year. During the last seven months of operation, last year, the Valley View company paid $20,000 each month in dividends.

On the property of the Van Emmett M. Co., a short distance above these mines, the Price lease and the Incas lease are both making heavy shipments of ore averaging $25 to $75 per ton in gold. The Incas Leasing Co. is planning to erect a cyanide mill for the reduction of the lower-grade ores in the dumps and stopes. The Cumberland company has let a contract for the construction of a 7000-ft. pipe-line to supply water to the mill from the new reservoir. An 1100-ft. cross-cut is being driven to drain the old Columbus mine, not far from the Cumberland. The property has a 300-ft. shaft which has been filled with water for fifteen years.

The Lily lease on the Ten Broeck is making a small but steady production of high-grade ore; and the Blue Dick, situated on the ridge just east of the Bonnie Girl mill, is the scene of a recent discovery. Assays from 10 to 15 in. of the vein show results of $200 to $500, with a 2-in. streak which runs $3200 per ton. Hollingsworth & Reeber have opened a large body of $40 ore and have bonded the property to Price & Co., who have a rich lease on the Van Emmett ground. This is an old district, dating back to 1873, when the discovery of gold on the La Plata river created much excitement. Parrott City, which was built at the mouth of the canyon, was the first town in the county, and was for many years the county seat. Most of the orebodies so far discovered are small, but the ores are rich and a number of mines have made excellent records. If the district were not so remote it would have prospered much more than it has. But the steady output of the last few years has served to demonstrate the real worth of the district, and it is likely that progress will be more rapid in the future. The district is rather quiet at present, but the outlook is cheerful.

BLACK HILLS, SOUTH DAKOTA

Free Assays to Promote Prospecting.—Anaconda to Build Mill.—Denver Men Buy Forest City Group.—Record Bullion Output.

With the idea of encouraging prospectors the Deadwood Business Club has lately perfected arrangements whereby assays for prospectors are made free of cost. The matter was under discussion by the club for some time. Ore samples are received by the secretary of the club and forwarded to different mining company assay offices throughout the district. In this way the work is divided so that no office is burdened with an amount of work which would be troublesome. The operating companies were very glad to enter into this arrangement with the club, and the result has been a stimulation of prospecting throughout the Black Hills. The only restrictions which the club has placed upon the offer are first, no sample shall consist of more than five pounds; second, not more than ten samples shall be submitted during any month by any person; and, third, the offer is limited to prospectors only. The secretary of the club, when the mining companies make out their returns, issues a certificate in the name of the club.

Announcement is made by the Anaconda G. M. Co. that funds have been pledged sufficient to complete the blocking out of the ore and the erection of a large mill. This company's property is situated near Roubaix, Lawrence county. A. E. Hall is superintendent.

Denver men have bought the Forest City group of claims near Hill City, Pennington county, for $30,000. There will be three equal payments. The purchasers have bound themselves to sink a shaft to a depth of 400 ft. and have the privilege of erecting a mill and treating such ore as they may extract in the course of development.

During the quarter ended September 30, bullion purchases at the United States Assay Office at Deadwood amounted to $1,855,000. All of this was produced in the Black Hills district, and it is thought to be the largest amount ever produced in a similar length of time in the country. It does not, however, represent the entire output of the Hills, as there is ore shipped to smelters and some bullion produced which is not marketed at this assay office. As a whole the mining industry of the Black Hills is in a prosperous condition at the present time. The production is growing steadily and without doubt the output of the present year will surpass any previous twelve-month.

A judgment of $14,000 was given in the U. S. court in favor of the Portland and Clinton mining companies for trespass and extraction of ore by the Imperial Mining Co., and operations have been suspended by the Imperial company. P. H. Bertschy, who was leasing on the Imperial, also has discontinued operations.

A Wedge mechanical roaster is being erected by the Golden Reward company at its mill at Deadwood to handle a sulphide ore, recently discovered, which differs from anything previously found on the company's ground. The ore will be roasted for cyaniding, and if it proves successful in operation, it will form a portion of a large new plant. The mill will be close to the present plant. The ore, which is from the Astoria vein, is mined quite wet, and a drier at the mine is planned. The orebody is opened up to supply 500 tons per day.

The new mill of the Trojan M. Co. is handling about 150 tons of ore per day, half of the capacity which the plant will have when certain changes are perfected. A 7-ton gasoline locomotive is used for hauling the ore from the mines to the ore-bins, which are situated on the side hill at the rear of the mill. These bins are constructed of reinforced concrete and timber and have a capacity of 1000 tons. The ore is drawn from them to a No. 5 Gates crusher, which reduces the product to $1\frac{3}{4}$ inch, and it then drops to a belt-conveyor which delivers it to the mill-bins. The belt-conveyor is 110 ft. long, from centre to centre, and has an upward slope of 16°. The ore from the mill-bin is fed to 16 by 36-in. Eclipse rolls, the strong cyanide solution being added to the ore at this point. The product of the rolls runs in launders to two 7-ft. Trent-Monadnock mills, where it is crushed to about 30 mesh. Classifying is done in four Dorr-Duplex machines, the sand running in launders to five 200-ton sand-tanks which are 28 ft. wide and 8 ft. deep. The slime goes to a Dorr thickener, where the moisture is reduced to about 55%. The slime treatment is perfected in three Pachuca tanks and a stationary leaf-filter. Precipitation is accomplished in three zinc-boxes. The standard mill solution has a strength of three pounds KCN per ton, and the weak solution one pound per ton. Sand treatment consumes five days, and slime agitation five to six hours, which with the filtering makes about ten hours. The Dorr thickener is to be placed in a 40-ft. tank. It is now running in one of the 28-ft. sand-tanks, and in order to bring the capacity of the mill up to 300 tons per day it will be necessary to build this larger tank and move the thickener. When this change is made it will give the plant six sand leaching-tanks, or a total leaching capacity of 1200 tons. The slime department is sufficiently large to handle its share of a 300-ton run. Electric power is used throughout the plant. H. S. Vincent, of Deadwood, is general manager; W. H. Weigand, of Trojan, mill superintendent, and H. Slaughter, also of Trojan, mine superintendent.

The New Reliance Gold M. Co., near the head of Annie creek in the Bald Mountain district, is successfully operating its reconstructed 20-stamp cyanide mill, and plans are being prepared for an additional ten stamps.

BUTTE, MONTANA

Butte-Ballaklava Shuts Down Again.—Deer Lodge Valley Smelter Case Still Undecided.—Heinze Retirement from Davis-Daly Causes Surprise.

The Butte-Ballaklava company has stopped active mining again and the shipping of ore will not be resumed until some repairs to the shaft are made. The company did not make over one or two shipments of ore from the 1400-ft. level to the East Butte smelter and the ore did not run over 4% copper.

Many are watching for news from Washington in regard to the action on the part of the Deer Lodge valley ranchers when a motion will be made to bring up for argument on appeal the celebrated fume case, a notice of which was filed with the court a few weeks ago.

The announcement received here that F. Augustus Heinze had retired from the presidency of the Davis-Daly company came as a surprise to many people in view of the interest shown by him in the property while in this city a few weeks ago. A year ago, just before W. H. Wiley made an examination of the Colorado mine, Mr. Heinze stated that the Colorado was not of much value and that it would not pay to put any more money into development work. However, after Mr. Wiley had made his investigation and recommended development work, and some good orebodies were found, Mr. Heinze changed his mind, and during his examination of the property a few weeks ago he reached the conclusion that the ore blocked out was of a grade sufficient to warrant it being shipped. The ore is now going to the Washoe smelter and the returns are declared to be quite satisfactory. According to some persons here there is an element connected with the Davis-Daly which desired that Mr. Heinze be eliminated from the active management of the company. Boston interests are largely in control, as evidenced by the fact that the offices of the company are to be at once removed from New York to Boston.

The Butte Central Copper Co. is carrying on development on the 500-ft. level of the Ophir in the hope of finding the rich body of ore discovered on the 300-ft. level, from which all the shipments have been made for several weeks past. The big electric pump had been placed down at a depth of 1000 ft., but as the ground was too soft to cut a station down to 50 ft. below that point the pump has been taken to the 500-ft. level. It is intended to lower the water to the 800-ft. level and to develop the property down to that point. In the course of a couple of weeks the company intends to increase its shipments from 50 to 100 tons per week, getting some of the ore from the 500-ft. level.

General Mining News

ALASKA

Juneau

The net operating profit of the Alaska Mexican G. M. Co. for the month ended September 15 was $22,247, according to the regular report recently issued. The company crushed 18,763 tons of ore, from which 156 tons of sulphides was saved. The value of the free gold was estimated as $28,239, and the value of the sulphides as $32,850. In the report the value of 753 tons of United ore, $4278, is subtracted from the gross, leaving a total production for the company of ore valued at $56,811, with a realizable value of $56,243. Operating expenses amounted to $33,996. During the month $6202 was spent on construction. The yield per ton of the ore milled was $3.02. The stock of broken ore was increased 15,360 tons. One hundred and ninety-two feet of development work was done during the month.

The report of the Alaska United G. M. Co. for the month ended September 15 shows an operating profit of $33,597 for the company from the Ready Bullion and 700 Ft. Claim. For the Ready Bullion claim the report includes the following items: Tons of ore crushed at R. B. mill, 15,316; tons of sulphides saved, 352; estimated value of free gold, $22,935; estimated value of sulphides, $17,712; realizable value of production, $40,151; operating expenses, $29,224; net operating profit, $10,927; construction expenses, $7026; yield per ton of ore, $2.65; development work done, 156 ft. For the 700 Ft. Claim the report includes the following: Tons of ore crushed at 700 Ft. Claim mill, 20,916; sulphides saved, 390; estimated value of free gold, $28,537; sulphides, $27,426; total production, realizable value, $55,386; operating expenses, $32,715; operating profit, $22,670; construction expenses, $3730; yield per ton, $2.67; development work, 378 ft.; stock broken ore increased 7207 tons.

IDITAROD.

Prince William Sound

Peter S. Erichsen has sold his copper claims on Glacier creek, 12 miles east of the Bonanza mine, to Cappel, Radclyffe & Company.

The Ibex M. Co. stockholders held their annual meeting October 9, say reports from Valdez, and authorized the board of directors to acquire more property for consolidation with the Ibex mine, which is situated on the glacier. The company in the past season has expended $10,000, which was paid out for labor and supplies.

Al. Grigsby and T. J. Devenney have taken a bond on the C. G. Debney property on Solomon gulch. They will continue operations throughout the winter.

The Tanana

The probable production of Iditarod for the season will be about $3,500,000, according to the estimate of Thomas J. Nestor, an Iditarod banker quoted in an Associated Press despatch. The population of the camp is estimated by Mr. Nestor to be about 2500. A prosperous season is expected for next year.

ARIZONA

Gila County

(Special Correspondence.)—An attempt is being made by the Cactus Copper Co. to redeem some of its earlier promises by the purchase of new properties. Some negotiations were had recently looking to the purchase of certain gold claims near Radersburg, Montana, but nothing definite has been announced as yet.

Globe, October 23.

Fire on October 21 destroyed the timbering and equipment of the Kingdom shaft of the Old Dominion mine, state reports from Globe. The men were at luncheon on the tenth level and escaped through 'A' shaft. The shaft was 10 ft. below the tenth level, sinking was in progress, and connections had been made with the workings by cross-cuts on the sixth and tenth levels and by a raise from the twelfth level, according to the report, when the fire broke out. The men had just blasted a round of holes before going to their luncheon. Bulkheads were placed in the drifts and the fire was confined to the shaft. The building containing the transformers and the electric hoist was saved. The financial loss will be large, but the output of smelting ore will not be affected. The production of concentrating ore will be decreased temporarily by 40 per cent.

The Summit Copper Co., operating under lease and bond the Gibson mine, 16 miles west of Globe, has stopped work, but will retain three men to keep the mine free from water. The shut-down is thought to be temporary.

The Barney Copper Co. will resume sinking in its two shafts in December. J. D. Coplen, of Globe, made the announcement of the resumption of work. The property adjoins the Live Oak ground.

Maricopa County

Reports from Wickenburg state that A. J. Kellis has located placer claims covering 20 acres, on which the deposits assay $100 per cubic yard.

The concentrating plant of the Monarch M. Co. will have a capacity of 100 tons of ore per day by Christmas. The additional machinery is on the way. E. D. Akin is managing engineer and C. W. Platt superintendent for the company.

Pinal County

The Ray Con. Copper Co. will start shipping concentrate to the Ray smelter, which recently was acquired by the A. S. & R. Co., about January 1. The Ray at present is shipping its concentrate to the A. S. & R. Co. smelter at El Paso. The company's production for this year is estimated at 25,000,000 lb., while next year the output should be 40,000,000 lb. of copper. The output of refined copper for this year, it is estimated, will be 17,000,000 pounds.

Yuma County

J. E. Kreeps, of Los Angeles, has taken a lease and bond on the Red Paint group of seven claims from J. F. Raney, according to recent reports from Parker. The claims are about nine miles northeast of Parker. The lease and bond run for five years, with monthly payments. The property is on a hill of iron oxides, according to press reports, the mineral content being of special value in the manufacture of paint and as a flux. Kreeps will start work about November 1.

CALIFORNIA

Nevada County

The Union Hill company has intersected the Lucky vein at the 300-ft. level. At the point of intersection it is about 7 ft. wide. As below 400 ft. the Lucky vein is in virgin ground, never having been worked below that depth, much interest is shown in the discovery by the Union Hill company, which will thoroughly develop it. In the early days the Lucky mine was one of the principal producers of the district.

SACRAMENTO COUNTY

(Special Correspondence.) Dredge No. 8 of the Natomas Con. of California was damaged and possibly destroyed by fire on October 20. The extent of the loss is not known at present, and an investigation is under way to see what can be saved. The fire was caused by an explosion in the oil transformer used in connection with the motor. The explosion threw burning oil over the walls of the room, and the flames made such quick headway that the efforts of the crew to put out the fire were ineffectual. The fire occurred early in the evening.

NATOMA DREDGE NO. 8.

The Natomas company is building, at Natoma, dredge No. 10, which will have a hull of steel throughout, instead of wood, as in former dredges. It will have 15-cu. ft. buckets, and may be in commission in the spring. It will be equipped with Bucyrus machinery.

Sacramento, October 23.

SIERRA COUNTY

Press reports quote C. C. Derby, manager of the Tightner mine at Alleghany, as saying that the new 10-stamp mill recently built there is running smoothly and has been operated steadily excepting a few brief stops for repairs incident to starting a new plant. The mill will be run during the winter months on ore that has accumulated on the lower dump and that which has been stoped from the newly opened vein. It is reported there is ample water for operating. There will be no cessation of activity in the winter months.

COLORADO

CLEAR CREEK COUNTY

Work was resumed last week at the Linn mine and mill. Stephens Bros. & Olds have a lease on the property.

SAN JUAN COUNTY

It is rumored that electric power may be used in the next few months at the Frank Hough mine, according to reports from Ouray. Electric power would necessitate the construction of only two miles of power-line. Work was to be started last Monday on driving a 500-ft. contact on the 3500-ft. development adit planned for the mine. A good start on development adit already has been made and steady progress is expected.

TELLER COUNTY

The Kavanaugh mill at Cripple Creek will be doubled in capacity in the next three months, and five or six more tanks will be installed. The mill can handle at present about 1000 tons per month.

Carl Johnson, lessee of the Maggie mine on Raven hill, Cripple Creek, has purchased the steam-hoist, compressor, and other machinery of the Rittenhouse mine on Gold hill, and is erecting it at the Maggie. He will purchase another boiler. The shaft, now 300 ft. deep, is to be sunk 100 or 200 ft. in the near future.

The five No. 2 R. Draeger helmets and the pulmometer ordered by the Portland Gold M. Co. will be delivered about December 1. At that date the mine-rescue car of the U. S. Bureau of Mines and a corps of men under J. C. Roberts will be sent there. The Portland employees then will be given expert instruction in mine-rescue work. Frank Smale is manager at Victor for the Portland company.

Ore assaying about $30 per ton has been found at the surface on the Comet claim of the Isabella estate, Bull hill, where Lees & Co. are working. The Requa Savage shaft, on the east slope of Beacon hill, has been temporarily shut down by the lessees.

The Lewis Mining Co. has been incorporated to conduct mining operations, principally in the Cripple Creek district. The incorporators are F. E. Brooks, M. B. Hurley, and G. W. Bierbaum. The corporation is capitalized at $150,000 and has its principal place of business at Colorado Springs.

The Portland G. M. Co. paid a dividend of 2c. per share on October 17. The new mill, during the quarter ended September 30, treated 29,599 tons of low-grade ore at a net profit of $33,111. The total net profit of the company from the mill during the first nine months of the year was $100,939. It is rumored that tube-mills will be added to its equipment. Additional tanks and machinery are now being erected there and excellent results are being obtained in the mill.

Messrs. Starkweather and Wilson, lessees of the Ingham claim of the Doctor-Jack Pot estate, on Raven hill, last month shipped 12 cars of ore, from a chimney opened on the adit level. The Hahnewald brothers, of Leadville, have installed machinery at the Old Gold mine, on which they have a long lease and propose to start active working at an early date.

IDAHO

BONNER COUNTY

William M. Ridpath, of Spokane, reports that the Pittsburg Mining Co.'s property near Lakeview has returns from several hundred tons of ore from the No. 1 tunnel ranging from 80 to 127 oz. of silver per ton in carload lots.

SHOSHONE COUNTY

With the price of spelter, lead, and silver as at present, it is reported that the Federal M. & S. Co.'s common stock will not be on the dividend list for some time.

Charles McKinnis, manager for the Caledonia Mining Co., operating in the Coeur d'Alene district, says in a letter to the shareholders that the lower adit, run from Deadwood gulch to tap the vein at a depth of 800 ft. below the present lowest working, has passed through the Osburn fault and is now making good progress. The compressor-building and a dry-house, 16 by 30 ft., have been completed, and the foundations are in place for the machinery at the adit mouth.

Robert Sheffels, president of the Jack Waite M. Co., operating a property of the same name near Murray, reports that the face of the main adit shows 3 ft. of clean shipping ore and 30 in. of fine concentrating ore. The adit is now in 1450 ft. and at a depth of 600 ft. has penetrated the shoot for 45 ft. and the orebody is widening. Frederick Burbidge, formerly manager of the Bunker Hill

& Sullivan mine, is looking over the Jack Waite and other properties to determine if the Washington Water Power Co. shall extend its transmission lines to the district. Pending the construction of a mill, the company will resume the shipment of its first grade ore, though it involves a wagon haul of 12 miles to the Oregon Washington Railroad & Navigation Co.'s line at Eagle.

Twenty thousand dollars' dividend, at the rate of 2c. per share, paid October 21, brings the disbursements of the Hecla M. Co. to $210,000 for the first ten months of 1911, and to $2,220,000 in the total amount paid. The cash surplus on hand amounts to $216,471. Profits for the year ended July 31 were $238,850, according to the report submitted to the stockholders at the annual meeting at Spokane, when it was decided to pay an extra dividend quarterly so long as the present earnings continue. The shareholders also arranged to end the fiscal year on December 31, instead of July 31 as heretofore, and changed the date of the annual meeting from October 6 to the second Tuesday in April. The report of the directors states that the ore reserves in the Hecla mine at Burke, Idaho, are sufficient to last five years at the present rate of production. The mine now is well developed to the 1200-ft. level. Sinking of the main shaft to the 1500-ft. level is in progress, 120 ft. of this work already having been acomplished. The officers and directors were re-elected.

BUNKER HILL MILL.

The Bunker Hill & Sullivan M. & C. Co. has paid its 169th dividend. It was the usual monthly disbursement of $65,400, bringing the total to date to $13,028,850. The Bunker Hill mine and mills are situated at Wardner and Kellogg.

MONTANA

LINCOLN COUNTY

(Special Correspondence.)—F. C. Schrader, of the U. S. Geological Survey, who during the past summer made an examination of the placer ground on Libby and Kennedy creeks, in northwestern Montana, has made his report, and estimates that there is $100,000,000 worth of gold in the deposits, much of which, he states, to judge from the attention which the district is receiving, will probably be mined in the near future.

The report states that "tests made of the deposit in six different shafts, fairly well distributed over about half a square mile in the southern part of the basin, show the gold content of the deposits to range from 20c. per cubic yard near the surface, to about $5 per cubic yard in the bottom foot of gravel next to bedrock. The deposit in the southern part of the basin seems to contain on the average about 80c. per cubic yard, including everything from the surface down to bedrock, or about $4 per cubic yard at bedrock. This would amount to about $17,360 per acre."

Two companies are now operating in the Libby creek district, and at least two others are expected to install plants during the coming year. Some of the ground is admirably adapted for dredging operations, but no dredges have as yet been installed.

Libby, October 17.

MISSOULA COUNTY

Frank Thomas, of Missoula, has reported that the $100,000 gold dredge of the Kennedy Creek gold mine has started operations. The dredge has a daily capacity of 2500 cu. yd., and it is estimated that the gravel will yield large returns, as a recent report upon the district by F. C. Schrader indicates that the gravel is very rich.

MONTANA

SILVERBOW COUNTY

The North Butte M. Co. has paid a quarterly dividend of 30c. per share. The report of operations, accompanying the dividend checks, states that a total of 4053 ft. of development work has been done. The ore reserves have decreased, as the amount of ore blocked out in the Snowball vein has not kept up with the ore in the stopes, and the development work practically has been confined to this vein. The opening up of the three lower levels of the Edith May and Jessie veins will be rushed. Several months will be required to block out these orebodies.

NEVADA

CLARK COUNTY

Work was resumed last week in the Duplex mine at Searchlight. Most of the week was devoted to repairing damage due to the failure of former operators to draw out the water in the pipes and to safeguard the condition of the machinery when the property was shut down. The machine drills were used on October 20. G. F. Colton is the present owner of the property.

Work has been resumed at the Searchlight-Parallel mine, near Searchlight, and extensive development work will be done, according to recent press reports. T. D. Forney is in charge of the property.

A vein of ore assaying about $50 per ton has been discovered at the Luisa claim, owned and operated by Nels Nelson, state reports from Searchlight.

ELKO COUNTY

Sixty-five per cent of the capital stock of $1,500,000 in shares of a par value of $1 each of the Bluster Mining Co. of Jarbidge has been taken on option and bond by Patrick Clark of Spokane at 50c. per share. Development work will continue under the present management until Mr. Clark takes charge of the property. The company has $20,000 and 700,000 shares of stock in its treasury.

ESMERALDA COUNTY

The Goldfield Florence company has reduced its working force by 28 men, the reduction being due to a shortage of ore. The mill will be operated eight hours per day, with a production of about 100, instead of 170 tons, per day. Seven power-drills will be kept going. The shaft will be sunk deeper and other levels will be developed.

The rich vein on the C. O. D. Con. property from which some $15,000 was taken about three years ago, but which was lost, has been rediscovered by Elmer Lowden and Howard Hardwick, lessees on the Victor claim, according to reports from Goldfield. The ore is said to assay between $250 and $500 per ton.

HUMBOLDT COUNTY

The Yellow Dog Mine Co. has been incorporated to develop the Yellow Dog Mining Co.'s property in the Dyke section of the Pine Forest range. The company is capitalized at $1,000,000. The entire issue is treasury stock and is assessable. S. L. Baker and L. K. Baker of Winnemucca lead the board of directors.

Rich ore has been discovered on the Golden Horseshoe property in Wild Horse canyon by Stall Brothers, according to a recent report from Lovelocks.

NYE COUNTY

The Fairview mill is to be moved from Shoshone creek to the mine, to eliminate the cost of transporting the ore. The Blue Jacket mill is to be ready for crushing ore in a few weeks. C. E. Rice is manager of the property.

Construction has been commenced on the Round Mountain Tungsten M. Co.'s mill on Shoshone creek. The lumber and first load of machinery are on the ground, and the rest of the machinery is reported to be at Tonopah. Carl Goblin is superintendent of the mill.

Development has been resumed at the Hoosier property. The shaft is down 335 ft. Tom Baker is superintendent.

The construction of the new customs mill and smelter to be erected at Tonopah by capitalists of that place will be started at once. The mill will be equipped with ten stamps, two tube-mills, and a cyanide plant with Dorr classifiers and Trent agitators, and will be built according to plans prepared by John G. and Charles Kirchen. A sampling plant will be constructed in connection with the mill, which is to be operated by electric power. To handle the project the Associated Mining Co. has been organized under the laws of Utah, capitalized at $50,000. It is a close corporation. J. G. Kirchen, who is manager for the Tonopah Extension M. Co., is one of the principal stockholders, and will be in charge of the new mill, which will be situated on the property of Manhattan Con. M. Company.

ROUND MOUNTAIN.

The quarterly report of the Round Mountain M. Co. shows a saving of 30% in ore-treatment, or $1.90 per ton. The mill is running well. R. H. Ernest is superintendent for the company. J. A. Stephenson and Chester Small, who own a quicksilver claim four miles east of Round Mountain, are negotiating with several companies to supply their mills with quicksilver, according to recent reports from Manhattan.

Storey County

The production of the Comstock mines last week amounted to $42,158, or nearly $3000 more than the previous week, according to the reports of the superintendents of the various properties. The Ophir was in the lead with a production of $21,392, the output being 400 tons of ore with an average assay value of $53.48 per ton. The Mexican hoisted 230 cars of ore with a gross assay value of $15,562. The Crown Point produced ore valued at $5204. The total production of the North end mines was $36,954. The Mexican output included the largest amount of high-grade ore ever extracted in one week from the south end of the stope above the 2500-ft. level, 129 cars, averaging $116 per ton.

White Pine County

The large bunkhouse of the Nevada United M. Co. at Ward was destroyed last week by fire, the origin of which is not known. The total loss is estimated at $4500. The company's loss was $3000, one-third of which is covered by insurance.

NEW MEXICO

Socorro County

(Special Correspondence.)—The Ernestine M. Co. milled 740 tons of ore during the week, yielding 56 sacks of concentrate. In addition, 9250 oz. of gold and silver bullion was smelted. New mortars for the battery are on the way from Silver City. The power-plant building with foundations is completed and in readiness for the De La Vergne high-compression oil engines, which will be delivered at an early date.

An average of 60 tons per day is being hauled to the Treasure Mining & Reduction Co.'s mill by wagon. A wire-rope tramway will be built at an early date, saving $1.50 per ton in transportation expense. When the tramway is built, the capacity of the mill will be doubled. The development in the lower levels continues in good ore.

During the week 300 tons of ore were milled at the Deadwood mines, which yielded 20 sacks of concentrate in addition to the gold-silver precipitate. Mine development was advanced 45 ft., opening up new ore. At the Gold Dust Mines property three shifts are advancing adit No. 3, which is 468 ft. lower than adit No. 1, where an oreshoot 530 ft. long has been developed. More than 1000 tons of ore was milled in the seven days by the Socorro Mines Co. The framework for the new power-house is being erected. The working shaft on the Pacific of the Oaks Co. was sunk 7 ft. The workmen's dwelling was completed at the main adit.

Mogollon, October 20.

OREGON

Baker County

The mill of the Blue Mountain M. Co., near Baker, has been set up and tested. Water for the mill is pumped from the shaft. A tramway is being built from No. 3 adit to the mill, a distance of 225 feet.

The season's work of the placer properties on Boulder creek, near Sumpter, has been completed, and all preparations have been made for next summer's run.

Sidney C. Love, formerly of Chicago, owner of the Mormon Boy mine, near Bourne, who was in Spokane a few days ago on the way to Europe, says the property is sending high-grade gold ore to the smelter at Tacoma. He reports that the Ben Harrison and Dixie Meadows, owned by Eastern people, also are in good shape.

UTAH

Kane County

G. T. Holladay, of Salt Lake City, owner of deposits of uranium ore about six miles from Pahreah, is quoted in the press as saying that preparations for mining are being made and that a mill undoubtedly will be erected on his claims.

Salt Lake County

Press reports from Bingham Canyon state that E. A. Wall and J. E. Bamberger have agreed upon terms by which Mr. Wall is to take over 50,000 shares of the Daly West M. Co. at $2 per share. This will give him control and puts an end to reports that the company will be merged with the Ontario Silver Mining Co., adds the report, as he already owns 25,826 shares of the stock issue of 150,000 shares.

The net profit of the Utah Con. Copper Co., taking copper at its present price, for 1911 will be about $300,000, according to an estimate in a report recently sent to stockholders. In the report U. H. Broughton mentions his resignation as president. He recapitulates the development done since the annual meeting in March, and mentions the discovery of two new lead orebodies, and sinking of the 3-compartment shaft from the No. 7 to the No. 11 level and its equipment with an electric hoist.

Summit County

The report of the Daly West M. Co. for the quarter ended September 30 shows cash on hand, after disbursing $54,000 in dividends, amounting to $306,250, making a net gain of $24,009. The orebodies mentioned in the previous report have proved to be persistent. The development work done includes a winze from the 1900-ft. level to the 2100-ft. level for ventilation, safety, and prospecting, and which revealed an orebody supposed to be a continuation of that found at the 1900-ft. level. A drift on the 1700-ft. level, at a point 800 ft. from the shaft, has been in ore of good value for 60 ft. In order to avoid trouble with ranchers, as noted in another column of this issue, the Silver King Coalition M. Co., the Daly-Judge M. Co., and the Daly West M. Co. have jointly bought 700 acres of land for impounding tailing.

WASHINGTON

Ferry County

(Special Correspondence.)—The first two units of the mill of the North Washington Power & Reduction Co. will probably be running on ore by November 10. All of the machinery but two boilers for the power plant has been received and adjusted to its place. The boilers have been shipped and are about due in Republic.

The Hope company has installed a gasoline engine and compressor for four drills at the Black Tail mine. On the 300-ft. level at new drift has been started on the north side of the fault, to pick up the main Black Tail and the cross-vein.

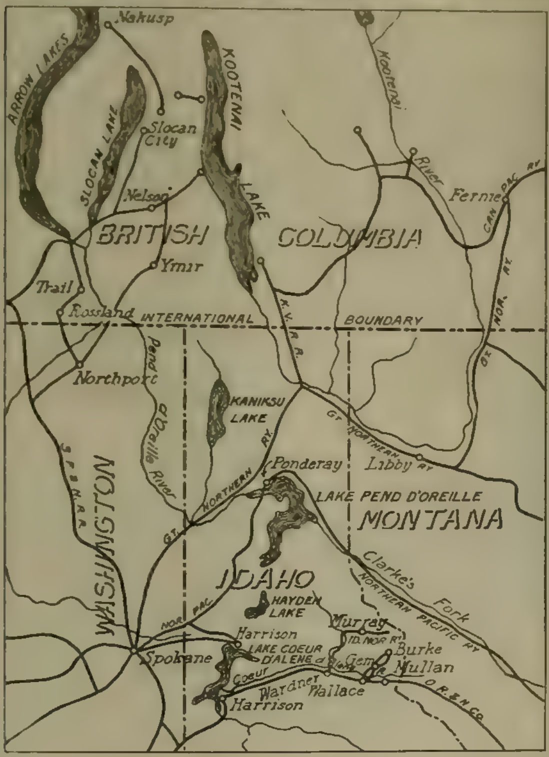
The San Poil Consolidated and Knob Hill companies are planning to join in the construction of a cyanide mill for the San Poil, Trade Dollar, and Knob Hill mines.

Republic, October 23.

CANADA

British Columbia

Jay P. Graves, vice-president and general manager for the Granby Con. M. S. & P. Co., announced on returning to Spokane from New York, that $1,500,000 will be expended in constructing and equipping a 2000-ton smelting plant at Hidden Creek. This includes a tramway, ore crushers, and ore docks at tidewater. Two hundred men are at work on the grading. He also said that the Hidden Creek properties, which have been taken over by the Granby company, will be on a producing basis in a year. Mr. Graves estimates that between 12,000,000 and 20,000,000 tons of ore is in sight at Hidden Creek aand Phoenix. The company has just completed a new plant for disposing of slag at Grand Forks, at a cost of $50,000. The Granby works are practically idle because of the coal miners' strike at Fernie, called last April. The company's coke supply was exhausted in August.



BOUNDARY AND COEUR D'ALENE DISTRICTS.

Ontario

E. Hargraves and W. H. Wright, both of Haileybury, have discovered free gold on their claims in Teck township, Swastika district, according to recent reports from Cobalt. The gold was found in a large dike of quartz and schist.

The Sutherland Cobalt Silver Mines, Ltd., is to continue sinking its shaft, now down 115 ft., to a depth of about 125 or 150 ft. before cutting a station. No change in formation has been found so far in the shaft, which is in conglomerate formation. At the mine there is a small compressor supplying air for two drills. A party of the directors of the company has just completed an inspection of the property.

The quarterly statement of the Temiskaming company says that the diabase sill intrusive into the Keewatin formation, has been found in the west cross-cut on the 575 ft. level, and in the main shaft at a depth of 585 ft. The company had on hand, October 1, $305,547, and a surplus, after deducting wages and taxes payable, of $251,559. The regular quarterly dividend of 3%, amounting to a disbursement of $75,000, was paid October 17.

Free gold has been found on the property of the Boston Development Co., Deloro township, Porcupine district, according to recent press reports.

The Beaver Con. Mines, Ltd., in southeastern Coleman, is to build a concentrator, according to recent reports from Cobalt. The mill will have a capacity of 50 tons per day. The plant will be the sixteenth of its kind in the Cobalt district, assert press despatches. The concentrator is to be in operation by February.

A spectacular showing of free gold has been found on the Brydge claim, in Deloro, Porcupine district, say newspaper reports. The Brydge claim has been purchased by a Klondike miner named Weatherby. It originally was under option to Proctor Smith and associates of New York, but they let the option expire.

A spectacular discovery of ore in a dike of porphyry about 300 ft. wide was made last week on the East Dome claim, according to press reports.

MEXICO

Chihuahua

The report of the Batopilas M. Co. for the year ended Dec. 31, 1910, recently issued, shows that operations were carried on at a loss of $106,258, while the year before there was a profit of $52,782. The shipments of silver amounted to 703 bars, containing 738,730 oz. of silver, against 1027 bars containing 1,047,625 oz. of silver for the previous year. A total of 43,612 tons of ore was treated during the year, against a total of 31,258 tons during 1909. Development work done amounted to 28,908 ft., against 26,491 ft. the year before. On June 30 some of the leased properties were taken over by the Batopilas M. S. & R. Co., a British subsidiary company. Of its 300,000 shares, Batopilas owns 225,000 shares.

The Terrezas smelter of the Rio Tinto Copper Co. will reopen about November 1, according to reports from Chihuahua. About 800 men will be employed. The smelter has been shut down for several months, owing to the unsettled political conditions.

The Chihuahua smelter of the A. S. & R. Co. is to resume operations immediately, according to late reports from Mexico. The present capacity is 650 tons per day. If labor troubles can be avoided two more furnaces will be added to the present equipment.

The new steam-plant at the Apodoquina mine, in the Parral district, is now in commission.

Sonora

Work on sinking the shaft of the Alacran mine of the Moctezumo-Arizpe company was resumed last week. It was about 100 ft. deep when work was stopped several years ago. The mine is one of the Mexican Metals Co.'s properties.

A 20-stamp mill and cyanide plant are being erected at the Oro Colorado mine, south of the Penn Sonora, according to recent reports from Cananea.

A carload of ore shipped to the Copper Queen smelter by the Agua Buena mine is reported to have yielded $4274 net, states a Cananea despatch. C. B. Bell is operating the property.

Rich ore has been discovered at the Penn Sonora property, near Nogales, states C. W. Phillips, who is heavily interested in the mine. The company is to build at Aguascalientes, three miles west from the mine, an electric power-plant for the mine, and a mill may be constructed there, according to recent rumors.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

O. B. PERRY was in San Francisco last week.

HOWARD D. SMITH has returned to San Francisco.

FRANCIS DRAKE sailed for Mazatlan on Monday last.

Inquiry is being made for the address of ERNEST G. LOCKE.

GEORGE H. GARREY has gone to Plumas county, California.

W. J. LORING will sail from New York for London on Tuesday.

VICTOR E. TULL, of Seattle, is at the Palace hotel, San Francisco, for the winter.

R. L. MANN, of Cazadero, was in San Francisco this week on his way to Idaho.

E. C. B. HEDEN is at Southampton, England, having returned from Newfoundland.

ELI T. CONNER has been appointed a delegate to the American Mining Congress held at Chicago.

S. F. SHAW has completed a two months investigation of the Porcupine district, and has returned to New York.

E. R. HAGGIN has accepted the position of chemist for the Cananea Con. Copper Co., at Cananea, Sonora, Mexico.

LEWIS F. JOHNSON has gone to Sierra county on mining business, and expects to return to San Francisco in about a month.

E. R. BUCKLEY has opened an office as consulting mining geologist and engineer at 1364 Peoples Gas building, 122 Michigan avenue, Chicago, Illinois.

FRANK H. PROBERT has left for Ray, Arizona, where he will be engaged in the interests of the Ray Central Copper Co. for the next two or three weeks.

HOWLAND BANCROFT has returned from a five months trip through Chile, Peru, and Bolivia, and will remain in Denver until the first of November, proceeding then to New York.

HERMAN KELLAR is in charge of an inspection trip to Ducktown, Tennessee, by the members of the Board of the Tennessee Copper Co. The party includes RICHARD SUTRO and H. M. KILBORN.

P. B. McDONALD has resigned as assistant engineer for the Munro Iron Mining Co. at Iron River, Michigan, to take charge of exploration work on the Marquette Range for the Heidelbach banking interests of New York. His headquarters will be at Negaunee, Michigan.

GEORGE E. FARISH will succeed CHARLES E. WATSON as manager for the Dobie and Tisdale companies of Porcupine, Mr. Watson having resigned to become identified with Plenaurum. Mr. Farish will assume his new duties on October 31, and will represent the Armstrong-McGibbon interests in the Porcupine district.

Obituary

MALCOLM L. MACDONALD, of Tonopah, Nevada, died suddenly of heart disease on October 23, in New York. He was born at Moundhouse, Nevada, and has been prominently identified with the development of that State. In the protracted litigation between the Amalgamated Copper Co. and F. Augustus Heinze he had a prominent part and later was a leading figure in the early development of Tonopah, where he was associated with T. L. Oddie, George A. Bartlett, W. Brougher, and others. In organizing the First National Bank of Tonopah and the Southern Nevada Telephone & Telegraph Co., as well as in promoting the construction of automobile roads across the desert he contributed materially to the development of the mining industry of his native State.

Market Reports

LOCAL METAL PRICES.

San Francisco, October 26.

Antimony	11—11¾c	Quicksilver (flask)	46
Electrolytic Copper	14—15¼c	Tin	45—46½c
Pig Lead	4.50—5.45c	Spelter	7¼—8¼c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50—9.75; large $7.50—8.60

METAL PRICES.

(By wire from New York.)

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Oct. 19	12.23	4.23	6.18	54
" 20	12.23	4.23	6.18	54⅜
" 21	12.28	4.23	6.18	54⅛
" 22	Sunday.	No market.		
" 23	12.30	4.23	6.18	54
" 24	12.30	4.23	6.18	54¼
" 25	12.30	4.23	6.18	54½

ANGLO-AMERICAN SHARES.

(Cabled from London.)

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

	Oct. 19. £ s. d.	Oct. 26. £ s. d.
Camp Bird	1 8 3	1 7 3
El Oro	1 3 3	1 3 3
Esperanza	1 13 1½	1 13 1½
Dolores	1 5 0	1 5 0
Oroville Dredging	0 5 0	0 5 0
Mexico Mines	6 13 9	6 18 9
Tomboy	1 0 0	1 0 4½

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing Prices. Oct. 26.		Closing Prices. Oct. 26
Amalgamated Copper	$ 54	La Rose	$ 3⅞
A. S. & R. Co	65¾	Mason Valley	8¼
Braden Copper	4⅞	Miami Copper	19⅛
B. C. Copper Co	3⅞	Mines Co. of America	4
Butte Coalition	16½	Nevada Con	16⅛
Chino	21	Nevada Utah	½
Davis Daly	⅞	Nipissing	7⅝
Doble	1⅜	Ohio Copper	1¼
Dolores	4	Ray Central	1¾
First National	1⅛	Ray Con	14½
Foley O'Brien	⅝	South Utah	⅜
Giroux	4⅛	Superior & Pittsburg	17
Goldfield Con	4⅝	Tenn. Copper	36
Greene-Cananea	7	Trinity	3¼
Guanajuato Con	½	Tuolumne Copper	3⅝
Hollinger	11⅜	United Copper	1¾
Inspiration	7⅞	Utah Copper	45
Kerr Lake	3⅜	Yukon Gold	3½

COPPER SHARES—BOSTON.

(By courtesy of J. C. Wilson, Mills Building.)

	Closing prices, Oct. 26.		Closing Prices Oct. 26
Adventure	4	Mohawk	$ 41
Allouez	27	North Butte	24¾
Calumet & Arizona	49	Old Dominion	39
Calumet & Hecla	385	Osceola	90
Centennial	9	Parrot	9
Copper Range	62	Shannon	7¼
Daly West	5	Superior & Boston	2⅝
Franklin	6⅝	Tamarack	22
Granby	29	Trinity	2
Greene Cananea, ctf.	7	Utah Con	15½
Isle-Royale	13¾	Victoria	1¾
La Salle	4½	Winona	3
Mass Copper	5	Wolverine	77

NEVADA STOCKS.

(By courtesy of San Francisco Stock Exchange.)

San Francisco, October 26.

Atlanta	$ .15	Mayflower	$ .03
Belcher	.55	Mexican	3.67
Belmont	8.30	Midway	.26
B. & B.	.18	Montana-Tonopah	.90
Booth	.08	Nevada Hills	2.70
Chollar	.13	Ophir	1.95
Combination Fraction	.08	Pittsburg Silver Peak	.95
Con. Virgina	.80	Round Mountain	.59
Florence	.75	Sandstorm Kendall	.03
Goldfield Con.	4.65	Savage	.17
Gould & Curry	.13	Tonopah Extension	1.10
Jim Butler	.23	Tonopah of Nevada	6.90
Jumbo Extension	.20	Union	1.62
MacNamara	.29	West End	.79

Decisions Relating to Mining

Specially reported for the Mining and Scientific Press.

Mining Monazite—Water Rights

Monazite is found in gravel in beds of streams and adjoining the bottom lands under the top soil. In mining it the top soil must be removed and the gravel thus exposed is shoveled on a perforated steel plate and water is then turned upon it so as to work the smaller material into the trough and the coarser gravel and rock shoveled out and thrown aside. The highest percentage of monazite is obtained by washing several times. The right to mine monazite under a lease of minerals and mineral rights for a fixed period as a stated royalty necessarily involves and carries with it such water rights as are reasonably necessary for the proper conduct of such mining operations, and the performance of such an agreement will be specifically enforced by a court.

National Light & Thorium Co. v. Alexander, (S. C.) 67 Southeastern, 310. March 1910.

Construction of Contract for Sale of Mine

A contract for the sale of a mine provided that before final payment the purchaser should keep constantly employed on the premises not less than four men; and it also provided that on his failure to do so all his rights under the contract should be forfeited, including all tools, machinery, and equipment of every kind on the premises. The purchaser on failure to perform the contract and in anticipation of the forfeiture removed the tools and machinery from the premises and executed a bill of sale for all such property. The subsequent seizure of such tools without the purchaser's consent was held in an action of replevin not to confer such a legal title as to authorize a suit in replevin without demand, as there might be a valid claim to the tools under the contract of sale.

Albright v. Brown, (Ore.) 107 Pacific, 458. Feb. 1910.

Gas and Oil Lease

A gas lease provided that the lessor should have free gas to light and heat his dwelling; and it also provided that the lessee was to furnish the gas on or before a stated date, and that the lessee should have twelve months to drill a well or thereafter pay a certain annual rental until the well was drilled. In an action on the lease the covenant as to the free gas was held to be independent of the covenant as to the time of drilling the well, and that the well must be drilled in a reasonable time and what is a reasonable time was said to be a question of fact and not one of law. It was also held that the lessee could not defend an action for a breach of the covenant on the ground that the lessor had forfeited the lease, as a party will not be permitted to take advantage of his own default and defeat a liability created solely by such default.

Indiana Natural Gas & Oil Co. v. Ganiard (Ind.) 91 Northeastern, 362. March 1910.

Performance of Assessment Work—Contiguous Claims

The statute of California requires $100 assessment work to be performed on mining claims. It also provides that where claims are held in common the work may be done or the money expended on any one claim. A failure to perform the required assessment work renders the ground open for re-location. Under this statute the Supreme Court of California has decided that where several contiguous claims are held in common, the necessary work to keep them all alive may be done on any one of such claims, if the labor or expenditure of money is equal in value to that which would be required on all the claims if they were independent. But such assessment work cannot in any event be treated as a performance of the necessary assessment work on another claim, where the claims are not contiguous in the sense of being attingent, but are separated, as example, by ravine, so that work done on one claim would not naturally benefit or have a tendency to uncover minerals in another claim.

Morgan v. Myers, (Cal.) 113 Pacific, 153. Feb. 1911.

Company Reports

BROKEN HILL SOUTH SILVER MINING COMPANY

This company is capitalized at 200,000 shares of £1 each. The report for the half year ended June 30, 1911, shows that during that period 175,472 tons of ore averaging 14.6% Pb, 6.5 oz. Ag, and 13.6% Zn was produced, and 175,041 tons was milled yielding 26,617 tons of concentrate, containing 71.6% Pb, 23.2 oz. Ag, and 5.2% Zn, and 95,990 tons of zincy tailing, containing 3.7% Pb, 3.8 oz. Ag, and 17.6% Zn. All the zincy tailing and 16,721 tons from the tailing dump was treated by Amalgamated Zinc (De Bavay's), Ltd., and 8991 tons from the tailing dump was treated by the Zinc Corporation, Ltd. The operating costs were as follows:

	s.	d.
Mining	10	8.6
Filling stopes	1	7.7
Development	1	3.0
Concentration	3	6.4
	17	1.7

The operating cost for the preceding six months was 16s. 2.8d., the increase being chiefly due to a 10% increase in wages which took effect January 1, 1911. The yield from the mine was £209,113, and from sale of tailing £41,945, a total of £251,058. The cost of mining was £108,193; concentration, £30,888; exploration and development, £10,948; freight and commission, £17,673; general charges, £1096; balance to profit and loss account, £82,260. Dividend 47 and 48, amounting to £60,000, were paid; £5087 was written off as depreciation on plant; £5090 was paid for office expenses, taxes, royalties, and other general items, leaving a balance on hand of £66,000. The property of the company consists of 69 acres, Block 7 and 8, at Broken Hill, New South Wales. The main shaft has a depth of 1150 ft., the milling plant has a capacity of 1500 tons per day. The Zinc Corporation has a contract for the accumulated tailing at 3s. 10d. per ton, and Amalgamated Zinc (De Bavay's), Ltd., has a seven-year contract for the current tailing at 3s. 9d. per ton. The shares were quoted in London on September 15 at 6$^5/_{16}$ to 6½.

CONSOLIDATED MERCUR GOLD MINES COMPANY

This company, which has been operating mines at Mercur, Utah, is capitalized at 1,000,000 shares of $1 each. During the year ended June 30, a total of 239,190 tons of ore was treated, from which an average recovery of $2.32 per ton was made, at a cost of $1.29 per ton for mining and $1.04 per ton for milling, a total of $2.33. The average content of the tailing was $0.88 per ton. The itemized treatment costs are as follows:

	Per ton.
Crushing	$0.1082
Roasting	0.9201
Leaching	0.4687
Precipitating	0.0532
Refining	0.0419

The operating loss was converted into a small profit by miscellaneous sources of income. During the year bullion to the value of $550,696 was produced; miscellaneous receipts amounted to $7933. The total cost of mining was $310,110; milling, $247,974, and $49 for the Manning mill, leaving a net profit on the year's operations of $496. During the year 5558 ft. of prospecting work was done at a cost of $4.40 per foot, but the results were disappointing. Several of the stopes are now practically exhausted, and the end of the life of the mine is obviously near. The management is endeavoring to acquire a new property, in order that the company may continue its existence.

Utah Consolidated has declared a dividend of 50c. per share, the first paid since January 1910. The resignation of Urban H. Broughton was accepted at the meeting. Roscoe H. Channing is the present general manager.

Recent Publications

Twentieth Annual Report of the Bureau of Mines, 1911. Vol. XX, Part I. Pp. 301, ill., index. Toronto, 1911.

The Production of Slate in 1910. By A. T. Coons. Advance chapter from 'Mineral Resources' 1910. Pp. 17. Washington, D. C., 1911.

Forest Fires and Their Prevention, Including Forest Fires in North Carolina During 1910, by J. S. Holmes, Economic Paper No. 22, pp. 48.

The Production of Salt and Bromine in 1910. By W. C. Phalen. Extract from 'Mineral Resources' 1910. Pp. 15, map. Washington, D. C., 1911.

The Production of Sulphur and Pyrite in 1910. By W. C. Phalen. Advance chapter from 'Mineral Resources' 1910. Pp. 18. Washington, D. C., 1911.

Results of Spirit Leveling in Utah, 1897 to 1910, Inclusive. By R. B. Marshall. U. S. Geol. Surv. Bull. 489. Pp. 38, index. Washington, D. C., 1911.

Results of Spirit Leveling in Nevada, 1897 to 1909, Inclusive. By R. B. Marshall. U. S. Geol. Surv. Bull. 488. Pp. 28, index. Washington, D. C., 1911.

Results of Spirit Leveling in Colorado, 1896 to 1910, Inclusive. By R. B. Marshall. U. S. Geol. Surv. Bull. 486. Pp. 107, index. Washington, D. C., 1911.

The House Fly in Its Relation to Public Health. By William P. Herms. Agricultural Experiment Station Bull. No. 215. Pp. 38. Berkeley, California, 1911.

The Cement Industry in the United States in 1910. By Ernest F. Burchard. Advance chapter from 'Mineral Resources' 1910. Pp. 71, map. Washington, D. C., 1911.

The Production of Gems and Precious Stones in 1910. By Douglas B. Sterrett. Advance chapter from 'Mineral Resources' in 1910. Pp. 58. Washington, D. C., 1911.

The Geology of the Lake Superior Region. By C. R. Van Hise and C. K. Leith. U. S. Geol. Surv. Monograph, Vol. LII. Pp. 641, ill., maps, inserts, plates, index. Washington, D. C., 1911.

Gold, Silver, Copper, Lead, and Zinc in the Eastern States in 1910. Mine Production. By H. D. McCaskey. Advance chapter from 'Mineral Resources' 1910. Pp. 19. Washington, D. C., 1911.

Uses of Commercial Woods of the United States: II. Pines. By William L. Hall and Hu Maxwell. U. S. Department of Agriculture, Forest Service, Bull. 99. Pp. 96. Washington, D. C., 1911.

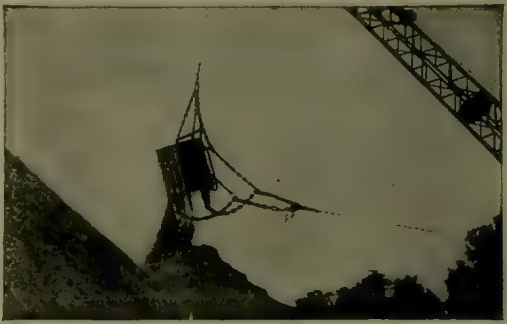
Tertiary Mammal Beds of Virgin Valley and Thousand Creek in Northwestern Nevada, by John C. Merriam, Part II, Vertebrate Faunas, The University Press, pp. 304, illustrated. Berkeley, California, 1911.

Lead and Zinc. Part I.—Metals and Nonmetals, Except Fuels. By R. W. Richards and Howland Bancroft. Advance chapter from 'Contributions to Economic Geology,' 1910. U. S. Geol. Surv. Bull. 470-D. Pp. 30. Washington, D. C., 1911.

Salt in Cyanides. By G. E. Colby and Geo. P. Gray. University of California, Agricultural Experiment Station Bulletin No. 72, October 1911. 3 pp. Though this bulletin deals with the effect of the presence of NaCl in KCN from the standpoint of its use in fumigation, the results given will be of interest to other cyanide users.

Hayward Drag-Scraper Bucket

The Hayward Company, manufacturers of the well known Hayward orange-peel and clam-shell buckets, has recently added a bucket of the drag-scraper type to its line. This bucket and its method of operation are easily seen in the accompanying illustration. It has been developed under the personal supervision of Judson Hayward, who conducted a long series of experiments under actual operating conditions, and the manufacturers claim that the new bucket is superior to others intended for like work, by reason of the greater speed with which it may be operated, greater capacity per single operation, and the ability of the bucket to work equally well in soft and hard material. It is said that it takes two men less than three minutes to change this bucket from a hard-digging bucket to a soft-digging bucket.



DRAG-SCRAPER BUCKET DUMPING IN VERTICAL POSITION.

In the mining field, the new drag-scraper bucket will be found particularly useful in placer mining, where the area of the property is so limited as to prohibit the economic use of a dredge of the California type. Inasmuch as a careful study of the conditions surrounding placer mining contributed to a considerable degree to the design of the drag-scraper bucket, careful attention having been paid to the work of machines heretofore employed in this work, the Hayward Company feels confident that it is now offering a type of bucket peculiarly well suited to placer mining. The digging and suspended mechanism, together with the arrangement for discharging the load, are positive in action, and the control of the bucket in a manner which insures great capacity is therefore possible even with a comparatively inexperienced operator.

Catalogues Received

McKiernan-Terry Drill Co., New York. 'Core Drills.' 68 pages and cover. Illustrated. 6 by 9 inches. 'Pile Hammers.' 16 pages. Illustrated. 9 by 9 inches.

Ernst Wiener Co., 46 Church St., New York. 'Carrying the Burdens of the World,' describing its line of cars, barrows, etc. 8 pages. Illustrated. 6 by 9 inches.

The Watt Mining Car Wheel Co., Barnesville, Ohio. Catalogue G, 'Ore Buckets and Skips.' 8 pages. Illustrated. 5½ by 8 inches. Catalogue H, 'Mine Car Wheels and Axles.' 16 pages. Illustrated. 5½ by 8 inches.

Denver Fire Clay Co., Denver, Colo. Bulletin No. 41. 'Case Gas Furnaces, Etc.' 16 pages. Illustrated. 4¾ by 7¼ inches. Also pamphlet, 'The Donaldson Tilting Crucible Furnace.' 6 pages. Illustrated. 3½ by 6¼ inches.

Edwin Yawger, Denver district manager for the Westinghouse Machine Co., read an interesting paper on 'Condensers and Cooling Towers' before the ninth annual convention of the Colorado Electric Light, Power, and Railway Association, at Glenwood Springs, recently. The article has been printed in pamphlet form.

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EDITORIAL

BULLION is becoming popular in financial exchange and nearly half a billion dollars in this form is now stored at the Denver Mint.

LENDING money to Europe, though not an unprecedented action for the United States, is at least unusual enough to deserve attention, and $10,000,000 in Prussian Government notes is not a small sum.

THE son of Charles Dickens has come to America to lecture upon his father's works and personality, and if he receive a welcome from every lover of the creator of *Mr. Pickwick*, *Agnes Copperfield*, *Mrs. Wilfer*, and *Nicholas Nickleby*, his ovation will be a hearty one indeed.

COMPLAINT has been made that the New York Edison Company has been furnishing power at a wholesale rate below the cost of production, the rate charged the small consumer amply repaying the deficit. This is one of the causes of popular demand for the regulation and control of public service corporations.

IN OUR issue of October 14 we quoted from *The Cement Age* a description of a battery foundation, which was there credited to Mr. F. E. Perkins. We are now informed that this article was actually written by Mr. F. E. Shepard, the president of the Denver Engineering Works Company, and are glad to bestow credit where much credit is due.

JOHN MARSHALL HARLAN, late justice of the Supreme Court of the United States, was a notable figure in many ways. Appointed to the Supreme Bench in 1877, his acts throughout his long term of service exhibited a man as big in mind and soul as he was in physique. Simple and kindly in tastes, staunch and uncompromising in intellect, hater of injustice and oppression, he was of the type of man which the Nation can ill afford to lose.

INDIANA held a conservation congress last week at the call of the governor, Thomas R. Marshall. Many notable speakers addressed the gathering, and permanent committees upon soil, natural resources, water and waterways, forestry, and vital statistics were appointed. The arousing of intelligent public interest in these vital problems of community life must result in great benefit to the body politic, and the precedent set by the Hoosier State should be followed by others.

OFFICIALS of the American Mining Congress were elected at the meeting in Chicago last week, and Mr. S. A. Taylor will be the new president, Mr. D. W. Brunton being first vice-president, and Messrs. E. A. Montgomery and Carl Scholz being the second and third, respectively. Mr. J. F. Callbreath, who has done such notable work in the upbuilding of the Congress, remains as secretary. The meeting was a notable one, both in the list of speakers and in the interest aroused, and on another page we give two of the more important papers of the session, which will be of interest to our readers.

MINE SAFETY was the subject of a demonstration by the Bureau of Mines at Pittsburg, on Monday and Tuesday of this week. The first day was occupied with demonstrations of explosives, safety lamps, and fuel testing, and on the following day visiting teams competed in first aid and mine rescue work. President W. H. Taft presented the prizes to the winning teams, and much interest was aroused.

POWER of things seen, as compared with things unseen will be utilized in the special train which will leave St. Louis on November 17 for an extended tour through Eastern States. The governors of California, Colorado, Idaho, Montana, Nebraska, Oregon, Utah, Washington, and Wyoming will be attended by exhibits of the agricultural and mineral products and wealth of their respective States. California will have double space, in order that the Panama-Pacific Exposition of 1915 may be adequately represented. Aside from the advertising value to the States represented, the plan of sending peripatetic exhibits to the East is one of great educative value, and should be warmly commended.

PERPETUAL restrictions often prove in the end a source of disadvantage. Sailors Snug Harbor, in New York City, owns real estate worth $21,500,000, a bequest made over one hundred years ago with the restriction that the land could never be sold. The trustees, overwhelmed with their holdings, are now endeavoring to devise a method by which the will may be broken and the property sold, so that more remunerative investments may be made. To foresee all the future is impossible, and here may be seen one of the disadvantages of a constitutional form of government, as compared with a monarchy. With new centuries come new kings and emperors, who are reasonably up to date; a constitution persists, even though the form of society which it was framed to govern has changed beyond all recognition.

THE Colorado Scientific Society has recently, in conjunction with the State School of Mines at Golden, arranged for a series of joint meetings in the larger mining towns of the State, for the purpose of awakening among miners a keener interest in the technology of mining. The application of sound business methods to mining and the increasing of the efficiency of metallurgical processes are the chief topics under discussion, and the movement deserves to meet instant success. The outcome will be awaited with interest, for the problem of retaining the attention of 'practical men' is a difficult one whenever discussions advance beyond topics of immediate usefulness. Since the days when Emmons, Van Diest, and Richard Pearce, to name but a few, made the meetings of the Colorado Scientific Society notable it has made a record of achievement, and we rejoice in this new evidence of service to the interests of the profession.

ELSEWHERE in this issue Mr. H. J. Stevens gives interesting data upon the past, present, and future of the copper industry, which will be of much interest to many. Extrapolation is at best a hazardous method of computation, however, and is subject to the error incurred by the proud young father who announced that his three months old son was the finest boy that ever existed, for if he kept on growing at his initial rate he would, at the age of 21, be fifteen feet tall and weigh six hundred pounds. Mr. Stevens concludes with a review of the copper mines of Alaska, discussing them from the business standpoint, and writers for the popular magazines will profit from its perusal. It is interesting to note, in passing, that in a thoughtful article on the Bering river coal-field, in the November *Popular Science Monthly*, Mr. G. W. Kay, professor of geology in the University of Iowa, similarly concludes that, so far as this part of Alaska is concerned the coal resources have been greatly overestimated.

CHINA continues to hold the forefront of public attention, and rightly so, for the changes which are taking place in that huge country are of world-wide importance as well as interest. The most notable development of the week has been the demand of the National Assembly for the immediate institution of a constitutional form of government, and the support of these demands by the army, now under the command of its old leader and creator, Yuan Shih-kai. It now seems certain that the Manchu officials must go, and with them the Chinese officials who, like Shêng Hsuan-huai, have been identified with the program of foreign loans that has incurred popular disapproval. The institution of a republican form of government in China is both improbable and unnecessary, as in constitutional monarchies, such as Great Britain, the will of the people finds quite as free exercise as in republics, such as our own. Meanwhile the fighting between the insurgent and imperialist forces is sharp, with heavy losses on both sides, emphasizing the fact that this is no opera bouffe revolution.

THE seamy side of mining finance has been in evidence in New York this week. In the Federal courts, a judge and jury are trying to unravel the devious methods of George Graham Rice and his adventures with other people's money. Rice has been exposed time and again, and his history has repeatedly been printed in the papers of the large cities. Though a clever and unscrupulous student of human nature, he is erratic and in times of prosperity suffers from an exaggerated ego. In another instance of criminal investigation there is some cause for sympathy. For some months there has been a great deal of comment concerning the promotions of a certain Albert Freeman, who in some way managed to associate with himself Julian Hawthorne, son of Nathaniel Hawthorne, the noted novelist. The younger Hawthorne had already made for himself a name in the world of letters, when he unfortunately turned his pen to the task of preparing glittering prospectuses and letters offering mining shares for sale. Josiah Quincy, ex-mayor of Boston, was an associate of Freeman in these ventures, another being J. B. Hanna, a nephew of the late Mark A. Hanna of Cleveland, Ohio. Nothing could have less to do with the real industry of mining than the operations of such gentry, and it is unfortunate that the legitimate industry should suffer as it does from such promotion jobbery, or that so-called mining ventures should be so frequently used as lure for the unwary, the avaricious, and the overtrustful.

Filling Mine Stopes

Filling of mine stopes is given added present interest by the recent caving in of the stopes of the App mine, in Tuolumne county, California. The damage in this case seems to have been small, owing to the absence of surface improvements in the area affected. But where mine workings underlie towns and other works of man the problem often becomes a serious one. Where timber is employed the cost is great where the ground is heavy and, in addition, as in this case, there soon comes a time when the decay of timbers is so far advanced that they can no longer perform their duty. If the ground yields slowly, swelling as it breaks, all may be well, especially if the workings are so deep seated that the disturbance does not extend to the surface. The filling of excavations with rock may be practised, but is expensive and open to the objection that the shrinkage is considerable where the volume of the stopes is great. In coal mining culm is often used for this purpose, and in the October issue of *The Mining Magazine* Mr. Edgar Pam describes the filling of workings with sand and gravel, which can be transported by water and exhibits a comparatively slight shrinkage. This method is attracting much attention upon the Rand, and is worthy of attention here. At the La Belliere, at St. Pierre Montlimart, in France, the sand from the cyanide plant is flushed into the stopes, at once serving as filling and solving the problem of securing sufficient storage room for tailing, a method that could easily be imitated at other mines. If no other purpose than the conservation of the dwindling supply of timber were served by the more general use of filling methods, their development would be amply worth while, to which safety from mine fires and cave-ins lend an additional advantage.

Industrial Unrest

At the close of a long civic struggle that marked an epoch in our national development the sentiment of the Nation was voiced by a great leader when he said, "Let us have peace." After years of industrial unrest in which efforts, in response to a popular demand that enterprises which directly affect the prosperity and safety of the entire body politic be subject to public scrutiny and control, have exhibited themselves at least as notably in the hampering of development as in the attainment of useful results, we are again nearing a state of mind where both the regulators and the regulated are becoming desirous of peace rather than a continual struggle. That changes, and important changes, are necessary cannot be gainsaid. Once during the Civil War General U. S. Grant is said to have desired to move his army across a river, and calling to him one of his engineer corps, a bridgebuilder of long practical experience, directed him to obtain working plans from the chief of the engineering staff and to construct the bridges as rapidly as possible. Later in the day, seeing the engineer approaching, he inquired what progress was being made in the preparation of plans. "General," was the reply, "the bridges are done; I don't know whether the pictures are or not." The enormous amount of rapid work that has been done in the industrial development of America in the last half-century has made necessary the not waiting for pictures in many cases, with the inevitable result that much has been done which will not meet the final specifications, nor does it all join into one harmonious whole.

Industrial evolution has now ushered in an era of operation of large units to secure economic efficiency, bringing new problems in its train. A 30 horse-power motor-car can be started and stopped at will, and if it is often necessary to adjust and repair it the individual owner is more annoyed than seriously discommoded. But a 3000 horse-power gas engine, which furnishes the electric energy to light a whole city, is a different affair. If adjustments and repairs are necessary, not one but many are affected; the aggregate discomfort and inconvenience forms a total which must be seriously considered. In the mechanical world a comparatively simple solution is available—duplication of machinery makes alteration and adjustment easy. In the economic world we have no such simple recourse; we cannot obtain our twenty-five million tons of steel products elsewhere while the Steel Corporation is being taken apart and reconstructed in accordance with what are the ideas of the moment. Every consideration calls for haste in the repair and readjustment of the industrial-social organization, yet the problems involved are so little understood that there is little consensus of opinion as to their proper solution. The suggestion is made that we need successful business men as legislators, to which the reply is that most of our present difficulties are due to the fact that so many of our legislators already are the covert or avowed representatives of business interests. We have had in the past too much individualism in our social development. The cure for this is not Socialism, but enlightened individualism—less of individualism and more of enlightenment.

The Market Value of Knowledge

For some months past the discussion columns of contemporary journals devoted to civil engineering have contained letters complaining of the low salaries paid to surveyors and civil engineers engaged in similar lines of work. The correspondents appear to believe this an abnormal and adventitious state of affairs, and are loud in their complaints. Yet nothing seems more obvious than that the ordinary laws of supply and demand are applicable; the low salaries paid to surveyors are due to the fact that a sufficient supply of capable men can be obtained at the rate of payment now in force. In the comment made upon the situation two important points seem to have been overlooked. One of these is that the average graduate of a technical school is, immediately upon graduation, incapable of performing most of the duties of engineering work without a preliminary period of training. Surveying is one thing which he can do satisfactorily, providing he has received his college training at any one of a large number of efficient schools. As a result the post of surveyor is the accepted starting point of the young engineer in the larger number of cases. The supply is therefore ample, the demand limited; the result follows naturally. The second point is one that is often overlooked and is frequently the cause of the belief by a young engineer that his merits go unappreciated. It is a fact that the mere possession of knowledge has little earning capacity, only skill in the application of knowledge to the attainment of some useful purpose has earning power, because it is from such application that useful results flow. To put it briefly, the manager draws the large salary because he makes or mars the profits of the enterprise. The horses furnish the strength and speed to haul a dray and receive their board and keep; the man who hitches them in their proper position and guides their efforts in the proper direction receives a wage. The simile is a crude one, but it cannot be denied that knowledge is only the 'basement complex' in which the rich veins of responsibility, initiative, and insight occur, from which golden dividends are won. Complaint is often made that there are few technical men at the head of large enterprises, but nothing is more certain than that if technical men as a class exhibited notable ability in the management of large enterprises their services would be in urgent demand. Frequently men have attained distinction in one branch of knowledge by ignoring the claims of everything outside the circle of their interest. The head of a large enterprise becomes perforce a clearing-house of knowledge, rather than a treasury of information; the demands made upon him are so various that he must of necessity rely upon others as sources of information; only the sifting, collating, and transmuting into useful form are his province. For a comparatively small sum the latest revision of the Encyclopedia Britannica can be secured, and special books of reference are equally available. Such being the case, the human encyclopedia can scarcely expect to receive a princely salary. On any subject there are available scores of men competent to collect data; the man who can see straight through the mass to the essential fact and set it in its right relations is the man who produces results and is rewarded accordingly.

Brazil as a Field for the Prospector

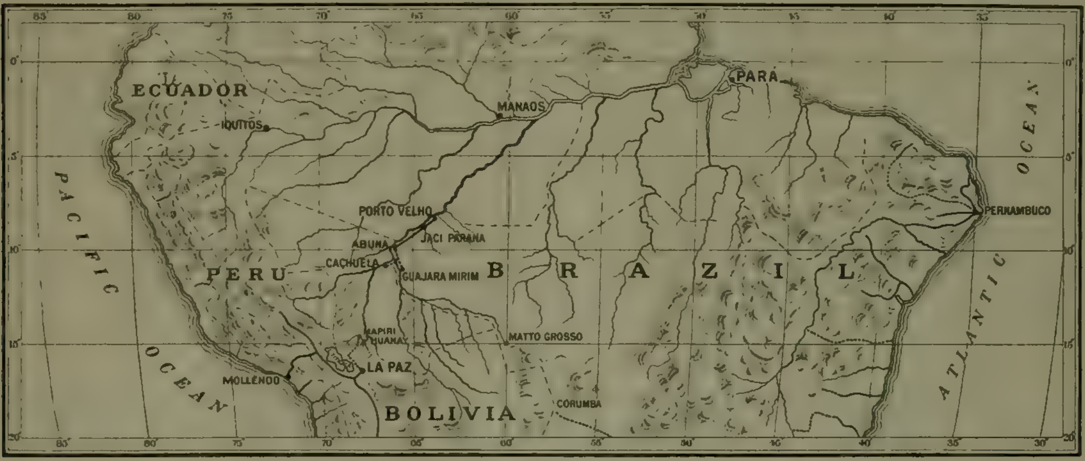
By Alexander P. Rogers

South America was a fruitful field for the early Spanish adventurers. Their cupidity drove them forward with a superhuman zeal to make most astounding trips in the quest for gold through a tropical country which was fairly bristling with all kinds of dangers. To one who ventures in those regions today it comes as a revelation to be confronted every now and then by the evidences of their travel, and you wonder how they ever had the courage to attempt such trips two and three hundred years ago. I am referring especially to the region lying upon the eastern slope of the Andes in Bolivia and Peru. The famous wealth of the Incas is supposed to have come from there, and at the present day the old ditches are still visible in certain places. To the average man this is a *terra incognita*, and few mining engineers are much more familiar with it.

Although the existence of gold has been known for a long time in this locality, the great difficulty of entering the country has deterred most people from making any attempt to look for it. In recent years it has been possible to go to La Paz and the Lake Titicaca region by rail, and several adventurous mining companies have even pushed on over the main range of the Andes to the eastern slope and erected dredges upon some of these rivers. The cost of transportation, however, is almost prohibitive, and the extremes of altitude and climate to be met are enough to lay the average man low in short order. A mine must be in the bonanza class to stand the strain. For these various reasons, the country has been very little explored to date.

Now, however, a route is being opened which should offer a great stimulus to exploration in this field. Most of the rivers upon the eastern slope of the Andes flow into the Amazon sooner or later. In the region in question they first flow into the Beni, which flows into the Madeira, and that river empties into the Amazon, forming an extensive river system through an enormous tropical jungle; but the point which is not generally understood is that this river system is largely navigable throughout the year. Ocean steamers from Europe and America go right up the Amazon to the city of Manáos—a distance of 980 miles from Pará—and many of them go up the Madeira river, 700 miles beyond. From that point a series of rapids extends upstream for 220 miles before navigable waters are again met. Above these rapids, however, the Beni, Mamoré, and Guaporé rivers are navigable another thousand miles for light-draft river steamers; in fact, steamers have been in operation here for many years; but the rapids upon the Madeira have presented a serious obstacle to intercommunication between the two sections.

Realizing this fact, the Brazilian Government undertook to build a railroad around this point. Their first attempt was a failure, but later on they secured powerful financial help and experienced American contractors, with the result that the line is now nearing successful completion. This road ranks with the Panama railroad as one of the great works of man. To the casual observer who travels over its 220 miles in a comfortable coach, this statement may appear unfounded, as he cannot realize the difficulties which had to be overcome, nor does he know what it has cost in human life. They say at Panama that for every tie in the railroad a life was lost. Upon the Madeira-Mamoré railroad this would also have been true, except for the fact that an enormous sum was spent, and is still being spent, upon the most up-to-date sanitary arrangements. It reminds one of the sanitation along the Panama Canal upon a smaller scale. At the time the work was started the death rate from fever and other tropical diseases was appalling. Out of the first 52 men sent to work on the line, 49 died in a short time, and later on when fever again broke out, the whole force became panic-stricken. By a lavish expenditure of money, a system of sanitation was established which has been steadily developed, until today there is a minimum amount of sickness and the end of the great work is close at hand.

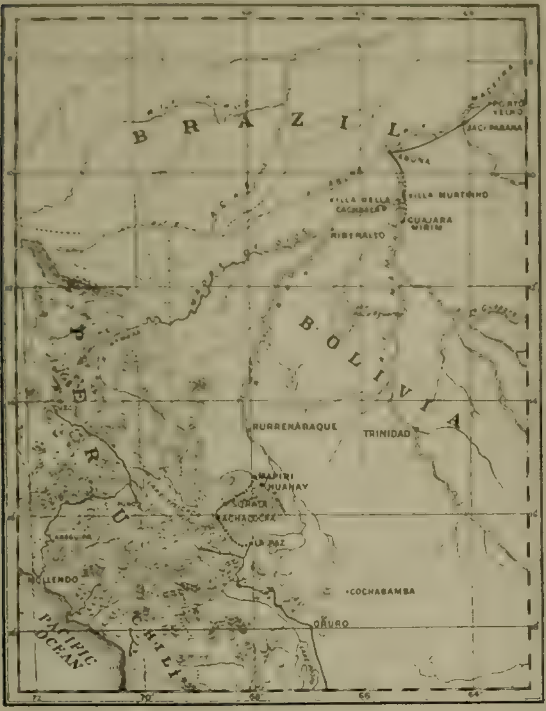


CENTRAL SOUTH AMERICA.

As already mentioned, the road is approximately 220 miles in length, starting from a point on the Madeira river, called Porto Velho, which large ocean steamers touch during most of the year. The upper terminus is at Guajara-Mirim upon the Rio Mamoré, where river steamers can be taken for 1000 miles up the Mamoré or Guaporé rivers. From a place called Villa Murtinho, a branch line crosses the Mamoré and goes to Cachuela on the Rio Beni, at the head of the rapids, where steamers belonging to the railroad company can be taken upstream for seven or eight hundred miles to Rurrenabaque. This is a pleasantly situated little town, about 1000 ft. above sea-level. You are still 100 miles below Huanay, in the gold country at the foot of the mountains, but this is as far as the steamers can go, and rafts must be resorted to beyond.

Just above Cachuela the Rio Madre de Dios empties into the Beni. Another line of steamers run up this river to the Inambari, which is known to contain considerable gold. In fact, a dredge has been installed and is working there now. By reference to a map of South America, it will be seen what a tremendous region is opened up to the prospector. Let no one imagine, however, that it is a playground, because it is not.

The railroad and river steamers have smoothed out the most dangerous and unhealthy places along the line, and have solved the question of transportation as far as they go, but beyond those points it is still rough sledding. It is no worse, however, than the pioneers encountered in going to the Klondike, and there is no extreme cold down here. Perhaps that may not be considered a great inducement to enter the country, but good mines are not found on every hill and the world has been so much explored already that it is necessary to go to these out of the way places in order to find new ones. Until some are found, there is no inducement to the transportation companies to extend their communications farther afield. What they have done is to offer a new point of attack, which cuts down the cost of transportation to more reasonable limits and avoids the necessity of hauling supplies over the tremendous altitudes of the Andes. Up to the present time all freight brought to Rurrenabaque has been much more expensive than that hauled from the Pacific over the mountains to Mapiri or Huanay. With the advent of the Madeira-Mamoré railroad and its system of river steamers, these costs will be reversed, and it remains for the prospector to find the mines before the railroad can be induced to push forward local means of communication. I believe, however, that the railroad would assist any legitimate undertaking throughout the region. A short account of a trip taken from La Paz over the mountains and down the Beni may be of interest to explain the difficulties encountered by travelers.



MAP OF PART OF BOLIVIA.

La Paz lies at an altitude of 12,000 ft. From that city a good wagon-road extends to Achacocha on the eastern shore of Lake Titicaca—a distance of 110 kilometres. From Achacocha to Sorata, the journey must be made on muleback over a rough trail between 35 and 40 kilometres in length. Beyond Sorata the trail crosses the main range of the Andes at an altitude of over 17,000 ft., and then drops down by a series of steep descents to the small settlement of Mapiri, only 2000 ft. above sea-level. It takes four days of strenuous effort to cover this distance of 160 kilometres, camping out each night wherever you may happen to be, but the experience can only be fully appreciated by actually making the trip. Once arrived at Mapiri, the mules are discarded and travel by raft is resorted to.

From Mapiri to Huanay is 60 miles by the river, or one and one-half days travel on a raft, and from there to Rurrenabaque, a distance of 100 miles, requires six days more over a series of rapids and through canyons, where the dangers are largely dependent upon the season. The best time of year to travel over this section is between July and November, when the river is low. After November it becomes very dangerous on account of the heavy rains. The cost of hauling in freight over the Andes is necessarily high, as everything must be sectionalized and carried on muleback.

In contrast to this journey, the route from the Atlantic, by way of the Amazon river, presents a marked advantage in the cost of transportation. It will take somewhat longer, but that is unimportant where freighting costs are in question. From Pará to Porto Velho is a trip of eight or ten days, depending upon the steamers. Traveling over the Madeira-Mamoré railway to the Cachuela on the Rio Beni will take another day, and up the Beni to Rurrenabaque about a week more, when the regular service has been inaugurated; probably before the end of the year, as the steamers are now being built on the river. From Rurrenabaque to the gold country about Huanay and Mapiri the trip is made on rafts, which are hauled up over the rapids. It is slow work, but pieces of freight weighing as much as five tons can be transported in this manner, an impossibility over the Andes. To enter the Inambari country, by way of either Tirapata or up the Amazon, will require about the same length of time.

At Mapiri there is some fever, but this country as a rule is not afflicted by the bad fevers found upon the lower Amazon. Anyone going in there, however, should carry a folding bed and finely woven mosquito net, as well as a plentiful supply of quinine, bismuth, and other necessary medicines. These things, as well as canned food and prospectors' outfits, can be purchased at Rurrenabaque. It must also be understood that the country is difficult to prospect on account of the dense tropical jungle covering everything, but the small rivers are numerous and the best opportunities at present will be found in placer deposits suitable for dredging or hydraulic purposes upon the borders of these streams. There is a vast region here awaiting hardy pioneers, which has been lying untouched for years, simply because it could not be easily reached. The point of this article is to draw attention to the fact that a short stretch of railroad along the Madeira river on the western boundary of Brazil has changed these conditions to such an extent, and will change them still more in the future, that a new field has practically been opened to the prospector.

Rediscovery of Lost Mines

An account of the rediscovery of certain lost emerald mines in Colombia is given by Douglas B. Sterrett in an advance chapter from the 'Mineral Resources of the United States.' When the Spanish took possession of that country in the sixteenth century the emerald mines of the Indians were seized by them. Excessive cruelties were practised by the Spanish mine workers on the Indians employed in the mines. In the war of independence of 1816 the country was so desolated that the mines of Cosquez and Somondoco were entirely lost. A Colombian named Francisco Restrep, guided by a few hints given in ancient Spanish parchment maps, and with little or no knowledge of geology or emeralds, undertook the search for the lost emerald mines. In 1896 he found traces of ancient workings and later the large workings of the lost mines. These mines are situated on a ridge of the great eastern range of the Andes, at an elevation of about 9000 ft. above sea-level. The great open-cuts and tunnels were scattered over an area 6 miles long and 3 miles wide. Some of the working faces of these mines measure 700 to 800 metres on steep slopes; of this, about 100 metres is emerald-bearing and the rest non-productive.

The Valuation of Oil Lands

By William Forstner

Among the several problems which a consulting engineer has to solve when examining an oil property, that of a proper valuation of the property, which will afford a basis for its financing, is undoubtedly one of the most difficult. The same question is considered one of the most important in examining a mining property, and in the case of oil properties the difficulties are much greater. In recent issues of *The Mining Magaine* M. H. Burnham has presented a series of articles bearing on 'The Finance of a Mine,' and I shall try to apply his ideas as far as possible to oil properties.

Mr. Burnham bases the capitalization of a mining property upon the rule that: "The requirements from the yearly return on capital invested in any undertaking with a terminable life are, that a portion be set aside to redeem the capital, another to provide such interest as is paid by Consols, and a third to meet the risk of loss. Expressed in simplest algebra this may be written:

[1]$D = r' + r'' + r'''$."

For American conditions these terms would express: D, the yearly net profit; r', the general rate of interest on money invested in high-class securities; r'', the yearly contribution for capital redemption purposes; r''', the portion set aside to meet the risk of loss of either capital or interest.

In estimating the value of mines, r' and r'' are covered by the net profit on the ore actually blocked out in the mine, in the case of gold ores, a known quantity, while in the case of other metals the value of the product must be conservatively estimated according to its market value and the general market conditions at the time, and the variations in its selling value must be included in determining the risk rate r'''. In estimating the value of an oil property the known factor is missing, or only exists to a small extent. Oil properties may be subdivided into the following eight classes:

Class 1: *Properties with producing wells and surrounded by producing properties.* Here we have the most favorable conditions to deduce a valuation. The value of an oil property consists in the profit that can be obtained by extracting the oil existing beneath its surface. This profit depends upon: the amount of oil which can be extracted; the outlay required to extract and market this oil; and the market value of the oil at the time of the sale thereof.

The amount of oil which can be extracted from a given territory can at the best only be approximately estimated. The oil-bearing parts of the underlying strata occur in lenses, which vary greatly in size, and are not of regular thickness. Besides, the degree of coarseness of the granules forming the material wherein the oil accumulates varies considerably in most of the lenses, as is proved by the microscopical study of the oil sands in neighboring wells. The degree of cementation in each individual lens also varies. The degree of saturation of the oil-bearing material is then a constantly varying factor. The pressure under which the oil exists is also variable, especially in those fields where the oil contains occluded gas. When we further consider that the production of a well is greatly influenced by slight imperfections either in drilling or completing the well, which may cause interrupted access of the oil to the sump which forms at its intake, it is clear that the production of each individual well, even within the restricted area of a property, is a variable factor. For instance, take the records of three properties, one in the Kern River field, one in the Coalinga field, and one in the Sunset field. In the first, covering 160 acres, the thickness of the oil sands varies from 95 to 404 ft.; the monthly output varies 26%. In the second, covering an entire section, the thickness of the oil sands varies from 110 to 547 ft., and the daily production per well from 20 to 636 bbl.; neither is the production of each individual well constant; it varies in some extreme cases 70%. In the third, covering 160 acres, the thickness of the producing oil sands varies from 32 to 247 ft., and the monthly production varies 33%. These figures show how irregular the production is on individual properties.

As to larger areas, for the year ended June 30, 1911, the daily average production of the wells, taken month per month in the different fields of the State, vary as follows:

Field.	Highest month, bbl.	Lowest month, bbl.	Per cent of highest.
Kern River	26.6	24.4	93.8
Coalinga	84.2	64.5	76.6
McKittrick	96.0	75.4	78.5
Midway	207.1	122.6	59.2
Santa Maria-Cat Canyon	185.6	119.6	64.4
Salt Lake-Sherman	38.1	29.1	76.4
Whittier-Coyote	24.9	18.4	73.9
Fullerton-Brea Canyon	75.8	45.7	60.3

I do not include the Sunset district in this list because its production during the last six months of the year 1910 included the shipment of the oil from the Lakeview well accumulated in the prior months. The figures for the Coalinga field are influenced by the very high production of the month of July 1910, and the extraordinarily low production during February 1911, which latter was due to the destruction of the pipe-lines caused by heavy storms. Eliminating these two months the figures would be:

Highest month, 79.4;

Lowest month, 68.2; 85.9% of the highest month.

In the Santa Maria-Cat Canyon field I eliminated the month of June 1911, because the production of that month was abnormally low, due to the sanding up of the Palmer wells, which had been temporarily suspended as the storage capacity of the company was filled with surplus oil. The above table shows that the average daily production per well in the different fields varies very largely except in the Kern River field, where it remains remarkably steady.

The only way to arrive at a satisfactory estimate of the production is to study the conditions of production and the behavior of the different wells on the property, and on those surrounding it, the conditions of the underground water, and other factors, and to base upon these data an estimate of the daily average production. The net profit to be derived from the sale of the oil will depend upon the market value of the oil and the cost of its production. The former is again to a large extent a matter of estimate, depending upon the future condition of the market. The probable minimum price for the next year will be a safe estimate, and the risk of a drop in the price will have to be taken into account when determining the value of r'''.[2] If the books of the company operating the property are well kept, the cost of production can readily be ascertained. This item includes only the care of the producing wells and their repair, the cost of handling the product, and general expenses, but does not include new development work. Unless some of the wells are in bad shape, and will require considerable work, perhaps redrilling, the cost of production can be closely estimated. In this manner we arrive at the figure of the net returns from the actually developed resources of the property.

The operation of an oil property consists in the extraction of the resources therein contained, and in most cases after these are extracted the value of the property may be considered zero. It is therefore necessary to provide for an amortization fund, which at the time of the depletion of the oil resources will at least equal the amount originally invested. The length of time within which the resources of the property will be exhausted determines then the value to be assigned to r″. Here the engineer meets another difficulty. Oil development in California is of too recent date to furnish reliable data in regard to the longevity of the wells in the different fields, and more so in the different portions of each field. In the Kern River field wells 11 years old are still producing, at a rate indicating but a slight yearly decrease in the production. In the Coalinga field, wells 10 years old are still producers; and in Los Angeles and Ventura counties older wells are still active, but the latter are small producers. Assuming, as is generally the case, that the property is only partly developed, it will be safe to allow it a productive life of 15 years, and assuming the rate of interest at 5%, then figuring at compound interest, a yearly sum equal to 4½% of the investment will at the expiration of that time refund that investment.

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[1] *The Mining Magazine*, May 1911, p. 361.

[2] *Loc. cit.*, p. 362.

The risks incurred in the fluctuations of the market value of the oil, and the risks of loss either in capital or interest to be taken in the operation of the property are combined in the terms r‴. The market value of the oil depends on so many conditions influencing the relation of production to consumption, that it is impossible to predict the course of its fluctuations with sufficient certainty to allow anything but an approximate value to the term representing that risk. The influence of the fluctuation of the market value on the net profits depends upon the relation of the value of the oil to the cost of production. For instance, considering the reduction in the prices paid by the Standard Oil Co. made a few months ago, from 65 to 45c. per barrel for oil above 22° B., and from 50 to 30c. per barrel for oil below 22° B. Assuming the cost of production at 10c. per barrel, this meant for the high-grade oil a reduction of profit from 55 to 35c. per barrel, or of 36.4%, and for the lower-grade oil from 40 to 20c. per barrel, or 50%, although in each case the reduction was 20c. per barrel. The engineer will have to give his term a value based on his conception of the existing conditions, and those he considers most probable to arise in the future. In my opinion, from 3 to 5 will cover the different cases.

The risk of loss either in capital or interest during future operations depends largely on the conditions of the oil occurrence in the territory within which the property is situated. In some parts of the California oilfields these conditions are very regular, so that the wells can be kept on production at little expense. In other parts water has invaded the oil sands, or may be expected to do so within a short time, and will cause great expense, and may materially affect the production of the wells. In other parts the character of the oil sands and the heavy gas pressure in the oil measures render the production of the wells irregular, necessitating a great amount of repair on the wells, often requiring them to be redrilled, and sometimes to be abandoned; and in the case of new wells causing them to be failures, or to cost an excessive amount of money. The value to be allowed for this portion of the term r‴ varies, then, within wide limits; which I suggest as from 3 to 10.

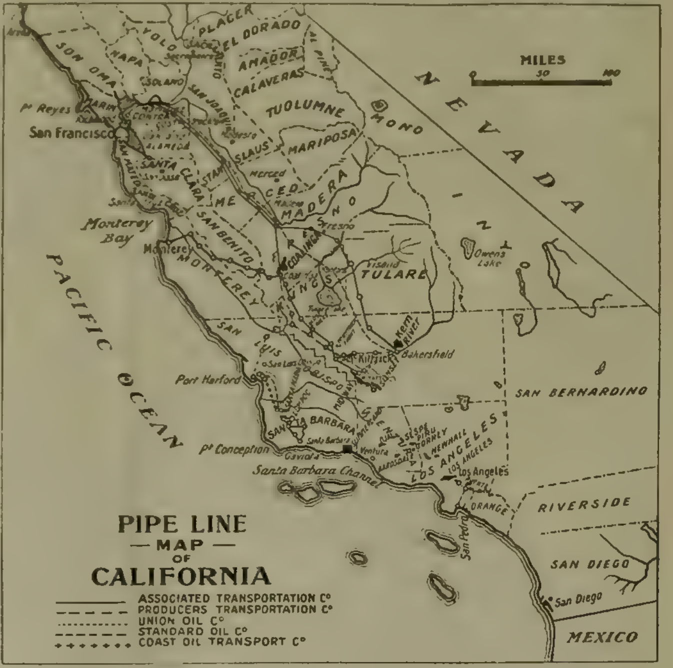
The values in the equation

$$D = r' + r'' + r'''$$

then vary from D = 16 to D = 25. In words: the investment in a partly developed oil property surrounded by producing properties, must be based on a capitalization of the estimated net profits, at rates varying from 16 to 25%. This investment consists of two parts; one covering the purchase of the property, and the other covering the money set aside as working capital for the proper development of the property. The revenue on the first must be covered by the net profits of the property at the time of the purchase, and must then represent these profits capitalized at rates varying from 13 to 15%, r′ + r″ + that portion of r‴ representing the risk of the fluctuation in the market value of the oil.

CLASS 2: *Properties surrounded by producing properties, but not developed.* In this case we have no net profits. A study of the conditions of the surrounding properties will give the engineer data on which to base an estimate of the probable capacity of the wells to be drilled. In this case profits will only begin to realize after a certain lapse of time; the risks due to possible fluctuations in the market value of the oil are greater than in the first class, and ought to be placed at the higher value, 5. The risks of loss of either capital or interest during development work are also somewhat larger, and may be estimated to vary between 5 and 10.

As the net profits will only be realized after a certain amount of development work has been done, we have in this case to consider deferred dividends. Let the term r⁗ represent the rate necessary to make up the loss of interest during the deferred period. For instance, assume it will take two years before the property can be placed on a dividend-paying basis, and assuming the life of the property at 15 years, then:



PIPE LINE
— MAP —
OF
CALIFORNIA

$$r'''' = r' + r'' + r''' \frac{15-13}{13}$$

At least a portion of the working capital will have to be expended before profits can be realized; the total capitalization will be estimated upon the basis of 23 to 28% for the estimated net profits after two years operation, and after deducting from this figure the working capital, we obtain the investment in the purchase of the property.

CLASS 3: *Properties with producing wells, but only partly surrounded by producing territory.* In this case the risk of loss of either capital or interest during development has to be placed higher than in the first class; I suggest the limits at from 5 to 12. For the other terms the values suggested for the first class can be used. A producing property only partly surrounded by producing properties must be based on a capitalization of the estimated net profits, at rates varying from 18 to 27%, and that part of the investment representing the purchase of the property must represent a capitalization of the net profits at rates varying from 13 to 15 per cent.

CLASS 4: *Properties partly surrounded by producing territory, and undeveloped.* In this case, as in that of the second class, the risks due to the fluctuations in the market value of the oil have to be placed at a higher rate than in the first class. Those of loss of either capital or interest during development are higher than in the third class, and I suggest placing the limits at from 6 to 14. The term providing for deferred payments, as explained in the second class, will also have to be introduced. The total capitalization will be estimated upon the basis of 24 to 33½% of the estimated net profits after two years operation, and the investment for the purchase of that property shal only represent that sum less the working capital.

CLASS 5: *Properties with producing wells, but at a short distance from other producing territory.* In this case the risks of loss of either capital or interest during development are much larger than in the former cases, and ought to be allowed figures varying from 8 to 16. Generally the number of wells in this case is small, and the production relatively small. The facilities for marketing the oil are also generally insufficient, so that the net profits at the moment of purchase cannot be given the value allowed to them in the first and third class; in other words, r''' will have to be increased, and r'''' will have to be allowed a certain value. The basis of capitalization will then be:

$r' = 5$

$r'' = 5$

$r''' =$ from 13 to 21.

r'''' on the basis of 1 year until dividends are paid $=$

$$(r' + r'' + r''')\frac{1}{14}$$

Consequently this varies from 24½ to 33% on the estimated net profits after one year's operation, while at least part of the working capital will have to be deducted to arrive at the investment allowed for the purchase of the property.

CLASS 6: *Properties at a short distance from producing territory, but undeveloped.* In this case the risks of loss of either capital or interest during development are larger than in the fifth class, and should certainly be allowed figures varying from 10 to 20. The deferred dividends ought to be figured for a period of 2½ years, and the basis of capitalization will then be varying from 30 to 42% of the estimated net profits after 2½ years of operation, from which amount the working capital has to be deducted to arrive at the investment allowed in the purchase price.

CLASS 7: *Properties with producing wells, but at a great distance from other producing territory.* This case is governed by the same considerations noted in the fifth class, except that the risks of loss of either capital or interest are larger and ought to be allowed figures varying from 12 to 20. The probable time before the property will be on a dividend-paying basis may be placed at two years, and the deferred dividends figured accordingly. The capitalization will then vary from 31 to 40½%, based on the estimated net profits after two years' operation, from which amount the working capital has to be deducted to arrive at the investment allowed for the purchase of the property. It may often be necessary to include in the working capital at least a part of the expenditure required to connect the property with a line of transportation of the oil.

CLASS 8: *Properties at a great distance from other producing territory and undeveloped.* In this case the property has no actual value, as J. R. Finlay remarked in his report to the Board of State Tax Commissioners of Michigan: "It is plain that where no deposits have been worked and none have been even proved to exist, the definite factors which can be applied to the valuation of an active property are lacking. In this case no definite appraisal can be made. A figure only represents a guess. I can see no way to come to any conclusion about such lands, other than to attempt such analysis of the facts as may limit the range between which guesses will be reasonable."[3]

In the foregoing I have tried to lay down some lines along which an approximate estimate of the valuation of oil lands can be made. I hope that other consulting engineers will criticize my work, and thereby help to clear up this question, which is, in my opinion, a very difficult problem for the consulting engineer when called upon to report as to the advisability of the purchase of an oil property.

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[3] *Mining and Scientific Press*, September 9, 1911, p. 328.

Oil-Mixed Portland Cement Mortar and Concrete

By L. W. PAGE

*In October 1909 I made the discovery that oil in considerable quantities could be combined with wet portland cement paste by a simple mixing process. It was noted that when oil was added to wet cement it disappeared completely when mixed for a few moments, and, furthermore, that there was no apparent separation of the ingredients upon setting. Experiments were at once begun with various kinds of oil, to ascertain which was best adapted for the mixture. After these preliminary inquiries were completed, tests were conducted, or are now in progress, in order to investigate the properties of oil-mixed cement, mortar, and concrete. The materials used consisted of portland cement, river sand, and ¾-in. crusher-run gneiss. The oils selected for use were seven varieties of fluid residual oil, varying in viscosity from 2.5 to 65 and in specific gravity from 0.893 to 0.945, and one sample of cut-back oil asphalt. The cement complied with the specifications recommended by the special committee on Concrete and Reinforced Concrete. Of the sand 17% was retained on a No. 10 screen and 96% on a No. 80. Of the stone 28% passed a ¾-in. mesh screen. The sand contained 37% voids, the stone 43 per cent.

Time of Setting.—The addition of oil retards both the initial and final set. The effect of 10% of oil is to increase the time of initial set about 90%, and the time of final set about 60 per cent.

Crushing Strength.—Concrete, like mortar, when mixed with oil, shows a decrease in strength, that containing 10% of oil having roughly 75% of the strength of plain concrete when stored in water. Air-cured concrete, mixed in proportions of 1:3:6 and 1:3:5, containing 10% of oil, has 65 and 75%, respectively, of the strength of the plain concrete mixtures. At the completion of the one-year tests on compression, a marked increase in strength is shown over similar tests at six months. The next tests will be made at the expiration of two years.

Toughness.—Cylinders of concrete, 6 in. in diameter and 6 in. high, were tested in the Page impact machine under blows of a 10-kg. hammer, falling upon a 5-kg. plunger from successively increasing heights of 1 cm. The results of this test indicate that the toughness or resistance to impact of oil-mixed concrete differs but slightly from that of plain concrete.

Modulus of Elasticity.—Tests for the modulus of elasticity were made on specimens of the usual size, 8 in. in diameter and 16 in. high. The results indicated that the addition of oil to concrete has very little effect on its stiffness, the initial modulus of elasticity, with a few exceptions, showing but little change. The effect of storing in water is to increase the modulus of elasticity to more than that of air-cured specimens, and is as true with oil as without it.

Permanent Set.—In the endeavor to discover the effect of oil on the elasticity of concrete, micrometer readings of permanent set were taken after releasing the load to its initial value of 500 lb. In 1:3:5 concrete, containing as much as 10% of oil, the permanent deformation existing after the application of 500 lb. per square inch was less than that in the specimen containing no oil. This was true of both air-cured and water-cured specimens. The elasticity of 1:3:6 concrete appears to suffer with the addition of oil, the permanent set of the 10% oil mixture, air-cured, being 0.00076 in. per inch of length, as against 0.00019 in. for the plain concrete specimens. The corresponding ratio appears to exist for the water-cured specimens. The permanent set of the 10% oil mixture was 0.00017 in. after the application of 500 lb. per square inch. Here, again, the beneficial effect of storing in water is well marked, the permanent set being very small for water cured concrete, when compared with that cured in air.

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*Abstract of a paper presented before the Amer. Soc. of Civil Eng., November 1.

Absorption. In order to determine the waterproofing qualities of oil mixed concrete, compared with those of a plain mixture, absorption tests were made on 1:3:6 concrete cylinders, 6 in. in diameter and 6 in. high. The cylinders were dried to constant weight in an oven, after being cured for 15 days in air. They were then completely immersed in water, and were weighed every day until they had attained constant weight. The addition of oil decreases greatly the percentage of absorption, the cylinder containing 10% of oil absorbing but 1.7% of water, based on the dry weight, while 6.25% was absorbed by the cylinder containing no oil. In almost every case the maximum absorption was attained within one day after immersion, and, furthermore, the rate of absorption seemed to be inversely dependent on the quantity of oil added. It will be noted that there is approximately only 0.5% difference between the absorption of the cylinders containing, respectively, 10 and 25% of oil. The inference to be drawn from this fact is that 10% of oil is nearly as effective as 25%, as far as waterproofing is concerned.

Four vessels of 1:3 mortar, each 2½ in. high, about ½ in. thick, and having an outside diameter of 8 in., after hardening in moist air for one week, were immersed in water to a depth of 5 cm. Vessel No. 1 was made with no admixture of oil. A damp spot appeared inside about 1 min. after immersion. In one hour it was completely water-soaked, the moisture having climbed by capillarity above the level of the surrounding water. Within a few days after immersion, water had penetrated the plain mortar vessel until its level inside was the same as that outside. Vessels No. 2, 3, and 4 contained, respectively, 5, 10, and 20% of oil. After an immersion of six months, the interiors of the oil-mixed vessels are as dry as they were on the day they were placed in the water. A corresponding series of tests was made on mortar vessels, made to contain water, with like results. The plain mortar vessels leaked, and those of oil-mixed mortar were perfectly tight. These results show with certainty the waterproofing qualities of oil-mixed mortar and concrete.

Permeability.—The following tests were made on specimens of 1:3 mortar, 3 in. thick and 6 in. in diameter: Plain 1:3 mortar, at the age of 28 days, under a pressure of 30 lb. showed dampness in about ½ hr. Under a pressure of 40 lb., applied for 24 hr., the leakage amounted to 146 c.c. Specimens of the same mixture, but containing 5 and 10% of oil No. 4923, remained perfectly dry for 24 hr., under a pressure of 40 lb. A ½-in. coat of 1:3 mortar, containing 10% of oil No. 4923, applied to the surface of a very porous concrete, was absolutely effective in preventing all leakage, even under comparatively high pressure.

Bond Tests.—Tests were made to determine the relative strength in bond of oil-mixed and plain concrete. Specimens were made of 1:2:4 concrete, mixed with 23.5% of water, based on the weight of cement and dry sand, making a rather wet mix. Rods 12 in. long were embedded in the centre of cylinders 8 in. in diameter and 8 in. long, one end projecting about ½ in. through the bottom. The specimens were bedded in plaster of paris on a cast-iron plate mounted on a spherical bearing block. The test consisted in pushing the rods through the concrete, the point of failure being taken at the drop of the scale beam. Two kinds of bars were used, plain and deformed. All specimens were tested at 28 days. The results show that the effect of oil is to decrease the bond strength, the decrease depending on the quantity of oil added. It is evident that the bond between plain bars and concrete is affected so seriously by the admixture of oil that it would be extremely inadvisable to use such a combination. The bond of deformed bars is not affected so seriously. With an admixture of 10% of oil, which is as much as is necessary to use, the bond strength is 84% of that attained by the mixture containing no oil.

Service Tests.—During April and May, 1910, two bridge surfaces of oil-concrete were laid at Ridgewood, N. J. In the Borough of Richmond, New York City, during May and June, 1910, about 400 ft. of street surface was laid with different aggregates. About 300 ft. of street in Washington, D. C., was surfaced in June 1910. Numerous inspections of this work have been made, and, up to the present time, it is all in very good condition. About ½ mile of roadway, laid with 10% oil-concrete in the suburbs of Harrisburg, Pa., in the summer of 1910, is also reported to be in very good condition. A vault, 112 ft. long and 18 ft. wide, in the United States Treasury Department, was built in the autumn of 1910. The side-walls of this vault contain 10% of oil. Its roof was constructed of ordinary reinforced concrete with about 3 in. of 10% oil-concrete on top. For several months this roof was subjected to a head of water of several feet without showing any signs of leakage. Another vault, in the north end of the Treasury, on account of leakage, has never been available for storing anything of value. Its roof was treated with oil-concrete, and is now perfectly dry. Numerous floors in the sub-basement of the Treasury Department, and a floor in the Office of Public Roads, have been constructed with 10% oil-concrete, and have remained absolutely free from dampness. A tank, about 12 ft. long, 4 ft. wide, and 4½ ft. high, constructed in the Office of Public Roads during the winter of 1910, has been continually full of water, and has not shown the slightest signs of leakage.

Summary of Conclusions.—The following tentative conclusions as to the effect of the oils used in cement and concrete may be drawn from the foregoing investigations:

1. The tensile strength of 1:3 oil-mixed mortar differs very little from that of plain mortar, and shows a substantial gain in strength at 28 days and 6 months over that at 7 days.

2. The times of initial and final set are delayed by the addition of oil, 10% of oil increasing the time of initial set by 90%, and the time of final set by 60 per cent.

3. The crushing strength of mortar and concrete is decreased by the addition of oil to the mix, concrete with 10% of oil having roughly 75% of the strength of plain concrete at 28 days. At the age of one year the crushing strength of 1:3 mortar suffers but little with the addition of oil in quantities up to 10 per cent.

4. The toughness of resistance to impact is affected but slightly by the addition of oil in quantities up to about 10 per cent.

5. The stiffness of oil-mixed concrete appears to differ but little from that of plain concrete.

6. The results of tests for permanent deformation do not indicate that a law is followed by oil-mixed concrete.

7. Oil-mixed mortar and concrete containing 10% of oil have very little absorption, and, under low pressures, both are waterproof.

8. Oil-mixed mortar containing 10% of oil is absolutely water-tight under pressures as high as 40 lb. per square inch. Tests indicate that oil-mixed mortar is effective as a waterproofing agent when plastered or painted on either side of porous concrete.

9. Bond tests show the inadvisability of using plain bar reinforcement with oil-concrete mixtures. With deformed bars the bond is not weakened seriously by the addition of oil in quantities up to 10 per cent.

A patent has already been granted to me for mixing oil with portland cement concrete and hydraulic cements giving an alkaline reaction. All citizens of the United States are at liberty to use this process without the payment of royalties.

The latest practice of some of the best mining companies involves the use of steel timbering in place of the wooden elements formerly used, and the development of reinforced concrete as a building material for the structures underground. Stables, for example, are made of reinforced concrete, and are not only more sanitary, more easily kept clean and sweet, but are practically noncombustible, and a fire, once started, can be closely localized.

Workmen's Liability Insurance

By C. O. Bartlett

*During the last few years, and especially last year, much has been said about workmen's liability insurance, and a number of States have enacted laws bearing on this important question. The bone of contention is, who shall pay the bill? It is certainly nice for every workman in a mine, factory, or on a farm to have a workmen's insurance policy, especially if some one else pays the premium.

There seems to be a general impression that insurance companies are robbers, that they have made vast fortunes out of the employees' insurance business, and if the State or general government would go into this business, the rate would be very much less. Now the fact is, judging from the past, that all business done by a city, State, or general government costs nearly twice as much as when done by private corporations or individuals, and there seems no reason why there should be any variation from this general rule in the insurance business. I think it is fair to assume that when any State, or the United States as a whole, engages in the liability insurance business, the cost will increase as in other lines, and the idea that a lot of money may thus be saved is only a myth.

In taking up this question, it should be considered most carefully that where there is one large mining corporation, or other corporation, there are hundreds of smaller ones doing business in every State, and I wish to speak especially of these medium-sized corporations or companies. The large companies, like the Philadelphia & Reading Coal & Iron Co., the United States Steel Corporation, the Pittsburg Coal Co., the Standard Oil Co., the International Harvester Co., and some others of similar type, control very largely the selling prices of their products; in other words, when they say 'Thumbs up!' up they go, and when they say, 'Thumbs down!' down they go. But the medium fellow, with competition on every corner, cannot do this, and if we add to the expense of these companies, even at the rate of 1% a year on the capital stock, it will mean that thousands will go to the wall.

Take the case of the State of Ohio, which is one of the largest manufacturing States in the Union, one of the best situated for manufacturing purposes, with plenty of coal at a low price and of a good quality, with cheap iron ore of a good quality, the best of water and rail transportation facilities, the best of farming lands from one end to the other to supply bread and meat, altogether, perhaps, more advantages than any other State in the Union. Two years ago a tax of one-tenth of 1%—that is, a special tax of one-tenth of 1%—was put on all corporations, and last year this was increased by 50%, making a yearly tax of 1½ mills on every dollar of the capital stock. In other words, a company of $60,000 capital stock is now compelled to put in the State treasury as a special yearly tax $90. This may seem like a small amount, but last spring more than 1200 of the Ohio corporations were delinquent in this special tax, the delinquency amounting to more than $2000.

To further illustrate, if a tax of 1c. per ton were put upon all coal mined in the United States, it would mean nearly 1% on the selling price of all the coal mined in the United States; according to E. W. Parker, the output of coal in the United States in 1910 was 501,000,000 tons, and at 1c. per ton means over $5,000,000. I do not hesitate to state that the 33 million tons of coal mined in the State of Ohio last year did not pay dividends to the owners of the mines of more than 2%, and a tax of 1% would mean ruin to many of them, for I assure you that a great many mines in Ohio are paying only small dividends.

According to this same report by Mr. Parker, the average price of bituminous coal is a little over $1 per ton. It has never been estimated by any actuary that the workmen's liability insurance tax against a mining or other company would be less than this amount, and probably it would be very much more, possibly 200% more; in fact, insurance companies state that it will be fully as much, and there is no reason to believe that the insurance companies are untruthful. At any event, so important a measure as this should receive the most careful consideration. Looked at carefully, and boiled down, it simply means that all workmen in mines and factories will have a liability insurance policy, so that in case of accident they shall draw a certain amount per week, say 60% of the amount of their wages; that in case of death their families will draw a certain amount per week, up to a certain maximum, say $3000 or $4000.

So far this seems easy. It is certainly a good thing for each workman to have insurance against injury or death, but the question then arises, who shall pay the bill? Naturally the workmen are anxious for the employer to pay the premium and the employer is naturally loath to do it. The fact that over 80% of the men engaged in business, mining or other kinds of business, do not meet with success should not be forgotten. Again, I wish to say, to miners and manufacturers, that if it is legal to insure the workmen in the mines and factories throughout the cities and towns, it is equally as important to the workmen on the farm.

That all manufacturers are much interested in this question and are anxious to have some law enacted, there is no question, and I feel I am voicing the sentiments of a large number of the manufacturers in Ohio when I state that they do not feel that they should pay the premium. It seems to me that the only right way to do this is for the employer to pay half and the employee pay the other half, and let the government, either State or National, bear the expense of the burden of carrying out the provision of the law. The true object of liability insurance should be to prevent accidents, and from an experience of many years, I feel absolutely confident in making the assertion that if any mine or factory insures its employees and pays for the entire insurance, the number of accidents will increase rapidly. But if you say to the workman, you may pay half of this and I will pay the other half, then you will have prevented to a very large degree all accidents, for the reason that the workman will be equally as interested and will try in every way to prevent accidents as well as the employer.

Another important point, and by far one of the most important of this whole question, is that this will bring the employer and employee into a close and friendly relationship. This is one of the great questions which the manufacturers are trying to solve today for, say what you will, all are in the same boat and should work in harmony as much as possible. It is a terrible thing for the head of a mine or factory to learn that one of his workmen has met with a serious accident, and it is certain that manufacturers are only too glad to do anything in their power to prevent these things. But accidents will happen, and the effort is to prevent them, so far as possible. In other words, I wish to emphasize the fact that prevention should be the main object in any workmen's liability insurance law. That should be the goal at all times, in all places, and under all conditions.

Much has been said about the splendid laws regarding liability insurance in European countries, and especially is this true of Germany; according to the addresses and articles in the magazines it is almost a paradise to work in Germany. But, like all other questions, there are two sides to this one, and of the other side not so much is heard. They do not tell us that the taxes in Germany are two to four times as much as they are here. It might be expected that many workmen would immediately go back to work under these favorable conditions, but how many mechanics from your town left for Germany last year? I venture to say that you would count the number on your four fingers, and I can furthermore venture to say that when you can divide it by four in many cases you can subtract one from this amount. On the other hand, how many of the workmen from that country have come

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*Abstract of a paper presented at the American Mining Congress, October 1911.

to this country to better their condition? Over 180,000 German people came to America last year. In Germany the employers pay only one-third of the cost, and I repeat that it must be considered most carefully before our mining operators and manufacturers are burdened with the tremendous cost of workmen's insurance. If agitation and legislation against the business industries of America keeps on at the rate of the last two years, serious consequences will surely ensue.

Where the Horse-Whim Fails

By Dennis H. Stovall.

Our mutual friend, the mine foreman, will tell you that the horse-whim is good enough for a 'jack ass property.' By which we are to infer that beyond mines of this class the horse-whim has its limitations. After knocking round through Western mining camps, and visiting all sorts of mines, I am willing to state that it is an easy matter to estimate the management of a property when you see its hoist. This prominent feature of the mine's equipment does not always indicate the worth of the deposit, but it is a certain indication of what results are being obtained. Go into almost any mining district, and you will find one or more good properties abandoned, the camp deserted, the mill turning to rust and decay, simply because the management 'made a mistake.' You soon discover the mine is filled to the collar with water, flooded beyond hope. The 'mistake' was in placing an inadequate hoist and pumping plant. A good hoist, operating a skip, either by single or double-compartment shaft, will keep the wettest mine dry, should the pumps fail.

GASOLINE HOIST FOR A SMALL PROPERTY.

The horse-whim is not altogether to be despised. There are times and places when it plays a most important part. Equipment of this sort costs but little, and does excellent work in prospecting when only a few men are employed. But in this day of cheap gas-engine power, the horse-whim is becoming more and more a useless adjunct. As a general rule, the intelligent mine manager can make a close estimate on the real worth and stability of his property when a depth of 200 ft. is attained. Then is the time to place an adequate hoist. Enlarging this feature of the equipment every time a deeper level is tapped will prove an expensive business, therefore it is better to place a large hoist at once, or install one of the unit type, which can be enlarged with each stage of development, without the removal or replacement of the original parts.

At an Oregon property that was originally equipped with a horse-whim, hoisting by this method cost 25c. per ton. Then a small steam plant was installed, and hoisting was reduced to 15c. per ton. Finally this proved inadequate, and a double-drum hoist of the latest type was erected. With this equipment the expense of lifting the ore from the mine dropped to 5 or 6c. per ton. Had this plant been placed at the time the horse-whim was thrown aside, much unnecessary expense would have been saved. A plant of this type costs between $5000 and $8000, depending upon the situation of the property, but it will serve the mine for all time. With a 150-hp. engine, and with a lifting speed of 500 ft. per minute, operating double-decked cages, it not only removes all the ore as fast as the men break it down, but takes care of all up-and-down transportation, such as the moving of stulls, tools, powder, and men.

Where the ore is low grade, every item of expense must be cut down to the lowest possible minimum. If the property is opened by vertical or inclined shaft, hoisting and pumping are two items that must be carefully calculated. Failure in this has proved to be the principal reason why a number of properties never reached the producing stage. To again quote our mutual friend the boss, "pumpin' and hoistin' are just like interest on a mortgage—grinds away day and night."

HORSE-WHIM FOR PROSPECTING WORK.

Barytes, or barium sulphate, is a heavy crystalline mineral, white when pure, which is very little affected by acids, alkalies, or corrosive gases. In 1910, according to E. F. Burchard, of the United States Geological Survey, the United States produced 42,975 short tons, valued at $121,746, a considerable decrease as compared with the figures for 1909. Barytes is an interesting and useful product. By far the greater part of the mineral produced, says Mr. Burchard, is consumed in the manufacture of mixed paints. It is not satisfactory as a pigment if used alone in oil, for its crystalline nature renders it too transparent to give good hiding power, and to be of any advantage it must be used in only moderate percentages in mixed paints, which consist principally of the lead and zinc-white pigment. Its use as an adulterant in white lead or in any other pigment or commodity is not legitimate and should be discouraged by the producers. There are sufficient legitimate uses for this valuable mineral to create a healthy market for it if properly handled. Barytes is used also in the manufacture of lithopone, a very white pigment that is suited most particularly to interior use and is employed in enamels and wall finishes. Barium salts are reported to be used in brickmaking in order to overcome the efflorescence of bricks. Other uses for barytes are in the manufacture of rubber, wall paper, asbestos cement, and poker chips, and in tanning leather.

The Past, Present, and Future of Copper

By Horace J. Stevens

[*]The great copper industry of the present day is a thing of small beginnings. In 1811, the world's production of copper was a trifle under 10,000 long tons, an amount smaller than was secured last year by any one of more than twenty different mines. During the present year the Anaconda mine at Butte has produced, during nearly every month, as much copper as was supplied by all the mines of the world in the entire year of 1811.

Fifty years ago, in 1861, the world's output of copper was but a trifle more than 100,000,000 lb., a production exceeded, in 1910, by the Anaconda Copper Co., American Smelters Securities Co., and Phelps, Dodge & Co. The production of the year 1900, the last of the nineteenth century, was just fifty times as great as that of the year 1800. Should the same ratio of increase be maintained during the twentieth century, the output of the year 2000 would be 24,318,150 long tons of copper, twenty-five times as much as the present production, and even a fifty-fold increase for the twentieth century would allow an average increase of less than 4%, while the average annual increase, for the decade beginning 1900 and ending 1910, was almost exactly 7%, compounded yearly. Those who foresee a complete collapse in the copper industry would do well to give consideration to the actual figures of increase during the past. The copper industry does not move forward at even an approximately steady rate, from year to year, but is given to advancing by great leaps, almost inevitably followed by periods of quiescence, or even of actual retrogression. High prices for the metal stimulate production, while curtailing consumption, and, as a direct consequence, output is increased, which decreases prices, which in turn brings about decreased production, due to the inability of small and weak producers to stand the strain of low prices. Decreased production again brings about high prices, and the cycle is begun anew. Much the same conditions existed in the American iron and steel industry for fifty years, until the formation of the United States Steel Corporation, which, while unable to prevent periods of depression, as its sponsors fondly hoped, has proved a wonderfully steadying factor in the iron and steel market, serving the purpose of a gigantic balance-wheel.

The growth of the copper industry is best shown by the following figures of the world's production, by decades, in long tons: 91,000 tons in the decade ending 1810; 96,000 tons in 1820; 135,000 tons in 1830; 218,000 tons in 1840; 291,000 tons in 1850; 507,000 tons in 1860; 900,000 tons in 1870; 1,189,000 tons in 1880; 2,373,000 tons in 1890; 3,708,000 tons in 1900; 7,390,000 tons in 1910. The influence of the electrical industry upon the consumption of copper is plainly shown by the figures since 1880. The production of the seventh decade of the nineteenth century was only 900,000 long tons, or a trifle less than ten times the output of the first decade of the century, while the production of the last decade of the century, ending 1900, was more than forty times the output of the first decade, and was more than four times as great as that of the decade ending in 1870, only thirty years before. The output of the decade ending 1910 was more than six times as great as the output of the decade ending in 1880, and was almost exactly double the production of the previous decade ending in 1900. The production of copper by the world, amounting to approximately 7,390,000 long tons, for the decade ending 1910, amounted to more than three-fourths of the total world's production of copper for the entire preceding century.

Figures of production and consumption of any given commodity in universal use may differ from year to year, according to whether a surplus is accumulated, or a preceding surplus is drawn upon, but over long-term periods production and consumption necessarily are the same, and, figured by decades, it is safe to say that the figures of production are practically the figures of consumption. At present there is a copper surplus, of which much is heard, but to show how comparatively unimportant the present surplus is, when compared with the figures of output for the preceding decade, it may be stated that the world's surplus of copper, at the present time, is slightly less than 300,000,000 lb. of finished metal, or a trifle under 135,000 long tons, an amount less than 5.5% of the total production of the decade, and equivalent to only about eight weeks supply of copper at the present time, measuring the supply either by productive capacity or by consumptive demand.

Exact figures are available regarding production, dividends, costs, and metal prices of the mines of the Lake Superior district since the first production was secured, in the year 1845, the total ouput for that year having been only 24,880 lb. of finished copper. The total production of fine copper, by Lake Superior mines, from 1845 to 1910, inclusive, a period of sixty-six years, or two-thirds of a century, was 5,122,478,402 lb., having a gross value of $726,849,840, from which were paid dividends of $182,824,770, the ratio of dividends to gross values, for this entire period, amounting to 25.1%, and dividends, divided by copper production, show average dividend payments of 3.56c. per pound. The average price received for all Lake Superior copper, for this period of sixty-six years, was 14.19c. per pound, which, after deduction of dividends, leaves an estimated cost of 10.63c. per pound, for all years. By adding the figures of expenditures on unproductive mines, amounting to about $60,000,000, the cost of Lake Superior copper would be made almost 11½c. per pound, and by adding a further $15,000,000 for assessments on mines that have since repaid in dividends the original assessments, the cost of copper would be made about 11.85c. per pound, leaving a net margin of profit, for the entire production, of almost exactly 2c. per pound, plus the present aggregate value of the various active mines.

Omitting the production of mines that have not proved profitable, the average cost of Lake Superior copper yielded by dividend-paying mines, has averaged about 9.5c. per pound, for all years, and the present cost of making copper, by all of the producing Lake Superior mines, probably is slightly above 9c. per pound. The actual average cost of making copper, in the leading producing fields, probably is between 9 and 10c. per pound, at the present time. Some of the newer fields, which are skimming their cream, show lower costs, but it is difficult to see where the world will be able to produce its copper, in years to come, at an average cost materially under 10c. per pound, this figure excluding the limited production of badly planned and badly managed mines, which yield only a small fraction of the total copper output, but secure their metal at an average cost very much higher than the average cost of all mines.

For the immediate future, the supply of copper in sight is fully adequate, and no unduly high prices need be anticipated, but the figures clearly foreshadow another boom period, within the next two to four years, at which time the alarmists will be as badly scared, for fear that the copper supply is petering out, as they now are for fear that the production is so much greater than consumption that nothing but permanent disaster is in sight. Allowing an average increase of consumption of 7% yearly, the figure that has ruled during the first nine years of the present century, the world's requirements of copper will amount to approximately 1,650,000 long tons in 1920; 2,975,000 long tons in 1930, and 5,350,000 long tons in 1940—the last named year, now only 29 years ahead, calling for a copper output almost six times that of the present rate. Twenty-nine years ago, or in the year 1882, the world's production of copper was 181,622 tons, or about one-fifth of the present output. Allowing for even a five-fold expansion during the next three decades, to correspond with the five-fold expansion in the three decades past, the world's copper requirements in 1940 will be more than 4,500,000 long tons. Should the ratio of increased production and consumption remain at an average of 7%, for the balance of this century, the world would yield and consume, in the year A. D. 2000, about 175,000,000 long tons of copper, a quantity of the red metal more than double the tonnage of the world's present production of iron and steel.

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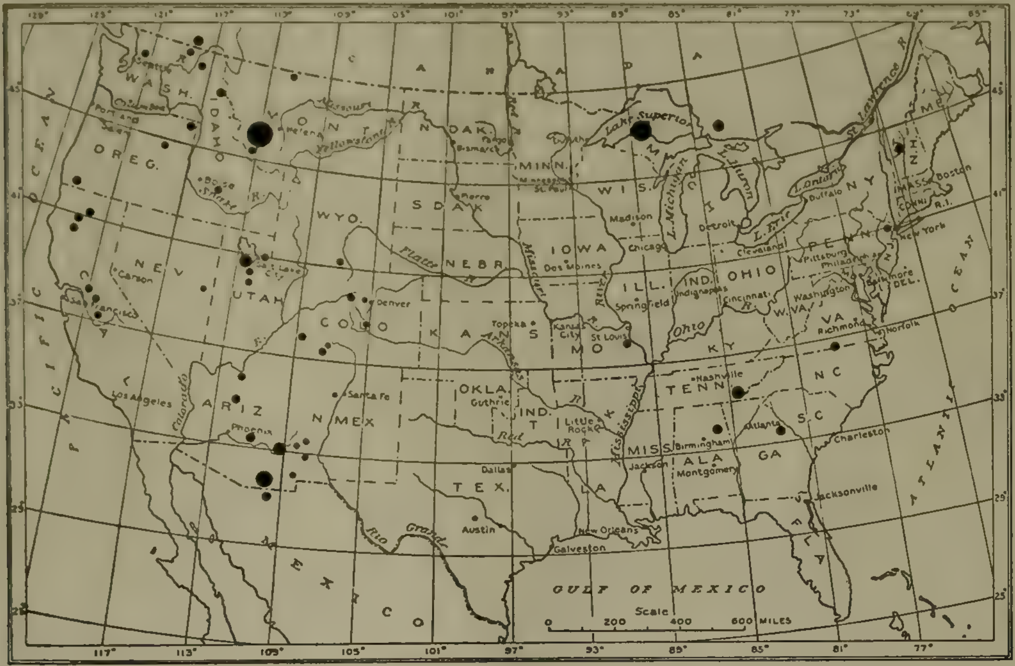
[*] Abstract of a paper presented before the American Mining Congress, October 1911.

A survey of the progress made by the copper industry during the first decade of the twentieth century, now lacking only a few weeks of completion, shows no revolutionary changes, but does show steady and in some cases phenomenal progress, in nearly every division of the industry. In the matter of mines, the old districts of Butte and Lake Superior remain the largest producers, but Arizona, with a half dozen important copper fields, passed Montana in output in 1908, though again taking second place in 1909. In copper mining, the most important development of the decade has been the making of the so-called porphyry mines, in which disseminated copper sulphides are mined from schistose or porphyritic country rocks. The development of such important new producers as the Utah Copper, Nevada Consolidated, Miami, and others of this class, has alarmed many people, who jump to the conclusion that the so-called porphyry mines must close down the older mines, developed on veins in Butte and other areas, and on the stratified trap beds of Lake Superior. There is no real occasion for this alarm, as the porphyry mines, while highly important, are not apt to be developed in large numbers. In fact, the entire western part of the United States has been scoured, by the keenest and strongest aggregations of capital in the copper business, for promising deposits, with a net result insignificant in the number of properties developed, though highly important in output already secured, and even more important in promise of future production. When the Mesabi iron range was opened, eighteen years ago, a similar wave of pessimism swept over the mine-owners of the older iron ranges in Michigan and Wisconsin, but time has proved that the high-grade ores of the Mesabi, capable of being mined by steam-shovel, at wonderfully low costs, are absolutely necessary in furnishing an adequate supply of ore to the iron and steel works of this country, and similarly it will be found, as time passes, that the production of the porphyry mines is absolutely essential in supplying the copper needed by the world, at anything like a fair figure to the consumer. Processes of actual ore extraction have been modified and improved, in many fields, with a resultant increase in safety to miners, and decrease in cost of ore extraction. The steam-shovel has come to stay, in copper mining.

Strange to say, the copper mines, which are vitally interested in extending the use of copper, were somewhat slow in adopting electric power, but rapid progress has been made in this direction during the past decade, and all of the mines of Butte are now electrified, while there has been a great increase in the use of electric energy in the Lake Superior district. The constantly increasing use of hydro-electric power is now restrained, and further restraints are threatened, by the conservationists. The newly adopted system at the Anaconda mine, at Butte, which combines the utilization of hydraulic, electric, and pneumatic power, offers great possibilities of pliancy and economy, and the lead of the Anaconda is likely to be followed by many other important mines.



MAP OF COPPER REGION OF THE UNITED STATES.

Perhaps the most striking progress made during the past decade, in any division of the copper industry, has been in smelting. No new principles have been adopted in either reverberatory or blast-furnace work, but reverberatories of a gigantic size hitherto unknown have been adopted at many plants, while even more striking progress has been made in the capacity of blast-furnaces. Ten years ago a 300-ton blast-furnace was considered exceptionally large, and near the possible maximum of size, but the Washoe works of the Anaconda Copper Mining Co., again blazing the way, now has two furnaces, each 56 in. by 51 ft. in size, with a maximum daily smelting capacity of 1800 tons each, and a third furnace that is 56 in. wide and 87 ft. long at the tuyeres, this mammoth furnace actually having smelted 3100 tons within 24 hours. It has been my privilege to see this great blast-furnace with smelting in progress at the western end, while the eastern end was frozen, and repairs in progress within the bosh.

The past decade has seen a further extension of the electrolytic process of refining, and the great bulk of the world's copper now is refined by electrolysis. In fact, very little finished copper, other than electrolytic, reaches the market, except from the Lake Superior mines, the product of which commands a premium by reason of its extra toughness and superior adaptability to drawing and stamping. With depth, many of the Lake Superior mines have shown a marked increase in arsenic, and for this reason a considerable part of the Lake Superior copper now is refined electrolytically, and sold as electrolytic and not as Lake copper. [Further data regarding the refining of copper will be found on another page in this issue.]

The price of 26¼c. per pound, reached in March 1907 by Lake copper, was not the result of any corner, but came about through an ill-advised scramble by consumers, who feared that they could not secure the metal. As a result of the high price, consumption was curtailed sharply in all directions, as happens inevitably under such unsatisfactory price conditions, and the copper industry of the world still suffers from the existence of a surplus of slightly under 300,000,000 lb. of metal, remaining from a surplus that, including both visible and invisible supplies, reached about 450,000,000 lb. at the end of 1909, since which time there has been a small but steady decrease in surplus, from month to month. [Statistics of production and marketing of copper throughout the world were given in full in the *Mining and Scientific Press* of October 28.]

The leading copper producers of the world are now operating under check, a 10% reduction in output having been put into effect in August of last year. Under the Sherman Anti-Trust law, this checking of production would be considered criminal, if it could be proven, yet the reduction of output was absolutely necessary in order to save the copper industry from a prolonged period of utter demoralization, during which scores of millions of dollars would have been lost by investors, and a quarter million or more working men would have suffered severely, many of them losing their jobs, and the remainder suffering severe cuts in wages. We have the authority of eminent statesmen, totally devoid of business experience, that the Sherman act is a panacea for all ills of the body politic, yet no sensible business man would do otherwise, if he had the power, than to reduce production at a time when a surplus product threatened not only the small remaining profits, but the very foundations of the copper industry. The issue thus is drawn very plainly between our present politico-criminal law and all the laws of business and political economy.

The tendency in copper mining, as in all other branches of industry, is toward combination in ever-larger units. This tendency is based upon and governed by purely economic laws, and the laws of political economy are so much stronger than any law ever devised by a parliament, or any ukase ever promulgated by a despot, that it requires no spirit of prophecy to forecast the ultimate outcome of the present clash between the laws of political economy and the laws of congress.

The Guggenheims are the bogey-men with which the public are most frequently alarmed. We have had it dinned into our ears, by innumerable patriots seeking office, and repeatedly set before our eyes, in every yellow newspaper and muckraking magazine, that "the Guggenheims are stealing Alaska." As a matter of fact, the Guggenheims control a copper mine in the interior of Alaska, that is a wonder in its way, yet which cannot be rated at more than a third-class property. This mine, the Bonanza, is a sort of copper-plated gold-brick, in that an interior core of limestone is surrounded by phenomenally high-grade bornite and copper glance. No competent mining man who has visited this property ever has estimated the amount of ore developed, and safely inferred, as capable of yielding more than 100,000,000 lb. of finished copper; a total production equivalent to only one year's maximum output by any one of the six leading copper mines of the world. In order to get this ore out of a wilderness, the Guggenheim interests have built the Copper River & Northwestern railway, a line of 195 miles length, variously estimated to have cost from $13,000,000 to $25,000,000. The gross value of all the copper contained in the Bonanza mine, taking the outside estimate of tonnage, is considerably less than the lowest estimate of cost of this railway, and the net profits derivable from the Bonanza mine, cannot, by the most liberal figuring, be estimated at more than $4,000,000 to $5,000,000. Instead of being commended for their enterprise and courage in building this railway through an arctic wilderness, the Guggenheims are held up to public scorn as thieves and robbers. This railway cuts through workable beds of coal, but is prohibited, by the Federal authorities, from developing or using this coal, and is compelled to import inferior coal, from British Columbia, at a cost more than double that of domestic coal, if its mining were permitted. Not only does the railway suffer from this arbitrary action by the Federal Government, but the 50,000 unfortunate American citizens who live in Alaska are compelled to pay double or triple the price they should pay for fuel, through the efforts to "save" the coal for some future use, at an indefinite date.

Purifying Water by Coagulation

The practice of using certain salts for the purpose of accelerating water clarification is of great antiquity. It originated in China, in all probability, thousands of years ago. It was used in Egypt for many centuries prior to its use in numerous plantations in the southern portion of the United States as an aid to the clarification of highly colored or very muddy waters. Coagulants have not had an extensive use in western Europe owing to the comparative absence there of muddy or highly-colored waters, but are now being used in quite a number of slow sand filtration plants in Belgium, Holland, and northern Germany.

The use of coagulants was not looked upon with favor ten or fifteen years ago, either in this country or in Europe. Careful scientific investigation into their use at a dozen places during the past fifteen years or more, particularly at Louisville, Pittsburg, Cincinnati, and New Orleans, and a complete absence of ill effects upon the health of the communities using regularly water treated in this manner have eliminated this feature. Coagulating processes are now recognized as not only necessary for the treatment of certain classes of waters, but as permissible for use with perfect safety.

The process has been carefully studied by the Royal Prussian Testing Station, and its merits are now recognized throughout the civilized world. The use of coagulants in connection with the preparatory treatment of water prior to its application to slow sand filters of the Pittsburg type is successfully practised in this country at Springfield, Massachusetts, Ferncliff and Poughkeepsie, New York; Indianapolis, Indiana, and is proposed for use in a number of larger cities. At Washington, D. C., for instance, provisions are being made to apply a coagulating chemical to the unfiltered water during muddy-water periods. Coagulants are also used in the preparatory treatment of water going to slow sand filters at Tokyo, Japan, Calcutta, India, and elsewhere. In connection with mechanical filter plants coagulants are always used, and it is safe to say that there are over 400 such plants in actual operation. A careful study of the practices of water purification in this country develops the fact that fully 12% of the urban population of the United States are being supplied with water purified by some process in which coagulation plays an important part.

At Cincinnati and New Orleans careful investigation with a view to ascertaining the advisability of using coagulants in connection with the clarification of water passed through quite large settling basins before application to filters of the Pittsburg type have shown the process to be entirely feasible, although somewhat expensive. It was found necessary to have a settling capacity following the application of the coagulating chemical equal to about 24 hours, otherwise some of the gelatinous precipitate would remain in the water as it entered the sand filter and would clog the layer immediately at the surface so frequently as to make the cleaning abnormally expensive.—*Engineering Record.*

Many salts have the property of causing the coagulation of the colloid silicates and hydrates which exist in dilute solutions such as river water. Lime and sulphate of soda are the cheapest and most convenient of these.

Along Mexican Trails

By Alexander J. Fraser

The completion of the Southern Pacific railroad along the Mexican west coast, with its branch to Alamos, and the building of the coast end of the Kansas City, Mexico & Orient railroad to El Fuerte in Sinaloa, marked the passing of the old order in muleback transportation and the closing of the coast trails of Sonora and Sinaloa. The completion of the latter road will completely eliminate the mule as a factor in freighting, and put an end to a picturesque phase of Mexican life along many historic trails of the interior. The advantages of the several railway towns as outfitting points for southwestern Chihuahua, the Sonora country adjacent to it, and northern Sinaloa, and the trails leading thereto, was the subject of discussion by some mining men while enjoying the refreshing evening breeze in front of the Hotel Central, at El Fuerte, after an uncomfortably warm December day.

El Fuerte is the headquarters for a large mining area, embracing such districts as the Lluvia de Oro, Calabacillas, Morelos, and others of less importance. From these districts, and from the haciendas—with their peon population—a large trade is derived. The little town lies along the east bank of the river, which, at this point, it is presumed, takes its name from the town. Seventy miles up stream the river is known as the San Miguel; still farther north and to the east, where its course is wildest and most crooked, the Indians baptized it Uruachi; while, near its source, in the wild country of the Sierra Madres, it passes under the name of Verde. This confusion of tongues and names may act as a stimulant to its, at times, excessive turbulence and irritability.

The town has its road, the Kansas City, Mexico & Orient railway, and wagon-trails, one of which, a broad thoroughfare, now partly covered with grass and weeds, deserves mention. Its beginning in Mexico is at the northern frontier, and its southerly route passes through Hermosillo, Alamos, Culiacan, and so on to Mexico City. In the days of the early settlers this trail witnessed scenes most picturesque and interesting. Two hundred years before the first panning of gold was done on Sutter creek, California, an endless succession of mule trains passed over this highway, each train with its conductor in the saddle and his crew *a pie*—a shouting, perspiring lot af sandalled brown humanity. Wares from the then distant lands across seas, brought over in barks and brigantines, and full rigged ships; silks from India and Japan; champagnes from France and Switzerland; fabrics from the looms of England and Persia; silver bullion southward bound, mingled with common products of the land on their final journey inland. The campfires on the hills at night; the laughing, singing *arieros;* the mules and burros, feeding, fighting, and neighing, are part of the memories of a great highway whose glory has gone forever. In those days such names as the Promontorio, Zambonia, Millionaria, Zapote, and others were famous, not only throughout Mexico but across the seas. Two centuries before the quartz lodes of Colorado were first discovered.

The Stilwell or Orient road, as the Kansas City, Mexico & Orient railway is called locally, makes a daily run from Topolobampo, its coast terminal, to El Fuerte, connecting at San Blas with the Southern Pacific system. Splendid things are promised for this road in the way of passenger comfort, when the gap between Choix and Sanchez is closed. A dozen cabs may be found backed against the station platform on the arrival of the train at noon, ready to absorb the passengers who wish to drive to town, six miles away. Seen from the mesa, as the cabs approach it, the town is rather attractive in appearance. The long low buildings, tinted pink and blue, with the tall cathedral spire in the centre, suggests some Oriental town. This pleasant impression is somewhat dispelled on entering the pueblo, by the usual monotony of Mexican architecture. The houses, mostly one storied, of adobe or brick, are typically Spanish. Their architectural evolution has been the same as that of houses in a majority of small towns in the country, over two centuries ago Spanish pioneers piled the adobe walls of their enclosure, four square, thick, and strong to withstand attack. It was then an Indian country, wild and unexplored. The sides and ends of the dwellings formed part of the walls in which narrow holes were cut to serve as windows and incidentally as port-holes. In some of the larger enclosures, large circular towers (*torreones*) were built at each end, in which the families lived when the haciendas were attacked.

Two hundred years later their descendants are found designing the brick or adobe walls of their squares and dwellings much on the same lines as their ancestors of frontier times. The bare enclosures of early days have given way to beautiful courtyards in the centre of the squares; yet the Spanish idea is still dominant in the low, flat-roofed houses, built flush with the narrow sidewalks; in the unattractive square-cut doorways and windows with their iron gratings, giving the impression of a cell. Where the houses are more pretentious and some attempt is made to lessen the severity of design, the iron gratings are rather ornamental, and the effect is not unpleasant. Graceful outlines seem to have been reserved for the Government buildings and cathedral. The color scheme, the interestingly narrow cobble streets, and the plaza with the cathedral fronting it, neutralize, in some degree, the plainness in architecture. The town in white would be unpicturesque; in pink and blue it is interesting for a day at least. The interior arrangement of the homes of the higher classes is in delightful contrast to their exterior plainness. Every square or home of pretention has its courtyard or *patio* with its abundance of plants and flowers. The effect is extremely pleasant. The furnishings are often elegant, and the characteristic high ceilings lend a distinct charm to the apartments. The three hotels at El Fuerte have their courtyards with their foliage; the rooms, thick-walled and cool, surrounding them. The floors are of brick, which also makes for coolness. The method of cleaning these is to sprinkle them with water and brush them with a coarse rush broom—a backbreaking enterprise. Because of its dissolving effect on the brick, washing them is not countenanced.

The cooking is good, particularly if the appetite finds zest in Mexican dishes. Cereals do not long remain wholesome in the tropics, and to this, in part, may be attributed the absence of breakfast foods. Pastry depends on stoves, and because of their absence, cake and pie are seldom in evidence. More meat courses, therefore, are indulged in to engage the attention, always terminating—breakfast, lunch, dinner—with the national dish—beans. A little jelly and sweet bread make up the dessert. At one hotel, where are a few permanent American guests, the menu, owing to the presence of a small stove, is a little more elaborate. The rate charged, ₱2 for board, is very reasonable.

The town has its electric lights, and the steady current suggests ability in the engineering department of the plant. It is refreshing to enquire about the climate in the semitropics. The inhabitants—native and American—particularly the land promoters, will lie about it with cheerfulness and a healthy assurance. It is excellent, señor, especially in winter it is excellent. When malaria is mentioned, the suggestion is received with a shrug—pooh! And yet, sooner or later the inevitable happens. On one trip, going through, I found five cases of *calenturas* in one hotel, three Americans and two of the daughters of the lady of the house being the victims; all of them in the throes of alternating currents—arctic and equatorial. To the credit of the place, be it said, mosquitoes of the *Anopheles* breed were little in evidence, and that scourge of foreigners, the small black fly, seemed to be entirely absent. The water system in use is of an antiquity antedating the advent of the Spanish pioneers. The supply is brought to the dwellings in canvas sacks, on burros. A writer in the *Mexican Herald* describes the burros of El Fuerte as "living under water." That they are living under difficulties is evident from the sadness and distressing mournfulness of their appearance.

The water front, when business is thriving, is interesting. The burros are driven into the river and each boy hustles to fill his sack, dipping the water with a small bucket and pouring in at the top. In the haste of loading, half of the water flows over the burro; that, of course, being a small matter. A small horn at the bottom serves as a plug to the outlet for discharging the cargo. Whether the water be red or white, or of a limpid clearness, into the sack it goes at five *centavos* the sack.

A little farther down the stream a long line of women are seated on the banks and beach, sousing and wringing the clothes or pounding and rubbing them on the worn surfaces of the larger rocks. A few pretty women may be seen among them, but none beautiful. Early in life these women tend to *corpulencia*, then adieu, *la figura hermosa*. Addicted as they are to washing, eternally washing clothes, there is among them an uncleanly superstition, that washing the face and hands in the early morning will make them ill. The origin of this unhygenic creed can not be determined. Some 'medicine man' among the Indian tribes of the waste places may have promulgated the doctrine. *Muchas platicas* (gossip) and many a jest and laughter break with the wavelets up and down the river front. Seafoam and soap-foam meet and mingle and eddy round the bodies of the little brown shavers splashing in the river.

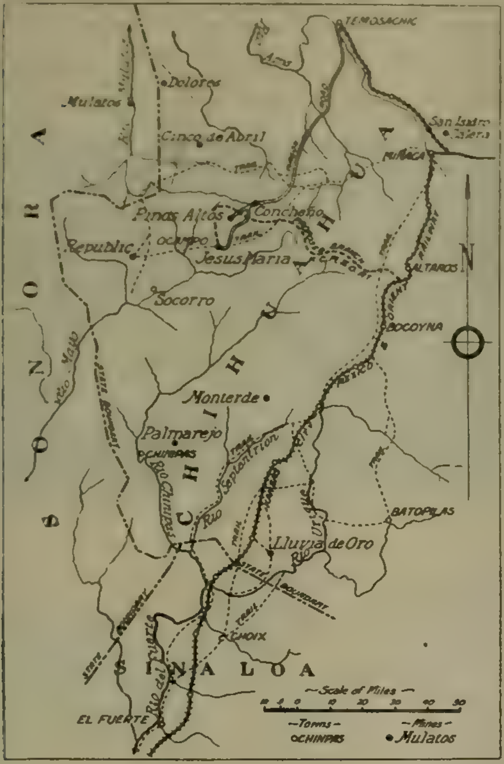
You may voyage upstream to the San Miguel and above to the Urachi, and beyond to the Verde, where the Tarahumare Indians dress in visions; something on similar lines may be found being enacted each day almost, decreasing in importance as the Indian encampments on the river increase. Into the beautiful river, at all seasons, goes the refuse—soluble and insoluble—from all the villages along all its banks. In times of flood, dead horses and dead cattle jostle together in their merry journey to the sea, traveling swifter in death than in life. The red on its face, it is said, is the blushing tinge it receives when passing the Batopilas virgin mineral belt above San Miguel. Small wonder is it that the roaring of the troubled stream may, at times, be heard for miles along its course. The concentrated product, taken inwardly, would not, in effect, differ greatly from that of the tailing solution flowing from a cyanide plant, but diluted as it is, it has a flavor that, to the thirsty, seems divine. The advice of physicians to boil the river water when used for drinking goes unheeded. The town has its plaza, with its abundance of plants and flowers. It is the preëminently charming feature of Mexican life—the plaza—with its flowers and shrubbery and foliage, the bandstand in the centre with its music, and the evening promenade of fashionably dressed people.

Good mules and a good mozo are important factors in the success of an expedition in the Sierra Madres. With such a combination to begin with, a host of evils are avoided. Dreams and slumber of the sweet variety attend the man whose *bestias* are in good trim. A few days, a week if necessary, is time well spent in the finding of decent saddle and pack animals. Horses are seldom used in Chihuahua or Sinaloa, and owing to the heat and long journeys burros are somewhat tedious. There are, usually, a number of corrals in the town or at the nearby ranches where mules can be purchased. The commission merchants usually have animals for sale. I had the good fortune to find excellent animals at the San Lucas ranch, near Las Casas Viejas, on the trail to Calabacillas. If a person's experience with mules has been limited, or if his Spanish is on the same footing, it will be found most satisfactory to have a friend along whose accomplishments include both. At the corral or ranch, or if brought to your hotel for inspection, the animals, you will be informed, are perfect specimens of their kind. All the virtues resident in mules have their abiding place in the pack before you. Whether or not you have previously engaged in a horse trade, you are aware of the ethics current among some of the votaries of the profession and what happens when trading begins.

A few miles ride on the saddle animal that looks good to you is advisable; after which you may prefer some other mule. Their sides should be examined for old sores. These old pack or saddle sores are very hard to heal, and although scarcely noticeable after a few months rest, often develop after the first day's packing or riding, if not attended to. When the mules have been brought to the hotel corral, the mozo should be instructed to wash their backs with soap and hot water, after which a bath of salt and water is advisable; the effect of the latter being to toughen the skin. Frequent washing and bathing for a time may prevent the recurrence of an old sore, besides insuring against new complications. The standard remedy carried by mule-train conductors, for saddle sores, is beef tallow, in which a little bluestone (copper sulphate) has been mixed. It has the virtue of quick healing. Too heavy blanketing, owing to the heat, is harmful, but the other extreme is worse. No matter how trustworthy the mozo may be, your personal attention should be given to seeing that sufficient blankets are provided and that the *aparajo* is plentifully stuffed with fine, light hay. Inattention to just one of these details resulted in my having to lead a pack mule six weeks while his back healed, hiring another to do his share of the packing. Good saddle and pack mules cost from ₱60 to ₱100.

The mozo should be a fairly good cook, although a highly artistic sense in that line is not always desirable. In the presence of a chef of distinction, saturated with a high art consciousness, the humble Mexican bean would shrink to nothingness. If you are in favor with the gods, you will know it by the mozo's refusing to look upon the mescal in the half-bottle. A word about this Mexican product. The mozo *par excellence* that is, the mozo of the mine manager and engineer, is a distinct prototype of his class. The northern Indian approaches him in one qualification only—that of guide. Compared to him the latter is slippery and unreliable. A Shoshone, or Piute, if he took it into his frowsy head, might leave the camp on the desert, miles from water, without so much as an adieu, or a word of warning. Centuries of peonage has impressed the peon with the idea of dependence, and a consequent respect and loyalty for his superiors. It is not an uncommon thing to send them for money, sometimes long distances. While in a district in southwestern Chihuahua, I had occasion to send to get a draft cashed. The manager of the mine at which I had stopped, needing currency, sent one of his mozos. The trip took four days, and the man had over $1000 with him on his return. At the same time another mozo was sent quite a distance to buy corn, carrying with him $500. Later, when I wished to hire one of them, I was told that under the system of peonage in vogue, I could not take him with me without the consent of the manager, to whom he was in debt. This trait of loyalty is significant, in view of the fact that the foreigner, especially the *gringo*, is looked upon by Mexicans generally, and by the higher classes particularly, as one to be 'worked.' In his high sombrero and white cotton pants rolled to the knees, shoeless, sockless, this sandalled son of the tropics has elements worth cultivating. Neither heat nor cold seems to affect his perennial good nature. I stood with one on the crest of the Sierra Madre at 2 a.m., under a small strip of canvas, hurriedly thrown over a rope stretched between two pines, with the rain pelting us unmercifully. We had gone to sleep under the brilliant illumination of the southern constellations and were slapped awake by heavy drops of rain in our faces—the forerunner, in these altitudes, of a deluge. Two hours later the brawling furies of the night had passed, and Orion, again resplendent, looked down on two sodden and shivering *hombres*, one of them apparently saddened, the other a grinning Mexican mozo. Initiative is not his. Rest assured if foresight is necessary, someone other than the mozo must possess it. His wages are from ₱1 to ₱1.50 per day with food. While not munificent, they suffice to impress him as being a rich man compared to his brother of the hoe, who is paid from ₱6 to ₱8 per month, with a small allowance of corn. But note the effect of a northern civilization, when he evolves to a certain point, he begins to lose in efficiency. This period in his culture is noted by a slight acquisition of English, and a desire to clothe his protesting feet in leather. When, finally, he becomes saturated with modern impulses, that which made him desirable has vanished and the fellow's occupation is gone. It was such a product that I had with me for a time. He talked volubly on Chartreuses, Vinos de Francia, Canadian Club, etc. He had submerged statistics and unholy descriptions of every town we stopped at over night. On the trail he wore *guaraches* (sandals), but carried a pair of shoes in his pack. He explained that *guaraches* were not allowed on the floor of some dance halls, and he wished to be prepared for any fandangos that might come his way along the trail.

The matter of supplies for the Mexican trail is one of easy arrangement. The small towns of the mining districts, through which the main trails pass, carry fair stocks of provisions. For instance, in traveling from El Fuerte to Morelos in Chihuahua, at least five supply points along the route can be utilized. This permits of light packing, an important matter when affairs are urgent. The more desirable things, such as coffee, dried beef, and rice, should be purchased at the railway towns; the best is not always sold in the interior. When the semi-tropics are reached, you bid adieu to cereals. Quaker Oats is sold at a few stores, but, owing to insects, is not desirable. Dried fruits suffer in the same way. Canned stuff, because of its weight, is out of the question on the Mexican as well as on the Alaskan trail. Potatoes are not grown extensively; for that reason few stores handle them. Those for sale are little larger than marbles. The price of bacon varies with the temperature; the shrinkage, due to the heat, being met by an advance in the price per pound, thereby making it an unpopular article of commerce. It is not easily obtained in the interior. As for pork, you will have none of it if you are a wise *gringo*. Eggs may, by diligent searching, be found at the ranchitos; the supply is uncertain. Cheese, beans, dried beef, and rice are always obtainable. The necessity of a plentiful supply of lard will become evident as the journey progresses, and a can with a tight fitting cover will prevent its anointing the pack. The *Mujeres* will look at you askance if a multitude of grease is not forthcoming, wherewith to fry the pounded jerked beef. You may carry flour and a small Dutch oven, but the chances are these will be dispensed with, and you will find yourself flirting with the native *tortilla*, the cornbread of the inhabitants. Things that add weight to the pack are soon discarded. A good appetite and a better imagination are aids in acquiring a taste for *tortillas de maize*, or *tortillas de harina*. The former are in vogue always in Chihuahua; the fashion in Sonora inclines to the latter. The simple life is in evidence largely on the Mexican trail, and some profess to enjoy it, for a time. A year or so of its simplicity, mingled perhaps with a bit of malaria, relegates it to the nether world, or some such locality.



PART OF MEXICO.

In regard to the pack: the standard weight of the tropics is 300 lb., and the day's journey is 12 miles. Therefore, should you wish to travel 25 or 30 miles per day, the pack ought not to exceed 150 lb. Two shallow boxes in which to carry the grub and cooking gear; a cot and a blanket; a quilt in addition for the winter months; a sack wherein to carry a change of garments, and a tarpaulin are all that is necessary. A mattress, because of its bulk, is a nuisance; the large palm-leaf saddle blankets are an excellent substitute. In winter the ground is preferable to a cot, as the wind has less surface to work on. A tent is seldom used, because of the necessity of stopping each evening at some ranch to purchase *sacate* and corn for the mules. The people, as a rule, especially those of the interior, are very kind, and an invitation to sleep in the *portale* is always extended. Even when camping in the open a tent is seldom raised. A stout tarpaulin answers the purpose admirably. Mosquito netting, a generous supply of quinine, and plenty of small change are indispensable. If it is not advisable to carry much currency, certified deposit checks of the Banco de Sonora, or the Banco de Minera, in the sums of ₱10 to ₱100 each will be found most convenient. These deposit checks are accepted at the mining agencies, where Wells-Fargo money orders or American bank drafts are refused.

PATIO OF THE ITURBIDE.

They are accepted readily at the stores at their face value for supplies, and can usually be cashed in the interior, less a small discount.

Two wagon-roads lead out from El Fuerte, one traveled extensively by those heading for the districts tributary to the El Fuerte river—the Lluvia de Oro in particular. The more easterly route is taken by those who wish to reach the Calabacillas or Morelos districts in Chihuahua. The first mentioned road passes through Choix, a journey of 15 hours from El Fuerte, and ends at the Mesa Colorado, from which point the districts are reached by trail. Choix is the local supply point for an extensive mining area, embracing in part the territory through which the El Fuerte river and the surveyed route of the Orient road passes. It is pleasantly situated in a small valley encircled by vari-colored rhyolite and andesite hills. Granite is much in evidence along the road from El Fuerte and east of the river to within a few miles of San Miguel. The high range twenty miles north and east of the town, over which the old Batopilas trail leads, is composed of that rock. Much of the eruptive formation overlying the granite is, apparently, of shallow depth. East of San Ignacio, where erosion has been particularly active, many dikes of diorite, andesite, basalt, and rhyolite may be seen cutting the granite. The contacts, although discouragingly barren in this vicinity, should not be interpreted unfavorably, as important orebodies have been opened along diorite intrusions in granite a few miles east of this point. The first and greatest mining boom of Mexican history, that of the seventeenth century, found a fertile field in this part of the republic, particularly in the great Alamos and Arteaga districts to the east and north.

A remarkable event of the period was the plunge of the Church in mining. Soul-saving and gold-saving were the ecclesiastical rivals of the boom, the latter, for once, being sanctified and blessed. With her sacerdotal robes tucked tight about her, the Church waded deep into the mysteries of metallurgy, and with brilliant financial results. To its spiritual astonishment, the Altar found itself in league with the *patio*. Mingled with the odor of burning incense from swinging censers, were the penetrating fumes from cupelling furnaces and the unholy smell of retorted amalgam. The State seconded the Church nobly in its exploitation of the mines and the natives. Their efforts were confined to skimming the cream, and that they succeeded is evidenced by the recorded production of those days.

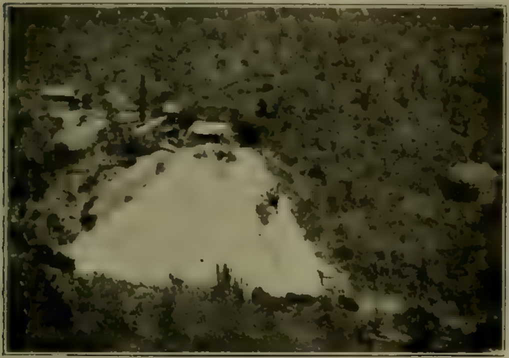
Many gold and copper prospects are being opened at this time in the Choix district, and the completion of the Orient road should greatly encourage development in that part of the country. The centre of attraction toward which all things in the vicinity of the El Fuerte river gravitate, apparently, is the Lluvia de Oro mine. Much has been written about this property, its great richness, the discovery of the vein, etc. A region of romance surrounds it. Its atmosphere has all the lure of the most fabled districts of Mexico, with their legends of lost mines, rich float, etc., but nothing in its fiction is more alluring than the fact of this 'Shower of Gold,' as it has aptly been named (Lluvia de Oro), situated as it is high above the river at the top of the mountain. No legend is more fascinating than that of the genesis of this deposit, deep amid the sedimentaries of the earth; of the mighty forces that wrought in its production; the subtle chemical skill at work in its subterranean laboratory, transmuting, combining, crystallizing its atoms; and, finally, the titanic uplifting of it from its Cretaceous bed and leaving it a mile above the level of the sea, its riches open to the Indian or peon. Every traveler passing through hears the story of the Gloria Pan, a mine with the greatest recorded production of all the lost mines of Chihuahua. It is supposed to be somewhere in this vicinity. The great richness of the Lluvia orebody, between limestone and andesite, suggests a similar deposit in the same locality, such as the Gloria Pan must have been, but one exhausted centuries ago.

Forty miles upstream is the little village of San Ignacio. The Urique and Batopilas trails meet at this point. Following a trail east along the little creek that empties into the river near the village, a ride of four hours brings us to the *antigua* settlement of Guadalupe Viejo. The ruins of an old church and numerous adobes suggest that centuries ago quite a population was established here. A few Indians and Mexicans are encamped near the ruins at present. The oldest inhabitant of the district knows nothing of the history of either mine or *pueblo*. The débris of *patios* and arastras may be seen at the foot of the mountain where water was available. A broad trail, nearly obliterated in places, leads to the summit of the mountain. A short distance below the summit, on the east flank, are the workings, some of which are inaccessible, of the Guadalupe Viejo. The vein is in rhyolite and where observable is four feet in width. The size of some of the workings suggests that the crevice rock was of a milling grade. Erosion has carried away the hanging wall rock for some distance, showing the steep dip along what seems to be the stripped foot-wall of the vein, a sheer drop of 2500 feet to the canyon below. This *antigua* is the lost Gloria Pan, according to some reliable authorities. Their opinion is based on certain geographical features that they claim tally with the recorded description of the *antigua*.

The territory lying between the Lluvia de Oro and San Ignacio offers little inducement to prospectors, the country having been capped by several flows, tuffs, etc. Many mining men following the trail up the river become disgusted with the appearance of the region and turn west. Had they prolonged their journey a day or two they would have reached a very interesting part of the great West Coast mineral belt, along the trend of which are situated some of the largest producers in Mexico. There is no hesitation in regard to it when once it is entered, as the country changes rapidly from uninteresting granite and rhyolite areas to a greatly oxidized region, some of which is scarlet in color, so impregnated is it with iron oxide. In its southerly trend this mineral belt includes the Artega, Batopilas, Calabacillas, and other producing districts. The Teneriba river empties into the San Miguel near the village of that name, and much of its crooked wanderings for thirty miles are within this zone. Many *antiguas*, some open to depths of 400 feet, bear witness to the activity of the early Spaniard. Except at La Dura, no mining operations are in progress in all this vast region, much of which is worthy of investigation. Deep-seated rhyolite, andesite, and other eruptives are the prevailing rocks of the districts.

The trail to San Jose de Gracia, Calabacillas, and Morelos from El Fuerte, lies by way of Chinabampo and Yecorata. The trip to Chinabampo is quite sufficient for the first day's journey, if the outfit requires breaking in. No mining is being done in or near the country through which the trail passes until Yecorata is reached. Some of the officials of the Orient railway are operating a large low-grade vein at the latter place, on a bond and lease from Robert Duff, a one-time superintendent of the Batopilas. All good Americans stop for a chat with the old gentleman in passing, when affairs are not urgent. Schist and granite are much in evidence through the district, overlain to the east by extensive areas of rhyolite and andesite. The old trail to San Jose de Gracia, now seldom traveled, branches off at this point. Some dredging is in progress a short distance above Yecorata. Along the trail to Calabacillas at Las Casas Viejas, El Reparo, Oro Fino, feed for the mules can be purchased, and, in a modest way, meals may be had. Little of interest in a mining way is noted until Placers is reached, as the country between El Reparo and the latter place lies between mineral belts. Above Placers, at the top of the mountain, is the mining camp of San Ignacio, owned by Philadelphia people. Some fine-looking veins are being developed to the point where a reduction plant will soon be advisable. The view from the camp is one of extreme beauty. There are situations in the Rocky Mountains that surpass it in the rugged grandeur of ranges and peaks that rise far above the line of timber, but to the magnificent sweep of this scene is added the peculiar charm of tropical light on the horizon unknown in the northern ranges.

There is little in a mineral way over which to enthuse in passing Oro Fino, as the place is handicapped by the memory of a ₱200,000 failure. Altogether, about four days are required to reach Calabacillas from El Fuerte. The trail to Reparo is an easy one, broad, and free from stones, after that it is a continuous series of mountains and canyons. As at the Guadalupe de los Reyes, the Rosario of Guadalupe y Calvo, the Jesus Maria, and at practically all the west coast producers, so at the Calabacillas the presence of andesite has played an important rôle, evidently, in the formation of the orebodies. The mine bears the same relation to the district in which it is situated as the Lluvia de Oro does to the territory in its vicinity; it is the luminary whose light is reflected in greater or less degree in the satellites surrounding it. It is classed among the world-beaters; an inelegant term, but one used at times in speaking of the elect such as Palmarejo, El Tigre, and Promontorio. Several ore-shoots have been opened on the vein, in width from 12 to 75 ft., in length from 60 to 100 ft., the average value throughout the mine being about $15 per ton gold. The ore is treated in a 20-stamp mill, by amalgamation and cyanidation, the tailing from the plates assaying about $3. It is a silicified rhyolite breccia, closely resembling some ores found in the same formation in Arizona and Nevada. This similarity in ores, noted now and again in widely separated rhyolite and andesite areas in the Cordilleras, may be attributed, perhaps not incorrectly, to their close relationship, as belonging to the period of volcanic activity which produced the world-chain of rhyolite and andesite rocks, its trend being along the Andes, the Cordilleras, the Aleutian Islands, and Japan.



GUADALUPE MINE.

Morelos is about one and one-half days' journey from Calabacillas. The trail is decidedly uphill at the start, but has the virtue of side-winding until the top is reached, when it follows the *cumbre*. It is uninteresting until nearing Potrero, as the country is capped by late flows, breccias, and tuffs. Then, rapidly, as on the El Fuerte river below San Miguel, the tiresome gray of the rhyolite gives way to the deep cream-brown and red tints of iron oxidation. The appearance of the region improves steadily as Morelos is neared. Whoever has looked down for the first time on the scarlet hills of Batopilas or Morelos, without a geologic thrill, is dead, mineralogically at least. The deep red warms the heart, as it warmed the hearts of Creel and Sheppard many years ago. Morelos is dead at present, but the evidence of its past energy is seen in the extent of the town, now falling to ruins. A few days spent in the surrounding hills convinces one that a resurrection is not improbable, and that sooner or later the old mineral will resume something of its former activity. The genial mining agent, Manuel Perez, kindly permitted me to look over the old account books of one of the properties operated by his family, and the record of two claims —one of them the San Anastasia—showed a production of over ₱30,000,000, principally in silver. The ore occurred along an intrusion of diorite in granite. When the diorite pinches along the strike of the vein, both vein and mineral content rapidly diminish, one pinching, the other petering out. The property was developed by shafts, and when water became bothersome operations ceased, after the reserves were exhausted.

There are many old and valuable mining claims lying idle in the district, some of them the property of Jose Creel and Alexander Sheppard. The trail to La Dura follows the river bed of the creek that flows through Morelos to the Tenoriba river, then along the river bed for about 15 miles until La Dura creek is reached, when it follows the latter to the camp. The little town is pleasantly situated high in the Sierra Madres and is surrounded by rhyolite hills. Many dikes of diorite, andesite, basalt, and other eruptives are found in the district, and many large and well defined veins have been developed by the Dolores company, the only mining company operating in that district. A roasting-furnace prepares the ore for further reduction in the crushing and cyaniding plant. The capacity of the plant—a Huntington and Little Giant mill—is out of all proportion to the size of the veins, some of which are 20 ft. or more in width. Gold predominates in the ore, a fair percentage of silver being also present. Few foreigners pass this way, but those who do are received most hospitably.

The trail leading out of Morelos to the summit, traveling east, is conceded to contain within its lofty windings all the ingredients that go to produce climbing that may be classed as stiff.

Another that is decidedly to the fore among the steep ones of the Sierra Madres is the drop that occurs from the summit to the *arroya*, near the Tomnil mine in Durango, on the trail to Guadalupe de los Reyes. Besides these, the trail from La Dura to the summit, going west, may be safely matched as combining the salient characteristics of each, adding a distinctive feature in that its design and construction could only have been engineered by a Mexican goat.

TAJO MILL, ROSARIO.

Once past the summit the route traverses great forests of pine, sweet-smelling, shading the moss and grass carpeted trail; a paradise far above slippery rock-slides and uncomplimentary expressions. A journey of three and one-half days suffices to cover the distance to Guadalupe y Calvo. The trail passes through Las Cebollitas, a gold camp of excellent prospects. A slight detour is necessary to reach Los Angeles, where a Mexican company is operating.

An altitude of 8000 ft. confers upon Guadalupe y Calvo an ideal summer and winter climate. Its history is the history of the Rosario mine. The manner of the discovery of the Rosario vein was told me by Manuel Perez of Morelos, Chihuahua. It was the custom of some of the Morelos people who had learned of the existence of rich placers on what is now Rosario creek, to spend the summer months at this new resort in the mountains, thereby avoiding the excessive heat of Morelos, and, at the same time, rock out sufficient gold to provide against the winter months. As soon as the weather began to get chilly the party returned to Morelos. Several seasons were spent in this highly satisfactory manner before the possibility of finding the source of the gold was considered. The deep red and yellow of the Rosario outcrop, in contrast to the sombre shades of the adjacent rock, makes the vicinity of the lode conspicuous for a long distance. In addition, the hill was strewn with float, some of it rich, and the placer operations frequently required the removal of quartz boulders that lined the creek. Mexicans of the mining districts, as a rule, are considered good prospectors, but these were blind to the signs in the water beneath and in the earth above them. Only the failure to find gold, going upstream, where the creek diverges from the hill, induced them to follow where the pannings led—farther up the mountain. In this way Fortune clubbed them into discovering the lode, which at this point was 60 ft. wide and about 1200 ft. from the creek. Then followed the usual denouncements and operations of milling, by arastras and other simple means. Later the property passed into the hands of the Ochoa family, from whom it was leased by London and Edinburgh mining men. The boom that followed the development of the orebodies is referred to by the natives as "the days of the English." The population increased rapidly from a handful in tents to 12,000 housed in brick and adobe. Supplies were packed from Vera Cruz, the nearest Atlantic seaport, a distance by rail of over 1000 miles. Merchandise from Europe by way of Cape Horn, as well as from ports of the Orient, was unloaded at Altata, the gulf port on the Pacific, and shipped inland by way of Culiacan.

A prosperous Mexican mining town in action is rarely uninteresting. The varied hues in apparel and in the tints of the buildings, intersperse a wealth of color through the life of the town, and where the area is limited, as at Guadalupe y Calvo, the effect is more pronounced. The frequent arrival of mule-trains from Vera Cruz after a six months voyage, or from Altata, with their interesting cargoes, was the occasion for great enthusiasm and festivities not included in the church calendar. The trains often numbered 500 mules, and a band of music frequently escorted them in and accompanied them for a short distance on their departure. The musical cry of the *arieros* to their mules, "*andele! andele!*" and the din of yelling and shouts of welcome to the conductors and drivers, seasoned black on tropic trails, made a spectacle wholly unknown north of the border. Each Saturday evening a keg of *mescal* was set up in the street, but this was looked upon as a preface, merely, to the elaborate and often wild proceedings of the night and day following. The production of the mine became so important that the Government established a mint about the year 1840. The walls of the buildings still stand, a reminder of former prosperity.

The negotiations with the Ochoa family for a new lease failing, the English departed for Vera Cruz and London. Under their management of the mine, the mint alone recorded a production of ₱50,000,000. With their departure the luck of the camp vanished. Disaster attended the efforts of the Ochoa family until finally they abandoned the property. The dump, at that time considered too low grade to handle, consisted of nearly 200,000 tons of ore, valued at $10 per ton, besides large reserves in the mine. The efforts of the new locators were confined to 'gutting' the mine and sorting the dump. After they had satisfied themselves along this line, they sold to a Texas syndicate. A small stamp-mill was installed, but the operations of the syndicate were unsuccessful and the mine was closed. Another turn of the wheel and the property is again in the hands of its friends the British, represented by the Western Mining Co. This company is erecting a 200-ton plant to treat the ore of the dump, as a beginning. Heavy faulting and capping of the rhyolite, the formation surrounding the district, limits the mining area to about two miles along the strike of the Rosario lode, which lies between the andesite and rhyolite.

WHILE the report of the Geological Survey and the Director of the Mint recently issued shows that Montana's gold and silver production for 1910 was practically the same as in 1909, it is believed here that the gold production for the present year will show a large increase, together with the silver output.

Breckenridge Mining District

Breckenridge, like Leadville and many other mining districts of Colorado, owes the discovery of its mineral wealth to that wave of westward emigration which in 1859 surged toward Pike's Peak and broke along the eastern flank of the Front Range. A detailed study of the district was recently made by F. L. Ransome and E. S. Bastin, geologists of the U. S. Geological Survey, and the Survey has just issued a report on the district by Mr. Ransome. This report covers an area of about 45 square miles situated in Summit county, Colorado, 60 miles southwest of Denver.

The rock formations of the Breckenridge district differ from those at Leadville and Tenmile in that the thick body of Paleozoic sedimentary rocks is absent, formations of later (Mesozoic) age resting directly on a base of pre-Cambrian rocks. During the ice age there were two advances and retreats of glacial ice. The earlier glaciation is represented by terrace gravels and by what has been called hillside wash; the later one by moraines and low-level gravels or valley trains. These later glacial deposits occupy the bottoms of the present valleys to a depth of 25 to 90 ft. and are yielding an important amount of gold to dredges each year.

The total gold production of the district is estimated by Mr. Ransome at somewhat less than $20,000,000, derived mostly from placers. Breckenridge in the past has yielded ores of varied kinds and richness, from the native gold of Farncomb Hill on the one hand to the zinc ores of the Country Boy mine on the other. Much of the output has been partly oxidized argentiferous lead ore, which, like the other ores and concentrates of the district, averages about $25 per ton in value. The deposits are principally narrow fissure fillings laid down through the agency of thermal waters and gases either given off or made effective by slowly cooling masses of deeply buried igneous rock.

Mineralogically the Breckenridge district, although noted for the occurrence of crystalline native gold in filiform and leafy aggregates of remarkable delicacy and beauty, is not of great or varied interest. Mr. Ransome concludes that the district does not give definite promise of any general and permanent revival of deep mining. Pay-ore has been found only within about 400 ft. of the surface, so that the future depends largely on the discovery of new bodies. At present gold dredging is the chief economic resource of the district. In 1909 four boats, with a capacity of 12,000 cu. yd. in 24 hr., were operating on the low-level gravels. An area sufficient to perpetuate this industry for ten or possibly fifteen years is available, but in addition there still remains much low-grade bench gravel that may some time be washed or dredged with profit.

California Vanadinates

While analyzing ores of the Camp Signal mining district, in April 1911, R. O. Hall discovered the existence of vanadium ores in California. Samples of the mineral were sent to W. T. Schaller, who has published in the *Journal* of the Washington Academy of Sciences the following: "Some samples of vanadium ore, sent to the Survey by A. L. Lombard and J. F. Main, of the Dirigo Mining & Milling Co., of Los Angeles, California, proved to be coated with a deposit of cupro-descloizite. The associated lead minerals are cerussite and vanadinite from which the cupro-descloizite seems to be derived. The locality is given as Camp Signal, in San Bernardino county, California. A qualitative chemical test showed the presence in quantity of lead, copper, zinc, vanadium, and a little water. A direct quantitative determination of the vanadium gave 21% of V_2O_5."

With the deposits of vanadinates, wolframite, hübnerite, and ferberite occur plentifully. The claims (eight in number) are situated ten miles northwest of Goff's, a station on the Santa Fé railroad.

Comparisons of Fuel Costs in the Dredging Field of Alaska

By E. S. Rust

In the construction and operation of gold dredges in the Alaska field the fuel problem is sometimes of vital importance. Electrical power at 2½ to 3c. per kilowatt hour is by far the most satisfactory if the dredge property is so situated that the cost of line construction from the power site to the dredge is not too great. For one small dredge it can readily be seen that great expense cannot be incurred in installing a long power line, but if the company building the dredge or dredges be large enough, or if there are other operating companies in the near neighborhood, it may prove advisable for several to consolidate for the installation of a power line or electric plant, provided the necessary water power be available. Should electrical power not be available, and the erecting of a power-plant not practical, we have to consider coal, fuel oil, wood, or gasoline as fuel for generating power. In some localities it is only necessary to consider two or three different kinds of fuel. At Nome there is no wood to be had at any price, and in that neighborhood distillate is found to be the most practicable for the 2½ or 3½-ft. boat, digging from a depth of 10 to 25 ft. Coal can be obtained from Seattle for about $21 per ton.

The Yuba Construction Co. has installed gas-engines on dredges operating in the Alaska field, and has proved their efficiency for handling anything but frozen ground, which up to the present time has not been dug profitably by dredging. Fuel oil, though cheaper than coal, has one serious disadvantage. No matter with what care it is handled, it is practically impossible to prevent some of it from entering the dredge pond and getting over the tables, thus interfering with the amalgamation of the fine gold to a great extent. The non-freezing qualities of distillate is also a point to be considered in comparison with fuel oil. At Dawson and vicinity there is a poor grade of native coal which may be bought at prices ranging from $15 to $18 per ton. Freight rates on coal from Seattle almost prohibit its use as a fuel in that district and Fairbanks. Wood may be had at Dawson and Fairbanks in sufficient quantities, but owing to the cost of cutting and transportation to the dredge, some other fuel could probably be used to better advantage.

From freight costs and from information given by operators in the Northern field, the following table has been compiled, and may assist anyone contemplating the installation of a dredge in the Alaska field in solving the fuel problem for his conditions of work. These figures represent the costs at the three towns only, and transportation charges to the dredge sites, which vary with the seasons and the localities, should be added. It is obvious that these may greatly increase the total cost.

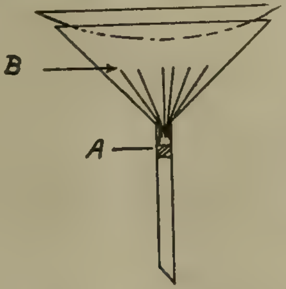
	Coal.	Fuel Oil.	Distillate.	Wood.
Nome	$17 to $21 per ton	$2 per bbl.	15c. to 21c. per gal.	
Fairbanks	None at present	$6.10 per bbl.	30c. per gal. *via* St. Michael	$12.50 to $15 per cord
Dawson	$18—poor native coal	$7 per bbl. in drums	32c. to 35c. per gal.	$12.50 to $15 per cord
Fuel equivalent	1 ton	116 gal.	29 gal.	2 cords
Fuel consumption per hp.-hour	8.7 lb.	½ gal.	⅛ gal.	20 lb. dry pine

COMPARATIVE COST OF FUELS IN ALASKA DREDGING FIELDS.

A Rapid Filtering Funnel

By H. Spurrier

The ordinary funnels used in analytical work may be made to filter far more rapidly than usual, by deeply etching lines from a point below the apex of the funnel to points forming a ring about two-thirds of the way up the sides, in the following manner: Coat the inside of the funnel with a layer of paraffin (containing a little turpentine or other agent to render it non-brittle) and allow part of the wax to run down into the tail and form a solid plug about 5 mm. below the apex of the funnel or well below the lowest point reached by the filter paper.



RAPID FILTERING FUNNEL.

Scratch six or eight lines in the wax coating extending from the point *B* to the wax plug at *A*; now fill the funnel to a point above *B* with hydrofluoric acid and allow to stand 25 minutes; then pour out the acid into another funnel prepared as the first, and so on until as many funnels have been prepared as required. The funnel should be covered with a waxed beaker cover. The wax may be removed by hot water and the deeply etched grooves cleaned out with the point of a mechanic's scratch-awl or other suitable tool. These grooves are not large enough to allow a filter paper to be broken by the stream from a wash bottle, but afford efficient channels for the filtrate to flow down. The funnels may be used with the filter cone and are especially valuable in filtering gelatinous precipitates such as alumina. The speed of filtration is increased by this means to about two and a half times the normal rate for a funnel not so treated.—*Jour. Amer. Chem. Society.*

Gold Dredging at Paracale

Press reports from China state that the Philippine Dredging Proprietary, Ltd., a Melbourne concern, of which J. W. McWhae, J. G. Aikman, and A. B. Johnson are directors and A. F. Showers is the secretary, has purchased the dredges and mill equipment of the New Zealand company now operating in the Paracale district, Philippine Islands. By the terms of the agreement the former controllers, Frank B. Ingersoll and a number of associates, are to receive 2% royalty of the earnings of the new company. The reports on the property for purchasers by J. W. McWhae and J. Bertinshaw state that the 800 acres of dredging ground acquired constitute a valuable property, provided that adequate plant is installed to treat the large extent of high-grade alluvial river beds stated to exist. The installation of dredges of large capacity, fitted with close-connected buckets—the whole plant designed so as to get the overburden away quickly—is expected to quadruple the yields being obtained with the present appliances at a relatively small increase in the aggregate working expenses. On the Paracale claim 64 bore-holes averaged 7 gr. of gold per cubic yard of drift; the Melville & Fingal claim averaged 10½ gr. from 13 holes bored, and the Nueva California averaged 13¾ gr. from seven holes.

The Refining of Copper

Eight plants handle the refining of upward of 1,000,000,000 lb. of copper in the United States annually, according to the *Boston News Bureau*. When all plans have been carried out, the Guggenheims, with their three refineries, will lead in capacity with a total of 480,000,000 lb. per year. At the moment there is being sold through their sales agency approximately 340,000,000 lb. per annum. The three Guggenheim refineries are owned by two of their companies. American Smelters Securities Co. owns the Baltimore plant, which at the time it was purchased had an annual capacity of 144,000,000 lb. Early in 1910 this had been increased to 240,000,000 lb. per year, and Daniel Guggenheim went on record some time ago as saying that its ultimate capacity would be 288,000,000 lb. The Smelters Securities company also owns the Tacoma smelter and refinery, which has a capacity of 24,000,000 lb. per year. The Perth Amboy refinery is owned by the American Smelting & Refining Co. It has a capacity of 168,000,000 lb. per annum. Thus for the three Guggenheim refineries an ultimate capacity of 480,000,000 lb. yearly should result when all improvements and additions have been completed.

By combining the capacities of the Raritan and Boston & Montana refineries the Amalgamated interests have a yearly total of 456,000,000 lb. in comparison with Guggenheims future total of 480,000,000 lb. The Laurel Hill refinery, owned by the Nichols Copper Co., has long held first place with regard to capacity, or at the rate of 396,000,000 lb. per year. This place has been usurped by the Raritan refinery, formerly owned by the United Metals Selling Co., but now controlled and operated by the International Smelting & Refining Co., its capacity being 408,000,000 lb. per annum. The Anaconda company operates a refinery in Montana with a capacity of 48,000,000 lb. yearly.

In the following table increase in capacity of the various refineries in the past three years together with present annual capacity is shown:

Plant.	Annual.	Monthly 1911.	Monthly 1910.	Monthly 1909.
Raritan	408,000,000	34,000,000	27,000,000	24,000,000
Boston & Mont.	48,000,000	4,000,000	4,000,000	4,000,000
Nichols	396,000,000	33,000,000	33,000,000	27,000,000
Guggenheims ..	*480,000,000	*40,000,000	25,000,000	12,000,000
U. S. Refining..	180,000,000	15,000,000	14,000,000	10,500,000
Balbach.........	30,000,000	2,500,000	2,500,000	2,500,000
Total	1,542,000,000	128,500,000	105,500,000	80,000,000

*Ultimate capacity.

Selling and refining of copper has always gone, for the most part, hand in hand. The United Metals Selling Co. handles practically all of the Raritan and Boston & Montana output, which at full capacity would total 456,000,000 lb. The Raritan plant, under recently acquired contracts, has been treating the product of three companies, Miami, British Columbia, and South Utah, which it does not sell. All other copper refined by International Smelting & Refining Co. is marketed by the United Metals Selling Company.

The Nichols Copper Co. does not maintain a selling agency, its product being sold by the American Metal Co. In addition to the Nichols output the American Metal Co. operates the Balbach refinery. The best customer of the Nichols company has for years been Phelps, Dodge & Co., with about 135,000,000 lb. of copper at current rate of operations. Phelps, Dodge & Co. alone of the big selling agencies, does not own a refinery.

A close working alliance has existed for some years between the United States Smelting, Refining & Mining Co. and the L. Vogelstein & Co. selling agency whereby the latter markets the output of the former. The Calumet & Hecla Co. owns and operates a small refinery at Buffalo where a portion of its subsidiaries' product is being treated electrolytically. There also the silver-bearing native copper of the Quincy company has been electrolytically treated for some time past.

The Lead Market

L. Vogelstein & Co. reports that the recent decline in the lead market took the trade generally by surprise. These are the first changes of note in desilverized lead prices since November 1910, though Missouri brands during the same period have fluctuated over a range of twenty points—from $4.22½ to $4.42½. Various reasons have been assigned for the decline, but it is believed that the smaller consumption of white lead due to the high price of linseed oil with resultant falling off in the paint trade, is chiefly responsible. Fear of possible tariff revision is another disturbing factor, and while admitting that one of the chief points of attack will be the lead schedule, the eventual success of efforts in this direction may be doubted. When the present bill was passed there was a strong fight to have the lead duty reduced, and in the bill as originally published the new duties were placed at 1c. on lead in ore and 1½c. on pig lead, but they were subsequently changed back to the Dingley rates. At the time these new reduced rates were in prospect the lead market was never less than $4 to $4.10 New York, based upon a price for soft Spanish lead of £2 (½c.) less than that now prevailing. Today's price is equivalent to $3.30 and the market is strong. Adding to this figure even a 1c. duty on lead in ore, the parity is 4.30c. New York. To import pig lead with a duty of 1½c. would cost in the neighborhood of 4¾ to 5c. per pound. In other words, even granted such a drastic revision of the tariff as above referred to, effects so far as this market is concerned are already discounted. In considering this phase of the matter, it should also be borne in mind that any diversion from foreign to domestic markets of lead made in this country from imported ore or bullion would probably result in higher prices abroad. As pointed out recently, stocks of foreign lead in bonded warehouses have been cut in half, in spite of which the European market has advanced, showing that this lead is needed in Europe. Assuming that this diagnosis is correct, the trouble will shortly be remedied, as buying against spring requirements must soon commence, and if painting has been put off this year, it only means an increased demand later on. That there is a good current consumption together with considerable confidence in the market, is shown by the heavy buying since the decline took place and this buying still continues.

ELECTROCHEMISTRY is the art of applying electrical energy to facilitating the work of the chemist. It is chemistry helped by electricity. It is the use of a new agency in accomplishing chemical operations, and it has not only succeeded in facilitating many of the most difficult and costly of chemical reactions, but it has in many cases supplanted them by quick, simple, and direct methods; it has even, in many cases, developed new reactions and produced new materials which are not otherwise capable of being made. A few examples will illustrate these points: Caustic soda and bleaching powder are made from common salt by a series of operations, but the electrical method does this neatly and cheaply in practically one operation; lime and carbon do not react by ordinary chemical processes, but in the electric furnace they react at once to form the valuable and familiar calcium carbide; carbon stays carbon except when the intense heat of the electric furnace converts it into artificial graphite.

THE UNITED STATES has long held first place as a manufacturer of asbestos goods, but the raw material for that purpose was freely drawn from Canada, at present the chief source of the world's supply. According to J. S. Diller, the production of asbestos in the United States is not only increasing in quantity, but improving in quality. The total output for 1910 was the greatest ever credited to the United States, being 3693 tons, valued at $68,357. This was an increase of 20% in quantity over the production of 1909, with brighter prospects for the future.

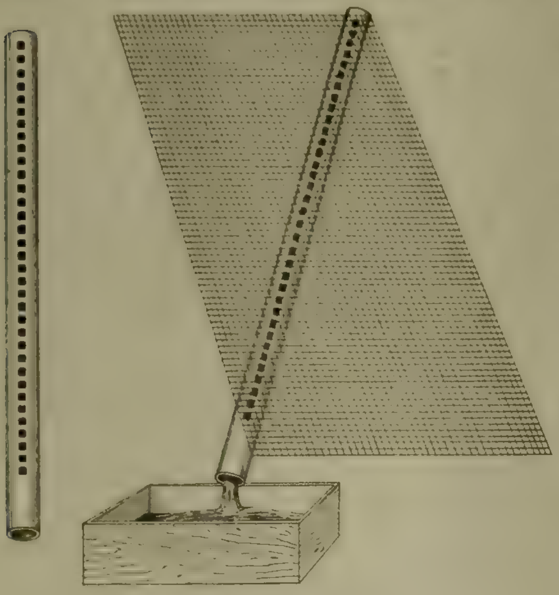
Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any letter is determined by its probable interest to the readers of this journal.

A Neat Sampling Device

The Editor:

Sir—While this method of sampling is not new, it may be used to good advantage for the sampling of mine screenings and may be made very cheaply. To construct the sampler, take a piece of ordinary 4-in. galvanized pipe, as used for ventilating mines and cut as shown in the illustration. Place this diagonally across and about 6 in. beneath the screen. The square holes in the pipe should be cut a little larger than the mesh of the screen used. If a ½-in. screen is used, the holes should be cut about 1 in. square and proportionately. Allow the end of the pipe to extend about 18 in. from the side of the screen and place a box underneath the spout to receive the sample. This may be emptied at the end of each shift, and a fairly accurate sample of the day's run will be obtained.



SIMPLE SAMPLING DEVICE.

MINER.

Rawhide, Nevada, October 18.

Aluminum

The Editor:

Sir—I beg to call your attention to an oversight on page 418 of your last issue. *Aluminum* should read *aluminium*. I know that most Americans spell it and pronounce it *aluminum*, nevertheless *aluminium* is the correct version and the one in use and accepted by the scientific world. The discoverer, Sir Humphrey Davy, in the beginning of last century called the metal *aluminum*, to be sure, but little was known about it, nor much use made of it, until the Germans seriously occupied themselves with this interesting and valuable metal seventy-five years later. They then gave it the name *aluminium*, which is the one adopted by all scientific bodies. No doubt you have heard of the Mannesman Brothers (Brüder) of Remscheid. I know them well—they are without doubt the greatest aluminium merchants in the world—and throughout their vast plants and works the word *aluminum* is unknown. All the standard dictionaries speak of it as *aluminium* and I remember very well that during a lecture on the subject while a student in Columbia College, no less an authority than the well known and popular professor, Charles F. Chandler, particularly called the attention of his students to the fact that *aluminum* was an American distortion and wrong version of the correct scientific name *aluminium*, and as a matter of accuracy, requested us to refrain from using it. Since your paper aims at scientific accuracy, you will no doubt accept these remarks in the spirit they are given.

JUAN FELIX BRANDES.

San Francisco, October 24.

[We are very glad to accept Mr. Brandes' remarks in the friendly spirit in which they are sent, but his conclusions can scarcely be so readily endorsed. The Standard dictionary, which is generally accepted as the standard of American usage, prefers the spelling *aluminum*, adding that there is great diversity of usage, and neither form has yet been adopted to the exclusion of the other. It was our privilege also to sit in the classes of that distinguished chemist, Charles E. Chandler, but our admiration for his profound knowledge and the fascination that he injected into lectures on what is too often but a dry science, did not lead us to adopt his practice in this regard. N. S. Shaler, an equally profound scholar and popular lecturer, may be quoted upon the other side, and T. W. Hunt, professor of English at Princeton, believes that *aluminum* is practically the accepted usage in America. That *aluminium* follows the precedent established by *sodium* and *potassium* is unquestionable, but when the attempt is made to pronounce the word the necessary alteration in the sound of the first two syllables almost eliminates the mental association with alum, the preservation of which was the chief reason for the devising of this method of naming elements. Use is the law of language, *aluminum* slips more smoothly from the tongue of Americans, and in this case, as in every other, we must be guided by what, in our judgment, is the usage followed by the greatest number of the well informed.—EDITOR.]

NO ESTIMATES of the amount of available iron ore in Canada have been made by any of the various governmental officials. In a report by C. W. Hayes on the 'Conservation of Natural Resources in the United States,' an estimate is made of the iron ores in the countries adjoining the United States. The estimate is there made of available ore as follows: British Columbia, 30,000,000 tons; Ontario, 9,000,000 tons; Nova Scotia, 4,000,000 tons; total, 43,000,000 tons. This is considered a sufficiently high figure for ore already known. At the same time the possibilities, and indeed probabilities, are so great that a much larger tonnage must be considered as likely to be found. The Lake Superior type of bedded deposit is known to occur in the extreme northwest of Canada in the Yukon territory and in the southeast in New Brunswick, a distance of 2800 miles. At numerous points between these extremes, Keewatin rocks of the great Archean shield are known to occur, and in nearly every case where these have been carefully searched the iron formation has been found. In far from all of these occurrences will the iron formation be productive of commercial ore, but there is every reason to expect that with careful and detailed exploration, many of them will. It is true that large areas at present are so far from transportation that they cannot be considered as possible sources of iron ore for years to come. The Clinton ore deposits, which yield such a large portion of iron ores of the United States, occur but to a limited extent in Canada and cannot be looked on as probable large producers. In Newfoundland, however, two steel companies have very large iron-ore reserves in beds of this type.

THE Standard Consolidated Tin Mines at Sandy Creek, by way of Charters Towers (Queensland), have commenced operation with about 30 men. A hoisting and pumping plant has been built, while the old stamp-mill is doing duty pending the construction of the complete plant. The building of a concrete dam is in progress.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

DENDRITIC markings are due to descending oxidizing solutions, and are chiefly manganese or manganese and iron stains.

CLAIMS which have been patented cannot be lost except through failure to pay the taxes upon them (when they may be sold for default), as the title conveyed by a U. S. patent is an absolute one.

PLACER is derived from the Spanish *placer*, which has the same meaning as the English term. *Placel* is the Spanish term for a sand-bank, and both terms are probably derived from *plaza*, a place.

RUTILE, or titanium oxide, was produced in the United States last year only at and near Roseland, Virgina. No rutile was imported, but one American company exported it in considerable quantities.

SERVICES of a watchman on an unpatented claim can only be allowed where improvements exist that require watching. When machinery or buildings require watching such service may be allowed as the annual labor required by statute.

MOLYBDENUM ores are difficult to concentrate when associated with chalcopyrite, as these minerals have nearly the same specific gravity, while the presence of more than a trace of copper in molybdenum renders it useless for most purposes.

SHAREHOLDERS who have paid the taxes upon a patented claim owned by a defunct company would have a claim against the company for the sums thus paid, but unless legal steps had been taken to dissolve the company and to vest title in the individual shareholders they would not hold a possessory title.

THE ONLY gas produced from crude oil up to within a very recent period, has been one having a value from 550 to 680 B.t.u. per cubic foot, used for domestic lighting and cooking. This gas has been produced by the process known as the 'cracking' of the crude oils, which is largely disruptive in effect and frees a very large percentage of hydrogen and carbon, resulting in a gas carrying 50% and upward of free hydrogen. This gas will give no higher efficiency in a gas engine than distillate.

ASBESTOS is classified as amphibole and chrysotile. The amphibole, or hornblende asbestos, does not have the fineness of fibre, the tensile strength, the elasticity, or the flexibility of the chrysotile, although it has approximately the same heat-resisting qualities. The amphibole differs from the chrysotile chemically, in having lime combined with its magnesia, and while the chrysotile, a silicate of magnesia, is always hydrated, the amphibole is frequently anhydrous. Chrysotile is best adapted to commercial uses.

DESIGN of an elevator for performing any special service and the selection of the proper buckets or cups are problems that should usually be referred to an engineer familiar with the operation of such machinery. So many details enter into the design of an elevator that general rules covering all cases cannot be given. The shape and size of the buckets, their spacing on the belt, their speed, the size of the pulleys, the inclination of the elevator, and the manner of loading the buckets bear directly on the operation, and all these points must bear a definite relation to each other.

BLACK SANDS can be concentrated like any other mineral, and from their high specific gravity are comparatively easy to concentrate. It is somewhat difficult to separate the gold from the other heavy minerals in black sand, but it can be successfully accomplished by any one of several methods, mercury being the most convenient. The recovery of platinum is more difficult, as it will not amalgamate. But the importance of the occurrence of platinum in black sand has been greatly exaggerated, and many processes are chiefly aimed at the securing of a supposed metallic content which has no existence in fact.

FOR handling ore, stone, coal, and all heavy materials, elevators should be run at a speed of 200 ft. per minute or less, and the buckets should be spaced continuously on the belt or chain. In discharging from these elevators the speed is not sufficient to throw the material to the chute by centrifugal force, but gravity acts practically alone. In this way the material from one bucket slides to the chute over the back of its leading bucket. In order to insure a clean discharge, the backs of the buckets are usually provided with flanged sides, each one forming a trough for the material from the succeeding bucket.

IF THE DIP of a fault is greater than 45° it probably has a downward component, often combined with a horizontal component (normal fault). If less than 30°, an upward movement is common (thrust fault). If there is a gouge or slickenside or movement striae, the direction may often be told by use of a magnifying glass. Sometimes the feel of a slickenside (smoothness being developed in the direction of the grinding) shows the direction of the movement. Of course if the geologic column is known or if there are surface outcrops of the veins, methods of descriptive geometry will often exactly solve the problem.

IN MAKING a mineral location upon public domain, it is usually not necessary to know upon what section of land it is, or to tie the location to a land survey monument, possibly excepting placers; but with agricultural and other entries and patents rapidly encroaching on mineral lands, it is often necessary in trying to keep clear of them, or in the case of disputes, to be able to find tracts of land in the field by their markings. In case of a contest between mineral and agricultural claimants each legal subdivision of 40 acres constitutes a unit. The Government prefers that placer claims conform to legal subdivisions whenever practicable, in such cases permitting the claims to be entered for patent without further survey or plat.

COBALT is principally used in the United States in making glass and pottery. A beautiful blue is given to glass by the oxide of cobalt. Sympathetic inks, according to a report of the United States Geological Survey, are made from cobalt acetate, chloride, and nitrate that are colored when heated and colorless when cold. This interesting phenomenon is due to the change in color of the salts on the absorption of water. When dry they are blue and easily seen on paper; when damp they are pink; and when dilute, colorless. A puzzling application of this principle may be in a doll whose dress is blue in dry weather, but changes to pink when subjected to dampness, as in wet weather or when the doll is held in the steam of a tea-kettle. Artificial flowers are made to show the same effect.

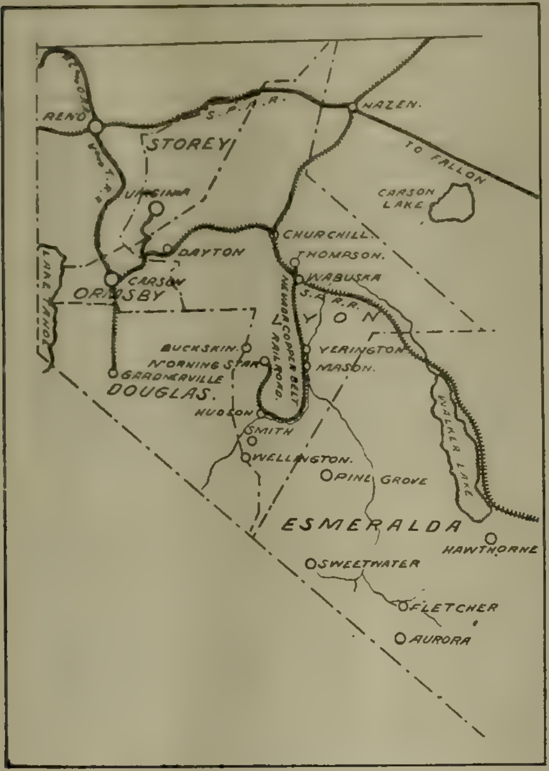
SAMPLING of a large stationary tank or reservoir of oil, particularly if the oil has stood so long that it has begun to stratify, or form layers of different density, may be done as follows: The sampler should procure an ordinary iron pipe, or preferably a tinned tube, 1 in. diam. and long enough to reach from above the man-hole, where he can grasp it, to the bottom of the tank. The lower end of the pipe should be reamed out with a round file. A conical plug of cork, wood, or other suitable material should be fitted to this end, and a strong, stiff wire, such as the ordinary telegraph wire, run through this plug and up through the pipe to a point where it can be grasped firmly by the sampler. A pull on the wire will close the bottom of the pipe, and a rap against the bottom of the tank will drive the plug home and make an oil-tight seal or valve.

Special Correspondence

NEW YORK

Stocks Dull.—Yerington Reorganization.—Braden Mill to Be Doubled in Size.—Copper Situation Weak.—La Rose Con. Postpones Surplus Distribution.

In a market way there has been little of interest during the week. Copper metal has been weak rather than otherwise, and the ruling price has been not above 12½c. The stock market has turned dull and is without any feature of interest. The Yerington Copper Co. is to be reorganized into the New Yerington Copper Co. The holders are to give up two shares of old stock for one in the new company. The Yerington properties are near the Mason Valley, and the new company will probably be managed by Duncan MacVichie. Braden Copper is apparently to be one of the low-cost producers whose output must be considered in making any figures on the copper situation. The Guggenheim engineers are figuring on between 6½ and 7½c. for copper with an output of 40,000,000 lb. per year. The 3000-ton mill probably will be doubled. The plant includes a hydro-electric equipment from which power is carried some 18 miles to run the concentrator. The directors of the Tennessee Copper Co., who, under the guidance of Herman Keller, recently made a trip of inspection to Ducktown, Tenn., report themselves as much pleased with the work which has been done in bringing the company's plant up to its present efficiency. The party included, besides Mr. Keller, H. M. Kilbourn, one of the vice-presidents of the National City Bank of New York, Joseph Walker, Jr., and Richard Sutro of Sutro Bros. & Company.



MAP OF SOUTHWESTERN NEVADA.

The copper situation is admittedly somewhat complicated and delicate. Any further heavy decline in the metal would bring a large number of well known producers face to face with a loss on every pound of output, and the alternative of operating at a loss or suspending production. A considerable increase in the accumulated surplus, possibly 20,000,000 lb., is expected. The Hancock Consolidated, the Cole-Ryan property in Michigan, is to sell its copper through the United Metals Selling Co. The Hancock is now producing about 100,000 lb. per month. Lake Copper, at one time the pyrotechnic sensation of the Boston copper share market, is just getting to the point of making its initial shipments. The company is expected to ship 1000 tons of ore daily within a short time, to the Trimountain mill. The stockholders in the La Rose Consolidated Mines Co. were hoping for something in the way of a melon, but were disappointed by the action of the directors at the special meeting held this week. Notwithstanding the protest of some directors who insisted that the stockholders were entitled to an immediate distribution of a large part of the $1,500,000 surplus in the company's treasury, it was decided not to disturb any part of it until after December 31, which is the end of the company's fiscal year. At the annual meeting the matter is to be taken up.

The smelting industry, upon which the larger business of mining must chiefly lean, is a field peculiar to itself, in that it is occupied by probably the fewest and the biggest middlemen in the world. The smelting of copper ores to the extent of a billion pounds or more annually in the United States is carried on at eight plants, of which three are owned by the Guggenheims, and two by the International Smelting & Refining Co. Next in rank to the plants mentioned is the Laurel Hill refinery of the Nichols Copper Co. which handles the ores of the Phelps-Dodge company. The Balbach refinery is operated by the American Metal Co., which latter is primarily a metal broker. By custom in this country the smelting of copper and the selling of the metal have always been handled by the same concerns in greater part. And it is a typical illustration of the modern tendency of concentration that so gigantic an industry should be so completely controlled by concerns that can be numbered almost on the fingers of one hand.

The decline in lead prices is affecting many of the lead mines. The present price for the metal is around $4.10 to $4.25 per 100 lb., with indications of lower prices in the near future.

BLUEFIELDS, NICARAGUA

Record Run at La Luz Mine.—Power-house at Patunka Falls is Planned.—New Mining Laws of Republic.

The September run of the La Luz & Los Angeles mine, which amounted to 1646 oz. of gold, made a new record for the mine. As the La Luz bullion assays over $17 per ounce, the total value of the production is about $28,000. The La Luz is worked by open-cut, but a vein has been found at a depth of about 120 ft. which assays on the average $125 per ton, according to recent reports.

Work will be started in the near future on the proposed power-plant at Patunka falls on Labue river, about one mile above Cuicuina. At present steam is used. H. J. and J. R. Amplett are in charge of the mine.

The recent changes in the mining code have aroused great interest among mining men. The decree is as follows, as published in *The American* of Bluefields:

"The President of the Republic,

Considering,

That until a total reform of the laws regulating the Mining Industry is brought about and in accordance with the progress attained by the same, deems it convenient to make various reforms in the Code treating of the matter, and to dictate dispositions which tend to the better development of enterprises already established, and using the legislative faculties with which he is invested,

DECREES:

The following reforms to the Mining Code of the 19th of February of 1906.

Art. 1.—The Article 62 will read as follows:

Ninety days after the registering is ratified, any qualified person may solicit a claim adjoining those of the discoverer, in the direction of the vein or ledge, and it can only be done in the direction of the dip or pitch of those whose formation lies horizontally in strata in such a manner that they do not present a proper continuation following a determined direction.

These solicitudes will be entered in the register and will be published in the same manner as that of the discoverer.

If the solicitude refers to a distinct ledge situated on the side of the pitch of another already conceded and less than three hundred metres from the limits of said claims, the publication of it will not be sufficient, but the solicitude will be notified in conformity with Art. 65 of the Code, being subject to nullity in favor of the owner of the known ledge; who will have the preference in the adjudication of the new solicitude, if he makes his right valid within thirty days, plus the interval of time necessary to cover the distance, to begin from the moment of notification.

Art. 2. Art. 212 is derogated. This derogation and the following reform of Art. 214 does not affect pending denouncements and concessions, the procedure of which will continue and be governed in conformity with the dispositions of the Code and its reforms.

Art. 3. Article 214 will read: at the expense of the interested parties will be published three separate times within the term of one month in any newspaper of the capital the solicitude made to the Executive Power to acquire the sites and plants referred to in Article 213; the solicitude to be communicated to the District Judge in whose jurisdiction said properties are situated.

Priority of petition made to the Executive or the Judge will establish the preference in the adjudication, excepting that which is ordered by Art. 217.

Art. 4.—Article 218 is derogated.

Art. 5.—Article 222 will read as follows: failure of payment of the right in conformity with Art. 204 of the law, will immediately cause the forfeiture of any zone concession without recourse, the concessionaire having the right to retain only the mining properties which he may have legally established.

Art. 6.—Article 223 will read: the concessionaires of zones are obliged to establish at least one mining property within the first year of their concession; not fulfilling which they will pay as an annual contribution one peso for each hectare contained in said zones.

If, after five years from the granting of the concession the legal obligations to develop the zone on a large scale are not fulfilled, the concession will terminate, the rights acquired in it will be lost, except that of the concessionaire retaining the mining properties which he may have legally established.

Art. 7. Article 224 will read: Failure to measure the zone during the time allowed for same will cause forfeiture of the concession. Time allowance may be extended only once, and for a period not exceeding the first.

If for a period of six months the interested party fails to demand the furtherance of his solicitude of a zone or extension of time, this will occasion the caducity of the denouncement.

Art. 8. The following paragraph will be added to the second part of Art. 231: likewise coal, naphtha, gasoline, crude petroleum, and any other similar combustible; tanks and vessels for the transportation and preservation of the same; all classes of utensils necessary for the process of cyaniding, such as cyanides, tanks, iron or wooden boxes for precipitating, zinc in sheet or chips; lathes to make these, pipes, ovens, and other articles and substances used in the aforesaid system.

Art. 9. Article 230 will read: The renewal of matriculations will be made each year and the Jefe Politicos will remit a copy of them to the Ministry of Hacienda with the object mentioned in the following.

Art. 10. It is prohibited to make clearings and sowings or establish whatever other agricultural or cattle breeding enterprises on the lands near to mines that are being worked, or near springs or fountains and on the banks of rivers and streams whose waters are utilized in mining establishments; and miners will only be permitted to establish yards or small gardens and pastures for the penning of their animals or other usages necessary to their undertaking.

Lands within a radius of fifteen hundred metres will be considered as close to a mine.

Any contravention to the requirements of this article will be punished executively by the mining authorities with a fine of from 100 to 500 pesos, such to be destined for the repair of the roads of that district.

Art. 11. The present law will begin to be in force from its publication and derogates all measures opposing it.

Given in Managua on the 26th day of the month of September of 1911.

Adolfo Diaz.
The Minister of Fomento,
A. Canton."

JOPLIN, MISSOURI

Smelter Strikes Settled, and American Zinc, Lead & Smelting Co. Re-enters the Market.—Method of Mine Ventilation.—Penetrate Underground Lake.

Labor difficulties at the smelters of the American Zinc, Lead & Smelting Co. at Deering and Caney, Kan., have been adjusted satisfactorily, and this company is again purchasing zinc sulphide ores in the Missouri-Kansas-Oklahoma district. The contract system is again in force, making it possible for the ore producer to dispose of his output at a figure weak or strong, according to the price of spelter, East St. Louis quotations. At the close of October, when the price was about $6.25, sulphides, sold in the open market, commanded from $38 to $45 per ton, on an assay basis of 60% metallic zinc, while ores sold on contract ranged from $46 to $49 per ton, assay basis, choicer lots bringing as high as $52. The American company is opening new mines in the Joplin district and materially increasing the source of its own ore supply. The weekly shipments from the American mines at Prosperity are now about 300 tons of blende; from the Duenweg mines, about 100 tons, and from other mines of the district, about 100 tons. The company also is planning to develop a large tract west of Joplin on which recent drill prospecting and new shafts have revealed rich deposits of high-grade blende. The output of the district is gradually increasing, being now about 4800 tons per week, and this figure represents a fair average for the year. The weekly average for other years since 1902 are as follows: 1902, 5048 tons; 1903, 4516 tons; 1904, 5139 tons; 1905, 4854 tons; 1906, 5364 tons; 1907, 5511 tons; 1908, 4988 tons; 1909, 5792 tons; and 1910, 5322 tons.

Cases involving the sale and transfer of Indian lands near the zinc and lead mining districts of Quapaw and Miami, Oklahoma, which were argued recently before the United States circuit court at St. Paul, Minnesota, have been passed upon, the verdict being a victory for the Government. The decision holds that the Indians have no right to sell their lands personally, nor can their heirs dispose of them, unless the transaction is through the Department of the Interior. This means a saving to the Indians of lands valued at $1,000,000.

Ore assaying barely 1% zincblende is to be mined by the Moler-Smith Lead & Zinc Co., of Carl Junction, Missouri, a company which already is milling 1½% ore at a good operating profit.

Ellisville, a new mining camp that has every indication of developing into a heavy producer, is springing up rapidly as the result of operations conducted in the bottom of an old shaft put down by Watkins and associates on the Connor Realty Co.'s land, two miles due west of Joplin, eight years ago. The shaft went to a depth of 85 ft. through solid limestone and was abandoned. B. P. Ellis last spring, at a depth of 88 ft., found zincblende which assays about 15%. It continued to a depth of 104 ft. Other drill-holes were sunk and the formation blocked out. A number of shafts are now being sunk and half a dozen drill rigs are busy on this and adjoining lands.

DENVER, COLORADO

Apex Law Causes Much Litigation.—Golden Cycle Dividend.—Clancy Process to be Tried in New Colburn Mill.—Nevada Bullion at Denver Mint.

The theory of extralateral rights has engendered much bitter mining litigation in Colorado of late. Three suits at law, involving some of the largest companies in Colorado, are now pending adjudication in the Federal courts. On October 19 the Vindicator Con. Gold Mining Co. brought suit in the Federal court at Denver against the Golden Cycle Mining & Milling Co., to recover $2,733,182 damages for ore which the former company claims was unlawfully extracted from its property by the latter. According to the allegations, the ore in question was taken out of a vein of which the apex is on the Christmas property of the Vindicator company, but which dips across the sidelines into the territory of the Golden Cycle company. The Vindicator company has retained the firm of Thomas, Bryant, Malburn & Nye to press its claims for damages in the Federal courts. The Golden Cycle has also employed counsel, and while the officers of the company persistently refuse to give out any intimations of their plans, it is known that they are preparing to enter a strong denial of the charges and contest the suit vigorously. The case is said to present difficult angles which will require the assistance of expert geologists and engineers to untangle. Each side is preparing for the introduction of much expert testimony.

LIBERTY BELL MILL.

Coincident with the announcement of the filing of the suit comes notice that the Golden Cycle company, on October 25, declared a special dividend of $1,500,000, and checks for the same were immediately sent to the stockholders, the principal of whom are John T. Milliken of St. Louis, Frank G. Logan of Chicago, H. McGarry of Colorado Springs, and A. E. Carlton of Cripple Creek. The Golden Cycle has been paying for some time regular dividends amounting to $30,000. Besides its mining properties on Bull hill, the company operates a custom milling plant at Colorado City and a smaller one at Cripple Creek. The Vindicator and Golden Cycle companies have each paid about two and a half million dollars in profits.

The Liberty Bell and Smuggler-Union companies, near Telluride, are involved in apex litigation which is still being pressed in the district courts. A third case now pending is that of the Neglected and May Day mines in the La Plata mountains near Durango, where the litigation has caused a suspension of operations in both properties for the present.

The Ajax Mining Co. has announced that the new Colburn mill, employing the Clancy cyanide method, will be started up shortly after November 1. The crushing department will handle 300 tons and the chemical department 200 tons per day of 24 hr. The mill will handle both high and low-grade ores, and besides treating the entire mine product, will treat some 200,000 tons of dump ore, the value of which will average about $4 per ton. The metallurgical details in the application of the process were under the supervision of A. W. Warwick, consulting engineer for the Ajax company and for the Moore Filter Co. of New York, owners of the Clancy patents.

The Grubstake Committee of the Denver Chamber of Commerce, which put in operation last spring a plan to revive the State's mining industries by sending out prospecting parties to search for new ore deposits, to be supported by popular subscription, is calling in the men who have been in the field during the summer. The season is closing and the committee now desires to take an inventory of the work done and the locations made. Max Boehmer, chairman of the committee, says its work has been successful. A final report of the committee will be made about November 15. It is announced by officials of the Chamber of Commerce that the plans for the formation of a big development company to exploit the more desirable locations taken up by the Grubstake Committee will be completed. To raise the necessary funds, stock in the development company is to be offered to the business men of the State.

The Denver Mint is receiving shipments of gold bullion from the Goldfield Con. Mines Co., and from other gold mines in Nevada. Federal officials state that Denver will become a general depository for gold bullion, it being considered more advisable to store it here than in seacoast towns. It is reported that $500,000,000 in gold now rests in the vaults of the Denver Mint.

KALGOORLIE, WESTERN AUSTRALIA

Geological Department Investigating Mining Districts. -Flotation Process to Be Tried at the Lancefield.—Mundaring Reservoir Overflows.—August Statistics.

The month has been characterized by an almost entire absence of any developments of note, or other matter in connection with the mining industry. The Government Geological Department has been busy examining the country between Norseman and Esperance for water supply. Interest is shown in the coal measures at Donnybrook in the southwestern part of the State, and the country between Sandstone and Lawlers in the East Murchison. Inspection is proceeding also at Mount Ida, north of Menzies and in the north end of the Kalgoorlie field, Coolgardie and Burbanks. These general examinations should be of value to the community, and the Chamber of Mines has asked the Department to issue reports as early as possible.

In the Yuanmi mine, belonging to the Oroya Exploration Co. the 300-ft. level continues to show well. The north drift from 181 to 198 ft. is in ore assaying $8 per ton, the vein being 52 in. wide. From 198 to 207 ft. the ore assays $14, and the vein is over 59 in. wide. The 20-stamp mill and the cyanide plant are well under way. The north drift at the seventh level in the Lancefield shows ore assaying $9.20 for 99 in., and the south drift $4.50 for 60 in. Experiments are being tried with the Minerals Separation flotation process, so successful at Broken Hill. The Golden Ridge, a locally controlled mine, fourteen miles from Kalgoorlie, in consequence of the bottom, the 500-ft., level showing poor ore, has decided to cut its monthly profit from $14,000 to $8500.

The Mundaring reservoir, the source of the water supply, is overflowing again, so there is 4,680,000,000 gal. available. The State Premier, in a recent speech, gave the preliminary figures for the past financial year for the plant as follows:

Gross income	$1,185,000
Expenses	354,000
Surplus	$831,000
Interest	561,000
Sinking fund	270,000
	$831,000

The surplus failed to pay all the sinking fund by $125,000, against $260,000 in the previous year, and $500,000 in 1904, so the situation is improving, and in 1912 there should be a balance on the right side. The benefits to the mining and agricultural districts near the main are important. The main conduit and extensions now total 875 miles.

The August gold yield from the State was valued at $2,420,000, and dividends were paid amounting to $38,500. The following goldfields contributed to the total:

East Coolgardie (Kalgoorlie) from 148,000 tons	$1,408,770
Mount Margaret	242,310
Murchison	195,570
East Murchison	144,570
Norseman	131,140
North Coolgardie	105,140
Coolgardie	58,690
Southern Cross	29,900
Kanowna	27,870

The Commission on Miners' Phthisis has been taking evidence during the past fortnight from doctors, mine managers, miners, and municipal officials. It is to be hoped that some sound conclusions will be drawn from the evidence; but it is certain that there will be a lot of the same ground covered as by the commissions on the same subject in Bendigo, the Rand, and Queensland.

The returns from the principal producers during the month of August were as follows:

Name.	Tonnage.	Value.	Profit.	Cost per ton Mining.	Cost per ton Treatment.	Cost per ton General.
Associated	10,692	$69,000	$10	$2.00	$2.64	[3]....
Associated Northern	1,396	19,800	.....	....	....	....
Burbanks Main Lode	1,701	21,500	.....	....	....	....
Chaffers	2,657	20,500	340	....	....	....
Golden Horse-Shoe	26,721	177,000	16,300	....	....	....
Golden Ridge	2,812	32,700	12,900	3.16	1.74	[5]....
Great Boulder Perseverance	21,511	137,500	26,000	1.70	3.32	[3]0.28
Great Boulder Proprietary	18,897	240,000	120,000	2.22	2.52	[3]0.14
Great Fingall	10,592	80,300	15,900	2.50	1.50	[5]0.40
Hainault	5,425	34,900	[2]440	....	....	....
Ivanhoe	20,802	204,500	90,000	1.96	1.98	[4]0.42
Kalgurli	10,670	107,000	45,200	....	....	....
Lake View Consols	[1]8,550	9,000	2,800	....	0.72	....
Lake View & Star	[1]13,640	84,000	1,800	1.62	2.46	[4]0.26
Oroya Black Range	4,700	47,000	14,700	3.40	1.66	[5]0.70
Oroya Links	8,388	54,900	6,200	1.70	2.70	[4]0.22
Sons of Gwalia	14,030	128,500	49,000	2.24	1.60	[5]0.34
Sons of Gwalia South	2,369	17,000	5,200	2.56	1.84	[5]0.22
South Kalgurli	9,608	58,500	8,300	....	....	....

[1] From old dumps. [2] Loss. [3] Dry crushing plants at Kalgoorlie. [4] Wet crushing plants at Kalgoorlie. [5] Wet crushing plants in other districts.

In these costs development and plant extensions are not included.

SALT LAKE CITY, UTAH

WEAKNESS OF LEAD MARKET THREATENS TO CLOSE MINES.—INDEPENDENT DEVELOPMENT PLANNED FOR THE DALY.—SILVER KING COALITION INCREASES OUTPUT.

Something of a scare has been thrown into the lead producers of Utah by the weakness of the lead market, and much speculation is going on as to what will happen if the price drops much farther. Utah is second among the States in lead production, and with a good market the output for 1911 would probably exceed that of 1910 by 25%. The 1910 production was 123,324,635 lb., valued at $5,549,588. The Utah producer has been favored by fortune this year in having three large smelters competing for the output. The American Smelting & Refining Co. and the United States S. R. & M. Co. fought hard for contracts some years ago, but in recent years they have not competed with each other so keenly, and they were going along peacefully until the International Smelting Co. announced that it would put in lead stacks and began bidding for ores. Then the older companies got busy, and the owners of lead mines have had a period of prosperity. In the competition for tonnage, exceptionally low rates have been made on low-grade lead ores, with the result that some of the older mines have begun shipping from their dumps, as well as sending out second-class ore left in the mines as unprofitable to ship. Fear is now being expressed that the increase in the Utah product, coupled with the slackness in consumption, are in themselves sufficient to account for the weak market. The local miners have been settling right along on the basis of $4.50, less the usual deductions for freight and similar charges, even when the New York quotations were down as low as $4.35. This cannot continue indefinitely if the market continues to sag. If lead goes to $4, it may not close many mines, especially if silver is strong, but a drop much below that figure will send a number of mines out of commission until conditions improve.

The merger of Park City properties has been abandoned, at least for the present. As a result, independent development work will be pushed on the Daly. There is much promising territory in this old property, which has shipped silver-lead ores amounting to $9,579,229 and paid $2,925,000 in dividends. Vigorous development of the virgin ground, it is believed by many mining men, will result in the opening of a new mine. Whether E. A. Wall will be inclined later to favor merging with any other property is a question. It is known that he has been a heavy stockholder in the Silver King coalition company, and a future merger might lean in that direction, although combination with the Ontario and Daly West has long been regarded as the first step in a large Park City merger.

The Silver King Coalition, having completed placing its underground electric equipment, is now sending out the largest tonnage in the history of the company. The Daly-Judge also is shipping heavily, while the Daly West is coming up strongly, all of these properties having silver-lead ore as the bulk of the product. The three companies have joined in purchasing 700 acres of land, at a nominal price, on which they will impound tailing from the various mills. This is being done to avoid lawsuits with farmers for permitting tailing to lodge on their ground.

In a letter to the stockholders, Urban H. Broughton, the retiring president of Utah Consolidated, says that the development work of the year has resulted in the uncovering of a tonnage equal to the amount mined, but that copper, gold, and silver contents are lower. Prospecting in the western part of the ground has uncovered two lead orebodies. There is now developed 23,000 tons of 17% lead ore, and 15,000 tons of 7% concentrating ore. The profit for the year is given at $300,000, and a $150,000 dividend was declared. It is stated that a large part of the profit came from selling the metal secured in dismantling the old smelter.

From Little Cottonwood comes an interesting shipment out of the recently organized Alta Consolidated. This company sent out about 33 tons of ore on which the control assays were 0.015 oz. of gold, 101.3 oz. of silver, 13.1% lead, 6.3% copper, 10% zinc, 21% silica, and 10% iron. Another similar shipment of 40 tons followed the first.

General Mining News

ALASKA

Juneau

The report of the Alaska Mexican G. M. Co. for the month ended August 15 shows a net profit of $26,169. The report was delayed, as the original copy was lost on the wrecked steamer *Ramona*.

The Alaska Treadwell G. M. Co., in the 15 days ended September 30, milled 38,640 tons of ore, from which 756 tons of concentrate was saved. The total production is valued at $91,426, with a realizable value of $90,246. The estimated net profit for the period was $41,489. The yield per ton was $2.36. Development work done in the period amounted to 408 ft. The stock of broken ore was increased 1529 tons.

MAP OF ALASKA.

Kodiak Island

Near Uyak exceptionally rich placer deposits have been found recently, according to reports from Cordova, and it is believed that the district may become important for its placer mining.

Prince William Sound

The customs mill erected by subscription at Valdez is now in operation.

A $5,000,000 company is to be organized to develop the Cameron-Johnson property, the title to which has been cleared in the courts. The claims are said to be among the richest in the Shoup bay district.

M. M. Reese, president of the Ibex and Mayfield companies, is quoted in the press as stating that in the spring a mill may be built on the Mayfield property.

At the annual meetings of the Mineral Creek M. Co. and the Chugach M. Co., at Valdez recently, the consolidation of the two companies was ratified.

Seward Peninsula

Reports from Nome state that the York Dredging Co., in less than a month of actual operation, has produced 70 tons of tin concentrate from the placer deposits along the Buck, Grouse, and other streams around York.

ARIZONA

Cochise County

Rich ore has been discovered on the Leadville property, near Paradise. G. A. Walker owns the mine.

Gila County

(Special Correspondence.)—The Copper Reef mine, 12 miles south of San Carlos, is employing 20 men. The inclined shaft is being sunk and is reported to be about 700 ft. deep. It is proposed to develop two veins from this shaft, and cross-cutting is in progress on the 6th level both north and south from the shaft. No ore is reported yet on this level. The property consists of 80 claims and is traversed for a distance of 4000 ft. by five veins with prominent outcrops showing considerable copper in the form of carbonates. John W. Gillingham, of Los Angeles, is general manager, and Charles T. Martin, of Globe, is managing director. The results of the recent directors' meeting have not been announced.

The McGaw shaft of the Superior & Boston is now below the 12th level. A sump is being cut preliminary to placing a station on that level. This is the only development work going on at present. Assessment work is being done on the unpatented claims. About 50 men are employed.

The Arizona Commercial is still idle pending reorganization of the company. The mine is being kept free of water and the railroad to Globe is in operation.

Globe, October 27.

Yuma County

It is rumored that the Clara Con. M. Co.'s property and smelter have been purchased by the Con. Arizona Smelting Co. of Humboldt. W. A. Clark is believed to have the controlling interest in the Con. Arizona company.

CALIFORNIA

Amador County

About 30 men have been laid off at the Central Eureka mine, says a newspaper report from Sutter Creek, and attention will be given to prospecting the lower levels of the mine. The mill has been treating ore from several levels, but there were indications that the ore-supply would soon be exhausted. It is thought that a vein can be tapped on the 2700-ft. level. An assessment of 4c. per share is being considered.

Owing to the expense of purchasing the Oneida property, the South Eureka M. Co. has omitted its regular monthly dividend of 7c. per share, state recent newspaper reports. The mine and mill are making their regular production, it is stated, but the payments on the Oneida, which is said to have been priced at $150,000, necessitate the suspension of dividends.

After being shut down for more than 20 years, the Empire and Pacific mines at Plymouth are being unwatered for development.

Calaveras County

Press despatches from Mokelumne Hill state that John Garavanti has sold the Garavanti quartz mine to British investors for $15,000.

Inyo County

The total production of the Skidoo M. Co. for the month of September was $19,097. The development and operating expenses amounted to $9059, leaving a net profit of $10,038.

Mono County

A prospecting tragedy was revealed last Saturday when the body of J. J. D. Miller, of Virginia, was found in a prospect hole 12 miles north of Bridgeport. The miner had been pinioned by a leg in a fall of rock. An improvised diary written on the back of an assay certificate showed the accident occurred October 6. The last entry, "No hope," was made on Friday, October 13. Miller is survived by his mother and his widow.

Nevada County

At the Holbrooke mine, says a report from Grass Valley, the miners have tapped a tributary to the main ridge channel which runs through the Posey property. The shaft, which now is down 106 ft., will be sunk to bedrock and cross-cuts will be driven at that depth. The shaft is about 400 ft. downstream from the point where E. C. Webster, some years ago, took out much rich ore. The Holbrooke is operated by the Reber M. Co., for which H. Reber is superintendent. The company employs one shift of five men. Development is hindered by water, which fills to a depth of about 40 ft. during the night. A 6-in. Cornish pump is used to clear the shaft of water.

Placer County

C. T. Snedeker of Chicago has purchased the Reublin mine at Last Chance from D. M. Ray and F. G. Albnos, according to recent reports from Auburn. It is stated that Mr. Snedeker will build a mill and will buy other machinery for developing the mine.

Plumas County

During assessment work at the Bullion mine, near Clio, a decomposed quartz ore panning about $40 per ton was discovered. The men, after driving a cross-cut 13 ft., had not reached the foot-wall, state recent reports. R. J. Read is superintendent of the property, which is in the Mohawk valley.

San Bernardino County

The Greenwater Copper M. & S. Co. has secured an option on the Supply group of 17 claims and the O. K. group of 10 claims in the Dale district from H. A. Landwehr, president of the Seal of Gold M. Co. Mr. Landwehr obtained title to the claims after some bitter litigation with Riverside stockholders in the Seal of Gold company, which he had organized to develop the claims. It is rumored that the purchasing company is identified with the Guggenheim interests.

Tuolumne County

The Slap Jack mine, idle for a dozen years through litigation, again will be developed, state reports from Groveland. A power-line will be built, and power taken from the Gold Ship to operate the mine. An electric hoist will be bought and the old head-frame will be replaced. The construction of a mill is under consideration. Richard Pierce is superintendent of the mine.

The Stanislaus Mining and Development Co. has been organized to operate the Crystalline mine. The company, which is capitalized at $500,000, was incorporated by H. A. McQueen, A. J. Schmidt, and J. E. Hill, and has offices at Modesto.

Construction work for the tube-mill for the If-I-Can property on Stanislaus river will be started soon.

Extensive caving-in at the App mine threatened much property in the town of Quartz, situated above the mine, and caused alarm to the residents. J. A. Keys, foreman of the mine, asserted that the mine was not damaged. The caving was caused, it is said, through failure to fill up properly the abandoned stopes. The power-line supplying illuminating current for the town was broken down by the caving, which left a depression reported to be about 100 ft. deep, 200 ft. long, and 150 ft. wide. The mine is owned by W. A. Nevills of San Francisco.

Yuba County

(Special Correspondence.)—Rich quartz continues to be developed on the Twentieth Century Wonder claim, owned by J. Rose. The vein averages 2 to 3 ft. wide and has been developed for 15 ft. It is claimed that much of the ore thus far extracted ranges from $100 to $3000 per ton. The property is situated in the Dobbins district, near Rackerby. At the Red Ravine, the first property to attract attention to the district, good ore continues to be developed, with bonanza showing at several points. It is reported that Los Angeles people are negotiating for the Seaborg & Davis property; also the Spanish mine. These properties were worked in a small way years ago, and commercial ore is said to have been opened below the 150-ft. point. At the Manzanita the shaft is down 125 ft. with the vein showing a width of 3 ft., and some high-grade ore has been found. Eight men are employed. New machinery is arriving at the Santa Rosa, lying south of the Manzanita. The Abbot mine reports a 3-ft. vein of ore assaying from $8 to $15 per ton in free gold. The shaft is down 60 ft., and is being sunk farther. The main orebody of the district is said to be traceable for 15 miles, with an average surface width of 7 ft. It courses north and south, between belts of slate and porphyry. Several mining experts are in the district, examining prospects.

Marysville, October 29.

The Mark Anthony M. Co., with its principal place of business at Marysville, has been incorporated by W. H. Carlin, H. A. Niemeyer, Emma A. Coughlin, W. E. Langdon, and Maude Lunsford. The Mulberry M. Co. has been incorporated by C. E. Harmon of Oakland, and J. D. Jessup and James W. Scott of San Francisco. Its principal place of business is to be at San Francisco.

COLORADO

Boulder County

The Central Colorado Power Co. has offered to build a $150,000 custom stamp-mill at Boulder if the Boulder Metal Mining Association can show there is enough ore in the district to warrant the investment. The Association is now collecting specimens from all of the camps, and it is believed that the mill is practically assured.

Clear Creek County

(Special Correspondence.)—The Dorit property is to be equipped with an electric-power plant. F. L. Patrick is manager of the mine. The Lalla mine at Alice, owned by the King Solomon L. & E. Co., is to be equipped with a 50-ton concentrating mill, a contract for the machinery having been awarded to the Traylor Machinery Co. of Denver. F. Dinsmore is manager. The Emerson vein cut by the Lucania adit proved to be 238 ft. wide, all ground being heavily mineralized. L. Sternberger is manager. The Silver Creek property has been secured under bond and lease by S. A. Offerson and development has been started. Shipments have been started from the Pioneer mine that was recently secured under bond and lease by Denver parties. The New System mill is running steadily upon ore from the Mint mine. The sinking of the shaft is progressing satisfactorily.

GOLDEN CYCLE MINE.

Idaho Springs, October 29.

(Special Correspondence.)—Work is to be resumed on the Bellevue-Hudson mine, situated on Columbia mountain. The shaft from the 14th level is to be made two-compartment. Ore is showing on the 80-ft. level that mills 725 oz. silver and 3.50 oz. gold per ton. G. W. Boyce of Denver is manager. A new blacksmith shop and ore-house have just been constructed at the Little Giant mine on Red Elephant mountain. Shipments of 400 oz. silver ore are being made. E. Minier is manager. New rails and air-pipe have been purchased for the Alabama mine on Leavenworth mountain. James O'Donnell is manager. The Big Indian adit has been driven 178 ft., and from surveys it is thought a vein will be cut shortly. E. Butts is manager. Work is going forward at the Key West mine and driving is in progress on an 8-in. streak of silver-lead ore that is worth $45 per ton.

O. Johnson & Co., lessees of the Seven-Thirty mine, are stoping on an 8-in. streak of ore that mills 399 oz. silver per ton. Joseph Wood, leasing on the Bismarck, has started shipment of ore, and returns of 575 oz. silver per ton are being received in settlement. A body of ore 12 in. wide has been uncovered on the 300-ft. level of the Aetna vein at the Capital mine. It assays 12 oz. gold, 18 oz. silver, 42% lead, and 7% copper. E. Bauman is manager.

Georgetown, October 30, 1911.

Teller County (Cripple Creek)

The Golden Cycle M. Co. has paid a special dividend of 70c. per share on the entire issue of 1,500,000 shares, and has $750,000 still in its treasury for operating. The company will continue its regular dividend rate of 2c. per month. There are about 35 stockholders.

Work on the Roosevelt deep drainage tunnel has been stopped owing to trouble with the electric hoist at the Intermediate shaft, and several days will be required for repairs. The adit has been driven over 15,800 ft. There is a flow of about 6500 gal. of water per minute from the portal, according to T. R. Countryman, the engineer in charge of the work.

Emerson & Wilson, lessees on the Morning Star claim on Bull hill, have purchased a 6 by 8 hoist from J. H. Wilbur, and prospecting will be started at once.

Active development work has started on the Blue Jay claim on Bull hill, under the direction of R. P. Russell. It is stated that the Blue Jay and Blue Bird are about to settle their apex dispute in the courts.

IDAHO

BOISE COUNTY

William Schuerding, formerly of Butte, Mont., and associates of Wallace, have acquired control of the Sunset Banner group of five claims on the west side of Beaver creek, opposite the Tuscumbia and Idora properties, in which district also are the Nipsic, Amazon-Manhattan, Callahan, and the Clark claims. He has organized the Sunset Development Co., with a capital stock of $500,000.

IDAHO COUNTY

H. M. Collette and associates have leased the Jumbo mine, at Buffalo Hump, near Grangeville, and development work will be started at once. A cyanide plant costing $20,000 will be built. Previous to the signing of the lease, an investigation extending over several weeks was made by engineers.

SHOSHONE COUNTY

The new adit at the Stewart mine is in more than 1100 ft. and it is believed that the work can be completed during November, as only about 300 ft. of work remains to be done. The first electrically heated dry-room in the district has been built at the mouth of the lower adit. It is reported that the room is so successful that other mines will build similar dry-rooms.

Two shifts of men will be used throughout the winter at the Snowstorm Extension M. Co.'s property, according to a statement by B. H. Lively, manager for the company. Two veins of lead ore have been found.

MONTANA

LINCOLN COUNTY

(Special Correspondence.)—The work of reconstructing the buildings and reopening the mines at Sylvanite owned by the Lincoln G. M. Co., will not be resumed until next spring, according to J. H. Ehlers, who is interested in the company. The buildings were burned by a forest fire over a year ago. When work is resumed the company will use electric power generated at the Yakt falls where a power-plant is to be constructed at once by the Milwaukee Power Co., a separate organization. It is the intention to develop 3400 hp. at the falls. Lumber for the power company's buildings will be sawed at Sylvanite, where the mining company has a small saw-mill.

Libby, October 28.

The adit on the Kalispell-Lincoln G. M. Co.'s property in the West Fisher district is now in 90 ft., according to John J. Hibbard, manager of the mine. The orebody is about 2 ft. wide and assays about $100 per ton in gold. It is free milling and the company expects to build a stamp-mill within the next year.

MADISON COUNTY

(Special Correspondence.)—Madison county, famous for its gold mines, now promises to become famous for its tungsten. The discovery was made in a locality which was a great silver camp away back in 1874, and in that day the ore was mined and brought out on the back of pack-animals at a profit. An old prospector came across some ore in a dump which he decided to have examined, and it was discovered the rock contained hübnerite.

Virginia City, October 27.

SILVERBOW COUNTY

(Special Correspondence.)—The destruction of the concentrator plant of the Butte Reduction Works by fire on October 25 may result in hastening the erection of the proposed zinc smelter by W. A. Clark. The reduction works, built many years ago by Mr. Clark, was sold by him to the Anaconda Copper Mining Co. about a year and a half ago, but in order that he might have a place to treat the zinc ore from his Elm Orlu mine he was given a lease on the concentrator. He equipped the mill with modern machinery and it was supposed that when the lease expired in June next, he would get an extension of time sufficient to allow him to complete a plant of his own. Mr. Clark for the past few years has been giving a good deal of his time to the development of his zinc property, and, after selling out his copper properties to the Anaconda company, stated that he proposed to make the zinc industry a feature in Montana's industrial life. He has an option on a large tract of land in what is known as German gulch, a few miles from this city and within half a mile of both the Northern Pacific and Butte, Anaconda & Pacific railroad tracks, and on this ground the contemplated smelter probably will be erected. It is known that when he went abroad the past summer, 100 tons of zinc ore from his Elm Orlu mine was shipped to Germany for experimental purposes and that he personally watched the testing of this ore. The results of the tests were not officially made known when he left the German mill, but it is stated that since his return the figures have been received and show that the process was a success.

The Combination mine property has been sold at sheriff's sale to satisfy a judgment of $25,083.45 held against it by John P. Reins. Mr. Reins says that he does not intend to operate the property at present. The railway spur built for the Tuolumne company by the Butte, Anaconda & Pacific Railway Co. to haul the ore direct to the Washoe smelter is now in operation. It is believed that the new surface plant will be in commission by the middle of November.

A. B. Wolvin, president of the Butte & Superior company, and George Bradley, chief engineer of the Guggenheim interests in Utah, came to the city several days ago with some of the directors of the company and made arrangements for the commencement of the proposed new concentrator. The mill is to be erected near the Black Rock mine of the company and will have a capacity of 500 tons per day and will be so constructed that the capacity can be increased to 1000 tons by an addition at any time.

Butte, October 31.

(Special Correspondence.)—The Butte-Alex Scott is shipping 80 tons per day to the smelter and getting returns which pay all operating expenses and leave something to the good. The Little Annie, which is operated by the same company, continues to produce rich ore on the 200-ft. level, and its shipments of 50 tons of ore per week are coming from that level.

The construction of the new surface plant of the Tuolumne mine is going ahead with as much rapidity as possible, but the work at the best is slow, and it is not believed that the plant will be in commission before the first of the year. The sinking of the shaft to the 1800-ft. level has been completed and a station is being cut at that point. The shaft will be sunk to a depth of 2000 feet.

Butte, October 28.

NEVADA

CHURCHILL COUNTY

The Rex company, on its property north of the Nevada Wonder, has rediscovered the vein lost some time ago when a fault stopped development. The company, to hold its claims, had to do a certain amount of development work this year, and it was during this activity that the vein was again found. No assays have been made.

ESMERALDA COUNTY

A small vein of ore assaying $80 per ton has been found at the Vernal mine.

Ore assaying $300 per ton, according to press reports, is being sacked on two levels of the C. O. D. mine. L. K. Koontz is quoted as stating that the supply of high-grade ore justifies the erection of a mill, and it is thought the company later on will undertake the construction of one.

The production of the Goldfield Con. M. Co. for the month of September was 26,760 tons of ore, valued at $676,383, according to the official report issued a few days ago. The net average recovery was $23.80 per ton. The net profit was $16.60 per ton. Of the production, 81 tons had an average value of $77.12, and 26,679 tons was milled with an average extraction of 94.11%. The development work done during the month amounted to 3192 ft. The low tonnage was due to shut-downs during the re-lining of the tube-mills and repairing the Chilean mills. The ore from the working faces in the Mohawk dropped in value, and the production was accordingly low, but it is believed the October production is above the average. The foundations for the roasting plant and building practically have been completed, and construction work is being advanced in a satisfactory way. The Goldfield Con. M. Co., on October 31, paid a dividend of 30c. per share.

Eureka County

Elmer Isaac and Charles Vallenaueth, lessees of the patented claims of Maurice Isaac and W. R. Lewis in Mill canyon, about four miles north of Cortez, have 80 tons of ore ready for shipment, the ore assaying, according to report, from $32 to $165 per ton.

Humboldt County

(Special Correspondence.)—The Neshobe group, Barret Springs district, has been purchased by the New York men. The property comprises four promising claims. The vein is said to have gold and silver ore assaying $30 per ton. The new owners announce that development will be started within a short time. Frank Krenkel, of New York, represents the purchasers. The Major-Gomes silver-lead property has been taken under lease and bond by G. W. Warmoth, formerly of Valdez, Alaska. The mine is in the Adelaide district, 12 miles south of Golconda and 22 miles east of Winnemucca. The Arizona mine and mill at Unionville has resumed operations. The Imlay M. Co. reports the discovery of a 4-ft. vein of rich ore in a 15-ft. winze sunk from the 200-ft. level. Samples are said to assay $25 per ton in gold and 80 oz. in silver. D. E. Craft is superintendent. The Salt Lake & Winnemucca Leasing Co. is preparing to conduct developments along the lines projected by Duncan MacVichie. The company recently acquired six claims adjoining the famous Adamson-Turner gold property. Rochester canyon is entirely staked out by placer miners. Several rich surface discoveries have been reported, and owners are preparing for a busy season.

Winnemucca, October 28.

The capitalization of the Crawford Leasing Co. of National has been increased from $20,000 to $50,000. The par value of the shares is $1. The company owns, in addition to the Crawford lease, the Koekler lease, adjoining the former, and is planning to acquire other claims.

Lyon County

The Nevada Copper Belt railroad has been completed into the Mason Valley mining district. The last spike was driven last week. The Nevada Douglas Copper Co. expects to commence shipping gypsum immediately, state the reports, and the Mason Valley smelter should be ready for receiving ore by the middle of this month.

Mineral County

Newspaper despatches state that there is good authority for a report that Tonopah M. Co. has made a first payment of $50,000 on the Aurora group of claims, covering about 400 acres of ground. The mines were developed until 1884, when the cost of pumping the water from the lower levels stopped mining. Today steam has been replaced by electric power, of which there is an abundance, supplied by the power lines running through Aurora to Wonder. It is said there is enough low-grade ore which can be mined for $2 per ton, to keep a 100-stamp mill busy for many years.

Nye County

The report of the Tonopah M. Co. for the week ended October 21 shows that 98 of the 100 stamps were in constant operation. The ore milled amounted to 3300 tons, which yielded an average of $20 per ton. No concentrate was shipped, but 38 bars of bullion, valued at $53,000, were shipped.

An important discovery of ore has been made in the North Star mine. No assays have yet been made.

Work on the Tonopah-Belmont mill is being rushed, and the concrete work is about completed.

The Montana-Tonopah mill last week treated 1053 tons of ore, with an extraction of 89.2%. The concrete work for the MacNamara mill has been completed.

The total shipments for the district for last week amounted to 8769 tons of ore, valued at $219,225.

Storey County

The output of the Comstock mines for last week amounted to $42,658, of which the North-end mines produced $39,175. The Ophir was in the lead, with a production of 361 tons of ore assaying $53.75 per ton. The Ophir output, however, is a little below its usual production owing to retimbering done on the 2100-ft. level.

Washoe County

Ore consisting of almost pure silver, so soft that it can be battered into any shape, has been found by the Nevada United Mines Co. in the Wedekind district, according to newspaper reports. When the vein was found in the new shaft the ore taken from it assayed about $50 per ton, but later developments have resulted in finding ore of steadily increasing value. On the surface the foundation for the hoist will be completed in a few days.

White Pine County

Reports from Ely state that the Giroux Con. M. Co. is planning to increase the capacity of its concentrator to 1000 tons per day and to build a railroad from the Bunker Hill mine to the plant. The sulphide zone near the Bunker Hill shaft, where it crops to the surface, will be stripped. The railroad is to be completed before severe weather comes. Retimbering the Morris No. 2 shaft is in progress. Two churn-drills will be used to find the extent of the orebody.

NEW MEXICO

Socorro County

(Special Correspondence.)—At the Deadwood mines extensive development combined with the regular mill tonnage is taxing the capacity of the present hoist to the utmost. During this development period the management has decided to devote a portion of the mill to treating custom ores.

The ore treated by the Ernestine M. Co. the past week amounted to 700 tons, from which a concentrate product of 50 sacks was obtained. The frame for the new 20-stamp battery is being erected, the mortars for which are on the way from Silver City.

The Mogollon Gold & Copper Co. has made arrangements with the Deadwood management to handle 20 tons of ore per day from the Little Charlie mine, which has been producing shipping ore for some time. The rock will be packed on burros, a distance of about a mile. This extra tonnage will allow the Deadwood mill to operate at about full capacity during the next few months.

Mogollon, October 27.

SOUTH DAKOTA

Lawrence County

Ore assaying $12 per ton has been discovered by A. T. Roos and John Treber on the Mascot group of claims in the Two Bit district, according to recent reports from Deadwood. The group of claims includes 185 acres. Two Bit creek, which runs through the property, will be used for power in the event of erecting a mill.

UTAH

Juab County

The Uncle Sam Con. M. Co., which owns four-fifths of the 500,000 shares of the Richmond & Anaconda company, is planning to prospect the latter property, which has been idle for years. The Uncle Sam is now developing a vein parallel to the orebody which has supplied the company with the ore. The properties, which adjoin each other, are in the Tintic district.

The Iron Blossom Con. M. Co last week paid out in dividends $70,000. This figure, according to recent press reports, brings the total of dividends paid by Utah mines in 1911 to $5,169,687. The Iron Blossom has paid in dividends this year $230,000 and a grand total of $930,000.

MAP OF UTAH.

While the exact value of the production of the Iron Blossom mine for September is not known, it has been estimated at about $70,000. More conservative figures are $60,000, on a basis of an average net value of $10 per ton for the 5900 tons of ore produced. The drift on the 600-ft. level of shaft No. 3 has intersected ore, although it is not valuable enough to ship. The company has been prospecting for months in this shaft to find the continuation of ores from the 500-ft. level.

The compressor at the Victoria, where the drift on the 1200-ft. level is nearing the vein, has broken down. At the Beck tunnel a drift will be run from No. 2 shaft to get under the vein. At the Swansea the vein has 'pinched' so that it occupies only a part of the drift.

Utah County

The Santaquin King M. Co. has been incorporated to develop property between the Union Chief and the Santaquin Chief in the Santaquin district. An adit will be driven immediately, according to official announcements, to reach the vein recently discovered in the Santaquin Chief and adjoining properties. The company, which is reported to own 17 claims, is authorized to issue 1,000,000 shares of stock, of which 600,000 already have been subscribed. W. D. Rawson, of Provo, is president of the company.

CANADA

British Columbia

T. D. Pickard and associates have secured an option on the Apex group of claims near the Nickel Plate from G. F. Willey of New York, according to recent reports from Hedley.

Ontario

Charles D. Taylor, of California, has bought the controlling interest in the Porcupine Imperial M. Co., state recent newspaper despatches from Porcupine. The shaft at the time of the fire last July was about 100 ft. deep and about 100 ft. of driving had been done. The fire destroyed the surface equipment, but the buildings have been replaced and machinery for underground development is being delivered.

Lionel R. Stuart Weatherley, according to despatches from Porcupine, has paid $15,000 down on a deal for the Preston East Dome company's stock. The transaction was the result of the discovery of what is said to be remarkably rich ore. Mr. Weatherley, who is reported to be British Vice Consul at Nome, Alaska, stated that the mine would in time be one of the greatest gold producers in the world.

MEXICO

Hidalgo

The Compañia Exploradora de Minas will start the construction of a reduction mill and cyanide plant in the Pachuca district in the near future. The company, formerly known as the Andres Tello company, owns a number of properties in the Pachuca and El Chico districts. The reduction plant is to be built at the El Borda mine, a few miles north of Pachuca.

The San Felipe de Jesus company has resumed the extraction of ore. The general clean-up, necessitated by the long period during which the mine was practically closed, has been finished.

The Santa Gertrudis company has invited bids for the proposed new shaft at San Guillermo, says a late report from Pachuca. The shaft, which is to have 5 compartments, will be 27 ft. 10 in. long. No decision has been reached as to whether steel or timber supports will be used.

Sonora

(Special Correspondence.)—There is reason to believe that the Greene-Cananea company will pay a dividend before the close of the year, possibly 40c. per year. W. D. Thornton, president of the Greene Con. Copper Co., would not commit himself to a definite statement as to the dividend, but did give a strong intimation that the report was not without foundation. He said that the mine is in good condition and that the company, having completed extensive improvements to reduce operating costs, there is no reason why dividends should not be paid, unless the copper market dropped to a point below its present level. He added that he looked for an improvement in the market. While Mr. Thornton declined to give the actual cost of production, it is understood that the company is putting copper down in New York at a cost of about 9c. per pound.

Cananea, October 26.

Press reports contain rumors that the Phelps-Dodge interests are negotiating the purchase of the Transvaal mine. Walter Douglas, general manager for the Phelps-Dodge company in the Southwest, is said to have made an inspection and to have made a personal report to James Douglas, his father, president of the company. Mining men in Sonora are reported to greatly desire the completion of the deal, as it is believed the purchase would result in the extension of the Nacozari railroad and the development of all the adjoining district.

The San Pedro M. Co., financed by Massachusetts investors, is to resume work on a larger scale than before, states a report from Clumpas. Apollos Fuller, superintendent for the company, is expected to be at Clumpas in the near future.

Ore assaying as high as $2000 per ton is being mined at the Cerro Gordo, and a shipment will be made shortly. O. L. Neer is superintendent for the company.

PERU

The production of crude petroleum in Peru for 1910 was 175,000 metric tons. The kerosene produced amounted to 1,050,000 gal., and the gasoline and benzine to 155,000 gal. Oil is found in great quantities along the north Peruvian coast, but only a comparatively small part of the field has been developed.

Recent reports state that the Proaño smelter at Tamboraque has stopped operations for the present.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS.

INJURY TO MINER—CONTRIBUTORY NEGLIGENCE

An experienced miner was injured by a fall of slate from the roof of a mine. It appeared from the evidence to recover damages for the injury, that the injured miner had carefully examined the roof for loose rock, but found it to be sound and solid. After taking out two cars of coal he examined it again and testified that it seemed to be solider than before and believed it to be perfectly safe and that there was no danger that the roof would fall. It was his custom generally to sound the roof after taking out each car, but the roof at this time appeared to be so safe that he only sounded it upon first entering and again upon taking out the second car of coal; and the accident happened about two hours after the last sounding and while he was working on the fourth car of coal. It was the duty of the miner to protect himself against such an accident while working in his own room, and it was the duty of the mine-owner to furnish props when needed. The miner had placed an order for props as he entered the mine in the morning, but the general rule in the particular mine was that props were sent within a day or two after an order was placed, that is, the orders were usually placed a day or two in advance of the need of such props, and there was no claim that the miner believed that he had immediate need of such props; and up to the time of such accident the miner had not discovered or suspected a condition that would require the immediate use of the props, and there was nothing to show that he would have used the props if they had been promptly furnished. The miner testified on trial that he was an experienced miner and knew as well as any man how to sound a roof and when it was beginning to get loose and when it was likely to fall and that he never before had missed in his judgment in respect to such matters and this was his first accident. He also stated that a roof might sound solid at one time and 15 or 20 minutes afterward let loose, and for this reason he usually tested the roof after taking out each car. Under these circumstances it was held that the mine-owner was not negligent in failing to deliver the props immediately, and that the miner was guilty of contributory negligence in failing to sound the roof in accordance to the usual custom after each car and that he assumed the risk which he knew and fully appreciated.

Williams *v.* Norwood-White Coal Co., (Iowa) 125 Northwestern, 232. March 1910.

INJURY TO MINER—CONTRIBUTORY NEGLIGENCE

A miner is not guilty of contributory negligence because of his failure to give notice within a reasonable time of a known defective condition. And such miner working in a mine may assume that the mine-owner has discharged his duty in seeing to it that the place is reasonably safe, and the miner is not required to exercise even reasonable care to ascertain whether the roof of the mine is soft or not, except as he is required by statute to examine the working place before commencing work and to repeat the examination after a stoppage of work during the shift.

Lockhart *v.* Sloss-Sheffield Steel & Iron Co., (Ala.) 51 Southern, 627. March 1910.

MINERS AS FELLOW SERVANTS

Miners engaged in mining operations are fellow servants; and the rule applies although by reason of seniority one servant was director or boss of their operations, and the negligence of such director or boss in failing to get a new rope, or for permitting an old rope to be used by his fellow miners for an improper purpose and for a use to which it had not been put, and the master was not liable even where such boss or director was guilty of negligence.

Avikanen *v.* Baltic Mining Co., (Mich.) 125 Northwestern, 545. March 1910.

Company Reports

ORIENTAL CONSOLIDATED MINING COMPANY

This company is capitalized for 500,000 shares at $10 each, of which 70,610 shares are owned by the company. The report for the year ended June 30, 1911, shows that during that period 342,956 tons of ore was produced by the mines owned by the company, and a further 1141 tons was produced by tributers, having a total gold content of $1,787,629 (corresponding to $5.19 per ton). From this ore $1,541,347 was obtained at an operating cost of $839,858, leaving an operating profit of $701,489. On new construction and development work $28,769 was expended, leaving a net operating profit of $672,720. The balance on hand on June 30, 1910, was $532,791. During the year dividends No. 16, 17, and 18 were paid, amounting to $644,085, leaving a balance on hand June 30, 1911, of $561,426.

At the Tabowie mine the ore reserve is estimated at 410,000 tons, of an average gold content of $4.88. At the Taracol mine the reserve is estimated at 285,000 tons of an average content of $4.57. The Kuk San Dong mines have an estimated reserve of 35,700 of a content of $2.22. The Charabowie reserve is estimated at 47,000 tons of $6.32 ore. At the Candlestick and Chintui mines the ore reserves are estimated at 11,580 tons of $10.75 ore and 13,000 tons of $3.09 ore, respectively. The development work in the Chintui and Kuk San Dong mines was unsatisfactory, and they now appear to be nearly exhausted. In the other mines development work was satisfactory and the ore reserves have been increased during the year. The average operating costs are given as follows: mining, $1.41 per ton; milling, $0.56; treatment of concentrate, $0.15 (cost per ton treated, $1.94); general expense, $0.32; other minor items making a total of $2.53 per ton. The recovery was as follows: bullion from mills, $2.67 per ton; concentrate treatment, $1.69; other minor items making a total of $4.49 per ton. This is itemized as follows:

	Ore mined, tons......	Bullion yield, per ton ...	Net yield, per ton conc...	Tailing, per ton	Net recovery, per cent ..
Tabowie	121,257	$2.26	$2.02	$0.47	84.4
Taracol	85,062	2.30	1.95	0.14	86.3
Chintui	29,637	2.33	1.97	0.41	85.4
K. S. D. North...	28,659	1.85	0.64	0.28	80.5
K. S. D. South...	29,734	1.51	0.53	0.24	80.2
Charabowie	39,610	5.25	1.56	1.22	81.4
Candlestick	8,997	8.14	1.40	0.20	87.5
Tributers	1,411	4.26	3.59	0.81	80.2
	344,097	$5.19	$1.69	$0.49	84.1

There are five mills upon the company's property, as follows: Tabowie, 80 stamps; Taracol, 80 stamps; Kuk San Dong, 40 stamps; Maibong, 30 stamps; Candlestick, 10 stamps; a total of 240 stamps. The average stamp duty per 24 hours was 4.2 tons per stamp. There are four cyanide plants; that at Taracol treated 23,743 tons during the year, yielding $534,199, an average recovery of 86%; the plant at Kuk San Dong treated 5491 tons, yielding $34,194, an average extraction of 66.8%; at the Candlestick plant 7246 tons was treated, yielding $21,964, an average recovery of 53.7%. During the year a cyanide plant was constructed at Kuk San Dong to re-treat the cyanide dump. This plant has a capacity of 80 tons per day, and much difficulty was at first experienced in treating the oxidized concentrate, but the plant is now in successful operation and is making a 58% extraction. The average gold content of the dump is $7, the tonnage available being estimated at 40,000. Some inconvenience has been experienced in securing timber rights from the Japanese administration, but this has been settled by the payment of a reforestration tax.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

WILLIAM H. [illegible] is now at Tonopah.

F. Z. BURNS is on professional business in Cuba.

H. V. WINCHELL was in San Francisco this week.

ERROLL MACBOYLE has returned to San Francisco.

A. C. BINGHAM, of Marysville, is in San Francisco.

F. B. CALDWELL has been at San Francisco during the week.

J. R. CAHILL is in charge of construction work at the Plymouth mine.

J. P. KEENE is testing a placer property at Princeton, British Columbia.

WALTER BALTZ, an official representative of the German Government, is in San Francisco.

L. H. THURSTON, of Dawson, Northwest Territory, is at the Fairmont hotel, San Francisco.

ALBERT BURCH is in general charge of the interests of Bewick, Moreing & Co. in California.

W. H. STORMS has returned from Nevada county, California, where he has been making an examination.

W. B. FISHER has been appointed general manager for the Davis Daly Estates Copper Co. at Butte, Montana.

A. H. CASE has been appointed acting manager of the Tennessee Copper Co.'s plant at Copperhill, Tennessee.

FRANK BURNS has returned from Mexico to resume his old position as superintendent for the Arkansas & Arizona Copper Co. at Jerome, Arizona.

J. V. N. DORR has been appointed general manager for the Mogul Mining Co., succeeding to the position made vacant by the death of W. L. McLaughlin.

H. C. MILLER is examining and testing the ore of the Pilot Knot Mining Co., Gottville, Siskiyou county, California, preliminary to installing a cyanide plant.

A. D. FOOTE has sufficiently recovered from the operation which he recently underwent in San Francisco to be able to return to his home, where he is making good progress toward recovery.

E. W. MCCRARY, formerly with the U. S. Geological Survey, has formed a partnership with F. M. HUTCHINSON, under the firm name of Hutchinson & McCrary, with offices at 712 German Bank building, Marietta, Ohio.

THE JUNIOR CLASS IN MINING of the Colorado School of Mines spent from October 18 to 21 inspecting the placer and lode mines in the Breckenridge district, Colorado. They were accompanied by Professors Schneider and Allen.

Obituary

EDWARD L. BALLOU died at his home at Igo, California, on October 1. A native of Illinois and a graduate of the class of 1876, University of Illinois, he removed to Shasta county, California, over thirty years ago, where he engaged in mine operation. He was a competent miner and a good citizen; he can ill be spared.

HORACE H. EMRICH was shot by an unknown assassin on October 17, at Kyshtim, Russia. He was born in New York in 1880 and graduated from the Colorado School of Mines in 1903. Both before and after graduation he had extensive experience at the Colorado smelter at Pueblo, which was operated by his uncle, Anton Eilers. Later he was employed at the Perth Amboy plant of the A. S. & R. Co., where he rose to be superintendent of the copper department. Early in 1910 he became superintendent of the electrolytic refining department of the Kyshtim Corporation, Ltd. He was popular both with his associates and subordinates, and the motive for his assassination is unknown.

Market Reports

LOCAL METAL PRICES

San Francisco, November 2.

Antimony	[illegible]	Quicksilver (flask)	$46
Electrolytic Copper	[illegible]	Tin	[illegible]
Pig Lead	[illegible]	Spelter	[illegible]

Zinc dust (100-lb. casks, per 100 lb.), small lots [illegible], large [illegible]

METAL PRICES

(By wire from New York.)

Average daily prices in cents per pound

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Oct. 26	12.25	4.23	6.18	54⅝
" 27	12.25	4.23	6.18	54½
" 28	12.25	4.23	6.18	54⅝
" 29	Sunday.	No market.		
" 30	12.25	4.23	6.18	54⅝
" 31	12.25	4.23	6.18	[illegible]
Nov. 1	12.25	4.23	6.18	54⅝

ANGLO-AMERICAN SHARES.

(Cabled from London.)

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

	Oct. 26. £ s. d.	Nov. 1. £ s. d.
Camp Bird	1 7 3	1 8 6
El Oro	1 3 3	1 3 0
Esperanza	1 13 1½	1 13 9
Dolores	1 5 0	1 5 0
Oroville Dredging	0 5 0	0 5 0
Mexico Mines	6 18 9	6 18 9
Tomboy	1 0 4½	1 3 1½

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing Prices. Nov. 1.		Closing Prices. Nov. 1.
Amalgamated Copper	$ 54¼	La Rose	$ 3¼
A. S. & R. Co.	65	Mason Valley	8⅜
Braden Copper	4¼	Miami Copper	19½
B. C. Copper Co.	3¼	Mines Co. of America	4
Butte Coalition	16¾	Nevada Con	16½
Chino	20½	Nevada Utah	⅛
Davis Daly	⅞	Nipissing	7⅜
Doble	1¼	Ohio Copper	1
Dolores	4	Ray Central	1⅞
First National	1	Ray Con	14
Foley O'Brien	⅜	South Utah	⅝
Giroux	4¾	Superior & Pittsburg	16
Goldfield Con	4⅛	Tenn. Copper	35¼
Greene-Cananea	6⅞	Trinity	3
Guanajuato Con	¾	Tuolumne Copper	3⅝
Hollinger	10⅞	United Copper	1½
Inspiration	7⅞	Utah Copper	45¼
Kerr Lake	3½	Yukon Gold	3⅛

COPPER SHARES—BOSTON.

(By courtesy of J. C. Wilson, Mills Building.)

	Closing prices, Nov. 2.		Closing Prices Nov. 2.
Adventure	4½	Mohawk	$ 41¾
Allouez	28	North Butte	24⅜
Calumet & Arizona	49¼	Old Dominion	40
Calumet & Hecla	385	Osceola	87
Centennial	9	Parrot	9¼
Copper Range	52	Shannon	7¼
Daly West	5	Superior & Boston	3¼
Franklin	7¼	Tamarack	22
Granby	29	Trinity	2⅞
Greene Cananea, ctf.	7	Utah Con	15
Isle-Royale	14	Victoria	3
La Salle	4⅛	Winona	3½
Mass Copper	5¼	Wolverine	78

NEVADA STOCKS.

(By courtesy of San Francisco Stock Exchange.)

San Francisco, November 2.

Atlanta	$ .15	Mayflower	$ .03
Belcher	.61	Mexican	3.55
Belmont	8.25	Midway	.26
B. & B.	.13	Montana-Tonopah	.92
Booth	.06	Nevada Hills	2.70
Chollar	.12	Ophir	1.95
Combination Fraction	.07	Pittsburg Silver Peak	1.00
Con. Virgina	.75	Round Mountain	.61
Florence	.79	Sandstorm Kendall	.03
Goldfield Con.	4.60	Savage	.15
Gould & Curry	.12	Tonopah Extension	1.07
Jim Butler	.23	Tonopah of Nevada	6.90
Jumbo Extension	.21	Union	1.75
MacNamara	.26	West End	.88

OIL SHARES.

(By courtesy of San Francisco Stock Exchange.)

San Francisco, November 2.

Associated Oil	$13.00	Occidental	$ .15
Bay City (New Stock)	.60	Palmer	.74
Brookshire	.50	Peerless	4.25
Caribou (New Stock)	1.00	Premier	.30
Claremont	.85	Republic	.30
Coalinga National	.11	Sauer Dough	1.25
Con. Midway	.04	Silver Tip	.85
Cresceus	.12	S. & F. McKittrick	20.00
Empire	1.20	S. W. & B.	.20
Enos	.40	Turner	.95
Maricopa National	.22	United Oil	.42
Monte Cristo	1.60	W. K. Oil	2.85

Current Prices For Chemicals

(Corrected monthly by Braun-Knecht-Heimann Co.)

Prices quoted are for ordinary quantities in packages as specified. For round lots lower prices may be expected while in smaller quantities advanced prices are ordinarily charged. Prices named are subject to fluctuation. Other conditions govern Mexican and foreign business.

	Min.	Max.
Acid, sulphuric, com'l, 66°, drums, 100 lb.	$0.75	$1.00
Acid, sulphuric, com'l, 66°, carboy, 100 lb.	1.00	1.50
Acid, sulphuric, C.P., 9-lb. bottle, bbl., lb.	0.13	0.18
Acid, sulphuric, C.P., bulk, carboy, lb.	0.09½	0.12
Acid, muriatic, com'l, carboy, 100 lb.	1.60	2.00
Acid, muriatic, C.P., 6-lb. bottle, bbl., lb.	0.15	0.20
Acid, muriatic, C.P., bulk, carboy, lb.	0.10½	0.15
Acid, nitric, com'l, carboy, 100 lb.	5.25	6.50
Acid, nitric, C.P., 7-lb. bottle, bbl., lb.	0.16	0.22
Acid, nitric, C.P., bulk, carboy, lb.	0.12½	0.15
Argols, ground, bbl., lb.	0.20	0.25
Borax, cryst. and conc., bags, 100 lb.	2.75	3.85
Borax, powdered, bbl., 100 lb.	3.00	4.00
Borax glass, gd., 30 mesh, cases, 100 lb., tin lined	10.00	13.00
Bone ash, 60 to 80 mesh, bbl., 100 lb.	4.50	5.50
Bromine, 1-lb. bottle, lb.	0.55	0.65
Candles, adamantine, 12 oz., 40 sets to case	3.50	4.15
Candles, adamantine, 14 oz., 40 sets to case	4.00	4.55
Candles, Stearic, 12 oz., 40 sets to case	4.95	5.50
Candles, Stearic, 14 oz., 40 sets to case	4.65	5.20
Clay, domestic fire, sack, 100 lb.	1.50	2.00
Cyanide, 98 to 100%, 100-lb. case, lb.	0.20¾	0.24¾
Cyanide, 98 to 100%, 200-lb. case, lb.	0.20	0.24
Cyanide, 129%, 100 lb. case, lb.	0.27½	0.28½
Cyanide, 129%, 200-lb. case, lb.	0.26¾	0.27½
Lead acetate, brown, broken casks, 100 lb.	8.75	9.00
Lead acetate, white, broken casks, 100 lb.	10.00	10.25
Lead acetate, white, crystals, 100 lb.	11.75	12.25
Lead, C.P., test., gran., 100 lb.	13.00	15.00
Lead, C.P., sheet, 100 lb.	15.00	18.00
Litharge, C.P., silver free, 100 lb.	10.50	13.00
Litharge, com'l, 100 lb.	7.50	9.00
Manganese ox., blk., dom. in bags, ton	20.00	25.00
Manganese ox., blk., Caucasian, in casks, ton (85% MNO_2—¾% Fe)	42.50	50.00
Nitre, double ref'd, small cryst., bbl., 100 lb.	7.00	8.00
Nitre, double ref'd, granular, bbl., 100 lb.	6.50	7.50
Nitre, double ref'd, powdered, bbl., 100 lb.	7.25	18.00
Potassium bicarbonate, cryst., 100 lb.	12.00	15.00
Potassium carbonate, calcined, 100 lb.	15.00	18.00
Potassium permanganate, drum, lb.	0.11	0.12½
Silica, powdered, bags, lb.	0.03	0.05
Soda, carbonate (ash), bbl., 100 lb.	1.50	1.75
Soda, bicarbonate, bbl., 100 lb.	2.00	2.50
Soda, caustic, ground, 98%, bbl., 100 lb.	3.15	3.50
Soda, caustic, solid, 98%, drums, 100 lb.	2.65	2.85
Zinc shavings, 850 fine, bbl., 100 lb.	11.25	12.00
Zinc sheet, No. 9—18 by 84, drum, 100 lb.	9.75	10.75

Current Prices for Ores and Minerals

(Corrected monthly by Atkins, Kroll & Co.)

The prices are approximate, subject to fluctuation, and to variation according to quantity, quality, and delivery required. They are quoted, except as noted, f.o.b. San Francisco. Buying prices marked*.

	Min.	Max.
Antimony ore, 50%, per ton	*$20.00	$25.00
Arsenic, white, refined, per lb.	0.01¾	0.02¼
Arsenic, red, refined, per lb.	0.07¼	0.08¼
Asbestos, according to length and quality of fibre, per ton	100.00	350.00
Asbestos, lower grades, per ton	10.00	100.00
Asphaltum, refined, per ton	15.00	20.00
Barium carbonate, precipitated, per ton	42.50	45.00
Barium chloride, commercial, per ton	37.50	42.50
Barium sulphate (barytes), prepared, ton	20.00	30.00
Bismuth ore, 10% upward, per ton	*75.00	upward
Chrome ore, according to quality, per ton	10.00	12.50
China clay, levigated, per ton	15.00	20.00
Cobalt metal, refined, f.o.b. London, per lb.	2.50	
Coke, foundry, per 2240 lb.	15.00	17.50
Diamonds:		
Borts, according to size and quality, per carat	2.00	15.00
Carbons, according to size and quality, per carat	75.00	100.00
Feldspar, per ton	5.00	25.00
Firebrick:		
Bauxite, per M.	175.00	
Magnesite, per M.	190.00	275.00
Silica, per M.	42.50	47.50
Flint pebbles for tube-mills, per 2240 lb.	15.00	25.00
Fluorspar, per ton	10.00	15.00
Fullers earth, according to quality, per ton.	20.00	30.00
Gilsonite, per ton	35.00	40.00
Graphite:		
Amorphous, per lb.	0.01½	0.02½
Crystalline, per lb.	0.04	0.13
Gypsum, per ton	7.50	10.00
Infusorial earth, per ton	10.00	15.00
Magnesite, crude, per ton	7.50	10.00
Magnesite, dead calcined, per ton	22.50	27.50
Magnesite, brick (see firebrick).		
Manganese ore, oxide, crude, per ton	10.00	25.00
Manganese, prepared, according to quality, per ton	30.00	70.00
Mica, according to size and quality, per lb.	0.05	0.30
Molybdenite, 95% MoS_2, per ton	400.00	500.00
Monazite sand (5% thoria), per ton	150.00	200.00
Nickel metal, refined, per lb.	0.45	0.60
Ochre, extra strength, levigated, per 100 lb.	2.25	3.25
Platinum, native, crude, per oz.	30.00	40.00
Sulphur, crude, per ton	15.00	25.00
Sulphur, powdered, per ton	40.00	45.00
Talc, prepared, according to quality, per ton.	20.00	50.00
Tin ore, 60%, per ton	450.00	475.00
Vanadium ore, 15%, per ton	150.00	180.00
Vanadium ore, 15%, per ton	200.00	250.00
Wolframite (see tungsten ore).		
Zinc ore, 50% up, per ton	*15.00	20.00

Commercial Paragraphs

The Mine & Smelter Supply Co., of New York, Denver, Salt Lake City, El Paso, and the City of Mexico, has acquired the exclusive agency for the Holman drill in the United States and Alaska.

Hammond & Co. has succeeded Samuel F. Hammond as representative of Eastern manufacturers engaged in the iron and steel industry and has opened offices in the Story building, Los Angeles, California.

The Kennicott Co., of Chicago, reports the sale of 24 Kennicott water softeners to the Peruvian Corporation, Ltd., for use on its railways in Peru. These water softeners will have a capacity of 5000 gal. per hour.

The Pacific Foundry Co., San Francisco, has been appointed the representative of the General Chemical Co. to handle the Herreshoff Roasting Furnace in the States of California, Nevada, Utah, Washington, Oregon, Idaho, Wyoming, Arizona, and New Mexico. The Pacific Foundry Co. will send to any one interested an attractive bulletin describing this furnace and also literature on its Kilker Matte Tapping Car.

The Byron Jackson Iron Works has won its suit against the United Iron Works of Oakland, California, for infringement of patents on automatic counterbalance centrifugal pumps owned by the plaintiff. This case has been pending for the past two years. The city and county of San Francisco recently purchased $120,000 worth of these pumps from the Byron Jackson Iron Works for use in its auxiliary salt-water fire system.

The Goldfield Con. M. Co. paid a dividend of 30c. per share on October 31. The operating profit for September was $444,366.

The Bunker Hill & Sullivan M. & C. Co. paid on November 4, 1911, dividend No. 170 of $65,400. This makes the total amount of dividends paid $13,094,250.

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EDITORIAL

GATHERING of the Atlantic fleet in New York harbor on November 1, upon thirty days notice, holds an element of astonishment even to patriotic Americans. A hundred vessels, twenty-four of them first class battleships, formed a fleet that only Great Britain could surpass. On the same day twenty-four ships of the Pacific fleet were reviewed at Los Angeles.

IT IS rumored that E. A. Hitchcock will resign from the office of Postmaster General. Apparently the proposal to send *The Review of Reviews* by freight, while the *Wine and Spirits Gazette* traveled in mail cars, was a little too much. But it must be placed to his credit that, for the first time since 1883, the department showed a profit, of $219,118, on the operations of the fiscal year ended June 30.

JOURNALISM lost a notable exponent in the death of Joseph Pulitzer. Even the younger generation can remember the time when *The World* and *The Sun* were the interesting expressions of vivid personalities. New times are upon us now, and journals are, like corporations, without any tangible personality. Mr. Pulitzer's influence lives after him in many ways and the school of journalism at Columbia University, for the creation of which he provided ample funds, is a fitting memorial to a great editor.

ANNOUNCEMENT is made that Mr. Waldemar Lindgren has been appointed Chief Geologist of the United States Geological Survey, and the mining profession will hasten to congratulate both Mr. Lindgren and the Survey upon the choice. Mr. Lindgren has been identified with the Survey for over twenty-five years, having more recently been in charge of economic geology, and having reorganized the division of mineral statistics. A graduate of Freiberg, he is best known to miners by his lucid reports upon the ore deposits of California, Idaho, Arizona, and Colorado, and engineers will regret if the executive duties of his new work prevent his engaging in field work that has proved so valuable to the profession.

NEW election methods in San Francisco have proved successful beyond expectation. At the primaries P. H. McCarthy, who had been an exceedingly unsatisfactory Mayor, was defeated and James Rolph, Jr., elected. At the general election on Tuesday a city administration in sympathy with the Mayor-elect and his policy was elected without any confusion. This is pleasing evidence that the majority of citizens will demonstrate their honesty and level-headedness when given a fair chance. It is time for San Francisco to put away graft and the domination of the unintelligent, and gird her loins to meet the demands which her destiny will make upon her with the opening of the Panama Canal and the expansion of commerce upon the Pacific.

MANHOOD suffrage in England will probably be introduced at the next session of Parliament. The Premier has been memorialized in favor of equal suffrage for both sexes, but woman suffrage in England does not seem an immediate possibility, being a matter which excites vigorous discussion in the 'tight little isle.' During the recent voting upon constitutional amendments in California the expression most frequently heard was that women might as well be given the ballot, as there would be no end to the agitation until they were. A more serious argument against it is found in the allegation that it will add disproportionately to the low-class, purchasable vote of large cities, accentuating the present complaint that the lower class of citizen votes early and often, while the business man and merchant too often see in election day only an opportunity to arrive earlier at the golf links or shooting ground. California is the first State with large cities within its borders to grant woman suffrage; the outcome will be watched with interest.

PHOSPHATES are becoming subjects of great interest, both because of the demand for superphosphates in agriculture, and because the resulting increased market for sulphuric acid offers a possibility of dealing with the SO$_2$ content of smelter fume. We recently published a description by Mr. M. W. von Bernewitz of the manufacture of superphosphate in Western Australia, and in this issue Mr. James A. Barr describes the phosphate industry of our own Southern States. Only of recent years has the widespread occurrence of phosphates in the United States been fully realized, as the extensive deposits of the West were not at first recognized as such. It now seems not impossible that the United States may some day hold a position in the phosphate trade similar to that occupied by Germany in the potash trade and Russia in the platinum industry. Though the industry is thus important there is little likelihood of quick fortunes being made in it. Phosphate rock sells in Eastern and Western markets at the rate of about 60 cents per unit per cent of available phosphoric acid, which in many places corresponds to the cost of mining plus the freight, though high-grade phosphate from Eastern deposits brings as much as \$4 to \$5 per ton f.o.b. the mine. Natural phosphates are of little use as plant food in the raw state, though the greensands of New Jersey and other States have long been quarried by the farmers and applied directly to the soil, producing plentiful crops. Ordinary phosphate rock is insoluble and must be treated with sulphuric acid to convert it into 'superphosphates' of somewhat indefinite composition before it is of service to the plant. The United States Geological Survey has published some thirty papers upon phosphates, of which the most recent, Bulletin 470-H, deals with the deposits of Idaho, Montana, and Wyoming.

IN REVIEWING for its readers the causes of the outbreak in China, the *Literary Digest* quotes the expressions of opinion of more than a dozen English journals, but not one from the United States. Various reasons might be offered for this, the most adequate, perhaps, being that no American journal had opinions worth quoting. The great dailies of England, such as the London *Times* and the Manchester *Guardian*, keep themselves well informed on progress throughout the world, and make an effort to obtain reliable information, where the American demand is for sensation. It must further be said, in extenuation of the great amount of misinformation regarding the Chinese rebellion recently published in America, that it may result from too great attention to Cantonese opinion, since nearly all the Chinese in the United States, with the exception of students and officials, are Cantonese of the merchant and coolie classes. The Cantonese, though clever and progressive, are of a reactionary temperament; they are the Sicilians of the Orient, and are about as representative of the Chinese Empire as the French Canadians are of the British Empire. For years they have been restive under the rule of the Manchu dynasty, and it is not unnatural that they should claim an influence in the present uprising, which is actually due to widespread dissatisfaction throughout the Yang-tze provinces with the policy of the Peking Government in regard to the nationalization of railways and incurring of foreign loans, greater than actually pertains to them. The Manchu dynasty will probably fall, it has long been tottering, but its overthrow is due to its inadequacy, not to its nationality. What the outcome will be is unsafe to prophesy. A constitutional monarchy seems most probable, but the man of the hour has not yet made his appearance. If this opportunity had come to Yuan Shih-kai twelve years ago he would have met it boldly, now he seems to fear the outcome, and the Government grows daily more disorganized. The need for a strong man is urgent, for the situation is critical. The interests of foreign powers in China are vast and are jealously watched, while the finances of the Empire, long in a precarious condition, and only recently exhibiting a more hopeful outlook, have now relapsed, and it seems probable that their last condition may be worse than their first. It behooves the leaders of the revolutionary movement in China to be careful, lest worse things than government by the Manchus befall them.

Some Words and Their Uses

The Mining Magazine has recently urged editorially that the loose use of 'fine' and 'coarse', as applied to alluvial gold, be discouraged, and suggests that the standardization committee of the Institution of Mining and Metallurgy issue a pronouncement giving to these words a degree of precision befitting their use by scientific men. We are inclined to go farther, and suggest that gold which is in small particles be described in some way not involving the use of 'fine'. 'Fine' gold is universally recognized as gold which is free from impurity, and some explanatory phrase is required if the reader is to infer that the attribute is physical rather than chemical. On another page there appears an interesting note by Mr. Waldemar Lindgren showing that placer gold in California is finer than that occurring in quartz veins. The first impression conveyed by the word is here the correct one; the placer gold is purer. It would be better to limit 'fine' to this meaning, when applied to gold, and thus avoid confusion of ideas. A cynic has said that the use of language is to conceal the absence of ideas. Though perhaps this is true of the language of diplomacy and polite society, the scientific man employs language to express ideas with conciseness and precision. Words of a double meaning add to the zest of casual conversation, but in technical speech they usually lead to profitless confusion.

'Proposition' has generally been reserved for technical use in mathematics and logic, though it has a wide variety of meanings. Americans, with their characteristic fluidity of speech, have dragged it into common use, for the numerous and elusive reasons which impel them to give new meanings to old words and to invent new phrases. Many of these are distinct acquisitions to speech, but all are subject to a spurious popularity which often leads to a looser and looser usage that finally ends in their abandonment by careful writers and speakers. 'Proposition' is already well advanced in this downward stage and is daily more loosely used by those from whom better things might be expected. We hear of business propositions, dredging propositions, a new scheme of legislation is referred to as a proposition, and so on, *ad nauseam*. A proposition is the result of a setting forth, and is therefore abstract; there is no necessity for applying it in a concrete sense. A sufficiency of words to express such ideas already exists; by using 'proposition' we are degrading from its high estate a word which has retained a definiteness of meaning that can ill be spared.

Carlyle invented new words and employed old ones in new senses in order to give a ponderous appearance of dignity to his style. A similar procedure is followed by many Americans to produce an opposite effect, and under suitable circumstances the result may be a satisfactory one. But due attention should be paid to suitability of circumstance, a judge may use forms of speech when playing with his children that would be unsuitable in an utterance from the bench. And too few realize the difference between oral and written language; a difference which is real and marked, though not so great in English as in some other languages, such as Chinese. A dental practitioner does not attempt to perform all his work with one tool, but employs a great number, each of which is nicely adjusted to its task. A practitioner of the art of expression should not be less well equipped.

Alaska and Its Problems

Alaskan problems have been prominent in the court of public opinion for some time, and, rightly or wrongly, public opinion, at first inchoate, has begun to take on rude form. Elsewhere in this issue Mr. Duncan M. Stewart discusses the problem of transportation, and its bearing on the future of Alaska, and Mr. George Otis Smith discusses the coal land laws, a collateral phase of the Alaskan problem. With much of what Mr. Stewart presents we find ourselves in cordial disagreement, with the rest we agree, and in any case the views of a citizen of Alaska deserve a hearing. A "no doubt but ye are the people, and wisdom shall die with ye" attitude of mind is conducive neither to progress or enlightenment. Our own views upon Alaskan problems have already been presented and need not be reiterated here. To us the real issues at stake appear more vital and fundamental than whether certain trails and railroads are to be built, whether coal and copper mines are to be developed, by whom, and how. The problems of Alaska are like a cake of soap which has caused the discharge of the geyser of widespread and deep rooted dissatisfaction with our system of public land laws, with the part which large aggregations of capital have played in the development of natural resources, and the methods by which governmental control of public lands and natural resources has been exercised and extended. Let us discuss these briefly in their order.

The public land laws are admirably treated by Mr. Smith upon the following page. Mr. Smith is lenient. It is not perhaps too much to designate our public land laws as a hodge-podge, evolved out of what of Roman civil law and the civil law of England was considered germane. Precedent is the guiding star of legal procedure; lacking its guidance in the solution of the problems arising out of the disposal of the immense areas of public land existing in the United States after 1803, blunders were the natural result. These at once created precedents, and there has grown up a shapeless mass of legislation that hampers progress. The state of development of the United States in 1910 was, in 1810, utterly incapable of conception, as far beyond realization as the distance to the moon. Yet a general scheme of legislation formulated in the early days of the Republic now limits the directions of growth.

Large corporations, like Home Rule, seem a topic incapable of temperate discussion; on the one hand we have 'muck-raking' magazines, on the other the Chancellor of Syracuse University. Yet nothing is clearer than that the part which large corporations, and their responsible heads, have played in the history of politico-economic development is one neither provided with horns and a tail, nor with a golden crown and harp. Large aggregations of capital developed because the need for them arose. Social problems of a great city are different from those of a country village—the social problems of 1911 are similarly different from those of 1861, and no amount of argument concerning the wisdom or unwisdom of past procedure will meet the needs of the present day. In the evolution of society we have come to a stage where the transaction of business in large units is an economic necessity. Once "Adam toiled and Eve span, who was then the gentleman?" Also the clothing trade was then restricted to fig leaves, and there was no Department of Agriculture, nor a Reclamation Service. We have now reached a much higher stage of development; one in which court orders commanding large corporations to disintegrate are as futile as the orders of King Canute to the sea. Ultra-conservatism cannot hold back progress, let it hang upon her skirts so much as it will. On the other hand, there is a strong public feeling that for the average citizen to be obliged to approach the heads of railroad and other public service corporations with bared head and a humble request for fair treatment upon his lips, and to have his necessities of life taxed to furnish disproportionate profits to corporate enterprises, differs but little in appearance and less in principle from the relation between the serfs and the barons of the Middle Ages. The barons had their power shorn from them, nothing is more certain than that the American people will not permit themselves to be overreached and exploited, even if it be necessary to keep business and industry in constant turmoil for the next half-century to prevent. For the present unsettled condition both sides are to blame; large corporations have frequently employed their power in illegal and unjust ways; the public, having found the corporations guilty in certain respects, now suspects them of every crime in the calendar and refuses to allow them any larger measure of freedom than they at present enjoy. The resulting situation is much like that of the soldier who caught a Tartar, the assistance of a third party is needed.

Neither have the functions of governmental control, as exhibited by Government officials, been without fault. In the endeavor to make shift with the faulty system of legislation, men who have engaged in the work of the development of natural resources have been led into subterfuges and evasions in the effort to comply with the law. On the other hand, Government officials, to prevent what they, correctly or incorrectly, regarded as attempts to take undue advantage of the faulty law, have been led into courses of action quite as devious and illegal. A horse, which has fallen in his harness, may in his struggles to arise, kick the shins of the men who are endeavoring to assist him. There has been good faith and honest endeavor on both sides of this matter. But those engaged in the development of mineral wealth are prone to forget that the days when the virgin treasures of the Great Plains and the Sierras were awaiting men with the energy and courage to win them are gone, never to return. It is idle to talk of developing Alaska by methods followed in Colorado and California; such methods were but a rough and ready makeshift, ill-suited to the days of 1851, and quite outgrown in 1911.

And at the root of the whole matter lies too great self-interest. It must be put to the credit of monarchical forms of government that they gave us *noblesse oblige*. A democratic form of government tends to substitute the phrase, 'look out for number one.' Public lack of faith in the efficiency of legislation as a remedy for national problems takes root in a public belief that Congress is largely composed of the representatives of interests, corporate and private, and that the golden motto of so-called statesmanship is 'scratch my back and I'll scratch yours.' In our public life today we have too few men who are known and believed to have a disinterested regard for the common welfare of the whole body politic. May their tribe increase!

What the West Needs in Coal Land Legislation

By George Otis Smith

*In any discussion of the needed revision of the public land laws, a due share of attention must be given to the statutes relating to the coal lands. While certain classes of lands in the Western States have largely passed into private ownership, the public's holding of coal lands is still large enough to deserve most serious consideration. West of the one hundredth meridian lies the Nation's greatest coal reserve, estimated at more than a million million tons of anthracite, bituminous, and sub-bituminous coal, and title to 60 to 85% of this tonnage is in the United States. It is self-evident that this fuel reserve is the key to the present and future industrial development of the Rocky Mountain region. Utilization of the water-power resources will be an important factor locally, and for several decades fuel oil may be expected to affect the industrial situation, but so far as we can foresee coal must be regarded as the principal source of power. Its present importance is shown by the fact that the coal production of the Rocky Mountain States was 14.7% greater in 1910 than in 1909, although for the whole United States the increase in coal output for the same period was less than 9%. Utilization of these Western coal deposits that will meet both present and future demands is the end that must be served in whatever public policy is adopted. The West needs and has a right to demand full opportunity for legitimate, energetic business development, but that does not include the right to inflict an unearned speculative tax on the future consumer.

Full opportunity on the public coal lands can be defined both from the standpoint of the coal operator and from the point of view of the consuming public. In my opinion the operator can justly ask two things: First, the right to occupy an acreage sufficiently large for economic operation during an average mine-life period, and, second, freedom from too great investment risks. Economic operation will be understood to mean installation of such equipment as will secure maximum recovery at low cost with proper safeguarding of both life and property, while excessive investment risks refer to capital outlays out of proportion to expected profits of operation. Both of the factors are in reality of hardly less interest to the public than to the operator, for upon them depend in the last analysis much that determines prices and concerns general welfare. The public should also demand that no right to the public coal land shall be granted except for present use. Actual development must be made the first condition of occupancy of any part of what now remains in the public domain.

The present status of coal mining in the West is the resultant of two factors, land ownership and consumptive demand for coal. The large holdings of coal land legitimately acquired through railroad grants and those secured by coal companies through dummy entrymen, and by purchase of agricultural entries as well as those patented to the States as non-mineral lands, together constitute a coal land supply that has practically met the demand. The strict administration of the public domain during the past few years, however, has shut off all opportunity for wholesale accumulation of coal lands under cover of the homestead and other laws. Up to the present time the acquisition of the coal land in the public domain has been largely accomplished without recourse to the coal-land law, so that the question becomes opportune—is the present coal-land law adequate to meet present and future needs?

This law relating to coal lands is less unsatisfactory than many of the mineral land laws now on the statute books. By its provision for the valuation of coal lands at an adequate price the law makes possible a selling price that may promote development and at the same time prevent monopolization. As is pointed out in a public statement by Walter L. Fisher, the present governmental policy of basing the valuation of public coal lands upon the tonnage and quality of coal which underlies the tract results in prices that are neither unreasonable nor exorbitant; the purchaser instead of paying a flat rate per acre in reality pays for the coal by the ton at values graded according to the quality and the character of the coal. Consideration is also given to every known physical and commercial factor affecting the value of the coal of the particular locality. The purpose has been to protect the present interests of the West by making the selling price of coal land approach, but in no case exceed, the present purchase value of a royalty under a lease-hold, such as the States of Colorado and Wyoming or land companies in the West grant to the lessee, and at the same time to protect the future interests of the people by having these prices such as to discourage long-time speculative holdings. We must always keep in mind the fact that large speculative holdings are sure to affect the future price of coal in two ways; through the possibility of monopoly, and through the certainty of accumulated interest charges on the cost of the idle land.

The test of any policy is in the results it produces. That the prices put upon the public coal lands are not prohibitive can be shown by the record of sales. In the four years following the adoption of the policy of classifying and valuing the coal lands, the sales have increased 12½% in acreage and 36% in value as compared with the four years preceding, and this in spite of the fact that the four years since July 1, 1907, have included a period of industrial depression and slow recovery as contrasted with the preceding period of boom conditions. So far, therefore, as its provision for pricing is concerned, the present law appears to be as satisfactory as a sale law can be.

One serious defect exists in the present law which, all must admit, demands an immediate remedy. The restriction of legal purchases to a maximum of 160 acres for an individual or 640 acres for an association is absurdly out of accord with good mining practice. The fixed charges of a modern coal mine equipped so as to safeguard life and property and to secure maximum recovery are too high to be assessed against the tonnage of so limited a tract, especially where the coal seam is of moderate thickness. Furthermore, unless provision is made for commercial operation on the remaining lands, too great an advantage is secured to the land-grant railroads and the large coal companies already in possession of considerable areas of high-grade coal. There is no public need of having either individuals or large corporations acquire large acreages of these lands for long-time holding without development. Nor is there any sound economic reason for the disposition of the coal lands in small tracts. The homestead law expresses the spirit of American institutions in that it has encouraged every citizen to own a home, but there is neither sentiment nor sense in a proposal to sell at a low price 160 acres of coal land to an individual, for every citizen does not need to own a coal mine.

In the endeavor to discourage long-time speculative investment in the coal lands, and at the same time permit present development, the fixing of selling prices has involved difficulties. It has been recognized that an ideal adjustment of values is well-nigh unattainable for many, if not for most, coal lands. These difficulties suggest the wisdom of considering the other method of disposition, namely, a leasing system. As Mr. Fisher has stated: "It may well be that a liberal, but wisely protected leasing law would be found to promote development more vigorously than any system of outright purchase." Thus, under a leasehold law, any uncertainties as to quantity of coal or as to costs of operation would not need to be so critically estimated in advance. There would be no necessity of discounting every possible future condition, but periodic adjustment of rate of royalty could insure all equities of both operator and public, and I should expect

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*Address delivered at the American Mining Congress, Chicago, 1911.

that such adjustments might as often be downward as upward. Under a leasing system, too, it would be comparatively easy so to adjust the relationship between ground rental and royalty as to prevent the acquisition of coal deposits until actual operation became profitable. The greatest advantage of the lease system to the operator directly, and to the public indirectly, is relief from the large capital outlay now required in the acquisition of the large acreage absolutely necessary for a modern mine. This argument advanced against the present policy of valuing the public coal lands at even conservative prices thus becomes an argument for a leasehold law.

The objections to a leasing system are of two classes: those based upon political theory and those based upon economic considerations. Under political objections I will place the arguments so often put forward against Federal landlordism, namely, that the Eastern coal lands were disposed of in fee, and that the West deserves the same treatment; and further, that the natural resources of the West should not be made a source of profit to relieve the Eastern taxpayer. Such arguments can be easily answered. Past mistakes are poor precedents for future blunders. The citizen who argues for the continuance of the liberal, wide-open, public-land policy of the past is apt to be one who wishes a middleman's profit on a small investment, and we know that, East or West, the owner of coal lands acquired as agricultural lands, or in any other way, at a low price, makes his large and unearned profit out of the coal operator and, through him, out of the public. Too large a percentage of the coal output of this country is now mined under lease to justify this objection to allowing the people themselves to lease direct. As regards the argument of reserving Western resources for the West, too few people in the public-land States realize that, under the present system of sale, the proceeds from the coal lands go directly into Western development through the Reclamation Fund, and cannot be used to relieve the Eastern taxpayers except as the whole country benefits by the agricultural development of these public-land States. It is reasonable to expect that any leasing law would make similar provision for the local use of revenue resulting from leases, and indeed several of the bills already introduced in Congress have specifically recognized the wisdom of such disposition.

Much more worthy of consideration are the objections to the lease system based upon the fear that the cost of coal to the consumer would be increased; but I regard this result as altogether improbable. The royalty paid into the United States Treasury can be no greater a tax upon the consumer than the royalty paid to the State of Colorado, or to the railroad land company, or to the farmer. The average price of bituminous coal at the mine, in the United States last year, was $1.12, which usually includes either a royalty or an equivalent interest charge, either of which would probably be greater than any Government royalty. This amount forms so small a part of the price to the consumer that the royalty under a Federal lease could be of but little concern to the public, if, indeed, it resulted in any increase in the first cost of the coal. However, considering the lease as contrasted with sale outright to the coal operator, the reduction in capital necessary for original investment and the elimination of many of the risks in such investment, must result in reducing cost of operation to the mine-owner, and thus make possible a correspondingly lower price to the consumer.

The other objection to the lease system is that based upon fears of expensive Federal management, and of inefficient administration or even maladministration. These are possibilities which we must squarely face; but my faith in the efficiency of public administration is increasing to such a degree that this argument against leasing is rapidly losing its force with me. Looking beyond our own Rockies, and out across the Pacific, it may be seen that a Governmental leasing system for coal lands is not a theory but an actual working fact. The Anglo-Saxon peoples of the Australasian States have found the leasing system not only practicable, but indeed preferable to the sale of coal lands. In New Zealand, where for thirty years the laws have permitted to the operator a choice of either sale or lease of public mineral lands, a conclusive argument for the leasing system is given in the latest statistics of mineral production, which show that approximately 90% of the total mineral product of that country was mined under leasehold. If our transpacific neighbors can administer a lease law so satisfactorily, and if the mine operators in New Zealand prefer operation under a leasehold, will a similar system be fraught with either danger or failure in the United States? The fact must be faced that Uncle Sam is a landlord on a large scale—a coal baron, if you please—and that the question before us is how these millions of acres of coal land are to be disposed of so as to serve the just needs of the operator who offers his capital, technical skill, and business experience, asking in return a fair profit, and at the same time to protect the public interests.

All that the West needs is, first, opportunity for the coal industry to develop as fast as the market justifies expansion, and with the least possible risks; and, second, opportunity for the public to secure its coal at prices based on a minimum cost of production and without any addition of unearned or undue tribute to private landlords who desire to speculate on the future needs of the consumer. These ends I believe can be best attained by legislation inaugurating a Federal leasing system for coal lands of the public domain.

Development of the Steel Rail

By William J. Boucher

Robert L. Stevens advocated the use of an all-iron rail, in preference to the wooden rail plated with strap-iron, then in use on some of the American railways. At that time there was no mill in America capable of rolling such rails, and as the Birkenshaw rail, with which the best English railroads were then being laid, required an expensive chair to hold it in place, it was not adapted to conditions in America, where metal-workers were scarce and iron was high in price. Stevens accordingly devised the base to the T-rail, thus dispensing with the necessity for the chair. He also designed the hook-headed spike (which is substantially the railroad spike of today), and the 'iron tongue,' which has developed into the fish-plate or angle-bar, and the rivets (which have been replaced by bolts and nuts) to complete the joint. Thus, with his all-iron rails, spiked to wooden ties, he first produced the type of track which is in general use throughout America at the present time. Much difficulty was experienced in obtaining a mill to roll the newly designed rail, for not only were no suitable rolls in existence and the cost of their making was large, but there was also much doubt as to the practicability of rolling such a shape. An iron-works in Dowlais, Wales, however, was prevailed upon to attempt the work, Mr. Stevens being required personally to guarantee payment for damages to the rolling machinery in case of a breakdown. On coming from the rolls, the rails were crooked and twisted, but, by persistence, he showed the mill-men how to straighten them while they cooled. The first rails weighed 36 lb. per yard, but the weight was soon changed to about 40 lb. per yard, and they were rolled in 16-ft. lengths, being 3½ in. high, 2⅛ in. wide at the head, and 3½ in. wide at the base. With the exception of slight alterations in the proportions, incident to the increased weight, the rail as designed by Mr. Stevens and first used in the Camden & Amboy track, is the rail of today. The price of these rails, in England, was £8 per ton, and the import duty was $1.85 per ton.—*Proc. Am. Soc. Civ. Engineers.*

No location can be made upon an Indian reservation unless allowed by a specific Act of Congress, but a location existing at the time the reservation was created and closed to further locations, has been upheld by the Land Department as being a part of the public domain excluded from the reservation.

An Australian Pump-Dredge

By Charles Janin

A method of treating gold-bearing alluvials that has been used with considerable success in Australia is the centrifugal pump-dredge, or pump hydraulic sluicing-plant, as it is also, and perhaps more properly, called. In this country the centrifugal pump has been successfully used on suction dredges for harbor and reclamation work and for tailing pumps on some of the gold dredges; also for elevating gravel in ground-sluicing where the ground lacks sufficient fall to provide the proper sluicing grade and when sufficient water is not available for a hydraulic elevator. Centrifugal gravel pumps were also used both in Montana and California on the old double-lift elevator dredge where the material from the buckets was dumped into a water-tight compartment built on the dredge hull, and raised therefrom by the pump to a straight sluice extending some distance behind the dredge.

While the use of the centrifugal pump for supplying water under pressure and for elevating gravel in sluicing is familiar to gravel miners, little is known in California of the pumping plant as a dredge, and indeed most California operators would not consider it a dredge at all, as it differs so widely from the modern dredge as used in California. The pump-dredge, instead of floating on a pond, like an ordinary dredge, and excavating gravel below as well as above the surface of the water, operates while resting on dry land and elevates by means of a centrifugal pump to sluices, placed at sufficient height to obtain the required sluicing grade, the gold-bearing material which is hydraulicked from the gravel banks near the dredge to a sump in front of the dredge.

It is obvious that the pump-dredge cannot be used as a substitute for the bucket-elevator dredge, nor can it be compared with the latter, either in efficiency or operating cost, but, on areas too small, or otherwise unsuited for a bucket dredge, but which contain a sufficient gold content to make it economically possible, a pump hydraulic plant may sometimes be used to good advantage. Where sufficient water, under natural head, is obtainable, a hydraulic elevator may in some cases be found more efficient, and under certain conditions a bucket drag-line excavator of the Bucyrus, or similar, type could no doubt be used to better advantage. The selection of a plant to work a given area is properly determined by a careful study of the conditions under which it is to operate. The pump plant seems well adapted to small areas unsuitable for ordinary methods of operating where the gold content is sufficiently attractive, and where the amount of water in the gravel is not too great to be handled by the pump, and where it is necessary to elevate the gravel to obtain a sluicing grade. A pump-dredge might also be used where water is scarce, or where it is necessary to hold the tailing in settling ponds in order not to conflict with an anti-débris law. In such cases, the low cost of installation makes it a popular machine in Australia, where plants of this type have been successfully operated for a number of years.

Following is given a short description of the centrifugal-pump dredge, and two illustrations which give a good idea of its adaptability. These photographs are of particular interest, as they show how thoroughly the bedrock can be cleaned. The centrifugal-pump dredge is built on a pontoon and rests on dry land while working, though it can be floated to a new point of attack on a property when found advisable to change the position of the plant, if enough water is available to make a flotation pond. The pontoon is generally 40 by 50 by 4 ft. in depth on the large plants, and 30 by 40 ft. on the smaller ones.

PUMP-DREDGE AT WORK.

The equipment consists of two centrifugal pumps, either driven by the same or by separate engines, the most approved type being driven by independent engines. Pumps are sometimes run in series coupled when a high lift is necessary; one plant in Australia raising the gravel over 100 ft. by this means. Steam is generally the motive power, but electricity is used whenever available. If water under sufficient pressure is not available for hydraulic purposes one pump, generally from 10 to 14 in., supplies a 4-in. hydraulic giant or monitor under sufficient pressure to

Table Showing Operation and Working Cost of Centrifugal-Pump Dredges or Pump-Hydraulic Sluicing Plants in 1910. (Adapted from Government report for Victoria.)

No. of plant	Actual working time, weeks	Time shifting and for repairs	Total material treated, cu. yd.	Average depth of ground, ft.	Approximate cost of plant	Size of pump, inches. For nozzle	For gravel	Approximate indicated horse-power	Number of men employed	Total recovery, oz.	Average recovery, cents per cu. yd.	Operating expenses, cents per cu. yd. Wages	Fuel and water	Repairs	Total
A	..11	1	68,565	25.0	$20,000	14	12	200	20	409.8	11.3	6.6	2.4	0.5	9.6
B	..33	3	135,520	14.0	14,000	12	10	130	20	1,087.2	14.3	7.4	2.3	0.5	10.2
C	..21	10	257,966	53.0	26,000	14	12	260	32	1,324.6	10.6	6.0	2.8	2.1	10.9
D	..48	4	348,480	36.0	28,000	14	12	...	50	3,300.0	18.0	5.9	3.5	3.0	12.4
E	..18	5	185,130	13.5	32,000	14	12	120	40	1,630.0	17.0	9.0	2.7	0.5	12.2
F	..11	9	76,470	23.7	20,000	..	8	...	11	471.0	12.0	7.5	2.1	0.5	10.1

wash down the bank and sluice the material to a sump in front of the dredge. From this sump a 10 or 12 in. centrifugal gravel pump, which is generally steel lined, on account of the great wear caused by sand and gravel, elevates the material, from which the boulders and larger gravel have first been screened, to the riffled sluices. This operation is somewhat similar to that of the pump on the old double-lift type of dredge. The sluices are placed either above the dredge or at a convenient point on the bank, and after the material has passed through the sluices the tailing is conveyed to the settling pond. If desirable, the excess water is returned to the section of the pump supplying the giant. The amount of water required depends to a great extent upon the nature of the ground to be worked. It has been estimated that a minimum of about 2500 gal. is necessary for each cubic yard raised by the pump. The water that is used in the giant is pumped with the material washed to the sluices, and this water can then be returned to the pump which supplies the giant, a continuous supply making up for evaporation and seepage.

CLEANING ROUGH BEDROCK.

There were 46 of these plants in operation in Australia during 1910, working an aggregate of 3,947,796 cu. yd. of material, with an average working time of 16 weeks per dredge. One dredge operated 48 weeks and two 46 weeks, the others ranged from 4 to 28 weeks each. The average recovery from ground worked was 3 grains, or about 12c. per cubic yard, and the working costs of all plants averaged 11.2c. per cubic yard. These figures are taken from the Government report on dredging in Victoria for 1910. The accompanying table, which was made up from figures taken from this report, gives details of operations of several of these plants. The dredge having the largest capacity washed an average of 12,284 cu. yd. per week at an operating cost of 10.9c. per cubic yard. Mention is made in the Government report of a dredge washing 24,000 cu. yd. per week at an operating cost of 34c., but, as it only operated six weeks, it was not considered that this was representative of actual conditions and was therefore not used in the tabulated statement given here.

As with bucket-elevator dredges, numerous failures are reported from ill-advised installations, either on areas unsuited for such equipment, or where the gold content is not sufficient for profitable work. However, there are undoubtedly areas unsuitable for a modern dredge installation that can advantageously be worked by some modified form of dredging, and, if the gold content is sufficient, a centrifugal-pump dredge or one of the other methods previously mentioned might be advantageously used. Certainly the equipment of a property should not be advised before a thorough examination of the ground has been made. Having all the necessary information, the selection of a proper plant will depend upon the judgment and experience of the engineer.

Relative Value of Quartz and Placer Gold

By Waldemar Lindgren

*Observations in all parts of the world have shown that placer gold is always finer than the gold in the quartz veins from which the placers were derived. The explanation, as has been shown in a most convincing manner by Ross E. Browne, among others, is that the silver alloyed with the gold is dissolved by the action of the surface waters. The purity of the gold becomes greater as the size of the grains diminishes, the explanation being, of course, that the proportionate amount of surface exposed to the action of solutions is greater in the finer gold. An interesting confirmation of this view is recorded by McConnell, who states that examination of nuggets from the Klondike shows that their surfaces consist of gold of greater fineness than their insides. Some interesting data on the fineness of California gold have been contributed by F. A. Leach and C. G. Yale. A few of these data, which were obtained from mint returns for a period embracing several months of 1898, are mentioned below. The average fineness of the gold of Nevada county is given as 855; of Placer county, 792; of Plumas county, 851; of Sierra county, 858; of Calaveras county, 835; of Tuolumne county, 804. This includes both placers and quartz mines. The finest gold produced in California is that from the San Guiseppe quartz mine, near Sonora, Tuolumne county. This gold runs from 982 to 998, or $20.63 per ounce. On the whole, however, the gold from quartz veins is decidedly lower in grade than that from placers. The highest average of fineness in California is that of the gold from the placers at Folsom, Sacramento county, which runs from 974 to 978. The gold from the dredging areas of Butte county, near Oroville, is also of high grade, averaging about 922. At the localities cited the gold is obtained mainly from Quaternary deposits in the present rivers.

In Placer county the quartz veins carry gold of a fineness from 580 to 921. In the main channels of Tertiary gravels may be noted the Morning Star mine, at Iowa Hill, where the gold is 900 fine; the Big Dipper, on the same channel, 884; Michigan Bluff, 940 to 970; the Red Point drift mine, 927; and the Hidden Treasure mine, on the White channel, 924 to 941. In Eldorado county the quartz gold varies from 570 to 901 in fineness. At the Excelsior claim, at Placerville, one of the principal channels, the gold on the bedrock had a fineness of 925, while that in an upper stratum at the same place, on 'false bedrock', reached 975. The gold in the Snow mine, above Placerville, a gravel deposit in the main Tertiary river, runs 948 fine. A drift mine at Grizzly Flat, on a small Tertiary stream near the headwaters and near some quartz veins, runs 871 fine. In Calaveras county the quartz vein yielded gold ranging in fineness from 627 to 885; one exceptional quartz mine near Angels Camp shows a fineness of 960 to 975. The gold in the gravels of the main Tertiary river draining this county yielded at Vallecito gold from 940 to 987 fine. In the Green Mountain hydraulic mine, at Mokelumne Hill, the fineness was 919.

The figures quoted show clearly that in the main Tertiary streams a considerable refining of the gold has been going on, so that the average grade is decidedly above 900. It is difficult to compare accurately the tenor of the gold in the present streams with that in the Tertiary channels, for it must be remembered that the former contains a mixture of detrital gold derived from Tertiary channels with much new gold set free during the erosion of the present canyon system.

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*From 'Professional Paper' 73, U. S. Geol. Survey.

Mineral Production and Resources of China—II

By Thomas T. Read

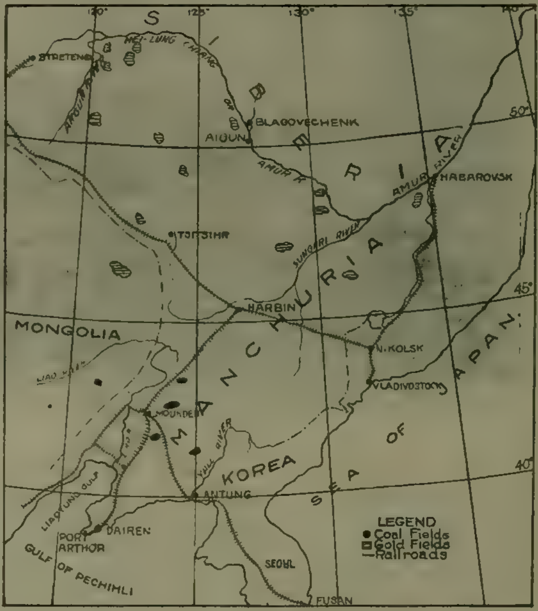
(Continued from p. 450.)

*Gold in China has unusual interest at this time, since the proposal to place the coinage of the Empire upon a gold basis is now receiving more serious consideration. The fact that the gold production is so small has always acted as a strong deterrent to the establishing of a gold coinage. Since China produces but little of either gold or silver, and must purchase them with exports of merchandise, the advantage of buying silver at its present low price is apparent. At present silver and copper are the media of exchange, the former passing at an approximation to its bullion value, while the copper *t'ung-tz'erh* and cash are subject to daily fluctuation of value. As each province now issues coins, which pass only at a discount, or perhaps not at all, in other provinces, the transaction of business is subjected to a wholly unnecessary burden. The central government having acquired control of the railways, will doubtless next proceed to complete its present shadowy control of banking, and a gold standard may be introduced, as large amounts of foreign capital are now invested in China, and interest payments are at present subject to sudden and extensive changes in the rate of exchange.

The absence of records of mineral production renders it difficult to obtain any knowledge of the gold production of the Empire. The best approximation can be made from the customs records of gold exported, since the amount used annually in the arts is but small. The export for 1908 was approximately $6,500,000, that for 1907 was $3,200,000. The occurrence of gold in China has been noted by Baber, Garnier, Duclos, LeClere, Hoover, Hosie, and others, but the most notable descriptions are by Hoover, Hosie, and Purington. The last has described[1] at length the occurrences of alluvial gold in northern Manchuria, along the Amur, Sungari, Tumen, Urga, and Nonni rivers and their tributaries, and its recovery by primitive washing methods. Gold also occurs in southern Manchuria, both in alluvial deposits and in narrow veins, frequently of the gash type. The Bureau of Mines of Manchuria has compiled a list of ten localities where gold is worked in Fengtien province, and forty others where it is known to occur. Bogdanovitch has published an excellent study of the deposits of the Liao-tung peninsula, dividing them into four classes: (1) existing stream beds; (2) Pleistocene high-level gravels; (3) ancient valley alluvials; (4) marine placers. The northern area is of much greater importance. It will perhaps be safe to estimate that Manchuria produces from 75 to 80% of an annual output of from $5,000,000 to $7,000,000 for the whole Empire. According to Russian reports, the Tuschetuchanovsky and the Tzetzenchanovsky gold properties in Mongolia have yielded, between January 1 and August 20, 84 poods[2] 10 funts 7 zolotniks of gold. This compares with 87 poods 38 funts 82 zolotniks in the corresponding period of 1910.

The gold-deposits of Chili have been described by Hoover. These are widely scattered, the most notable being veins at Chin-Chang-K'ou (119° 56′ E., 42° 20′ N.) and at Chuan-Shan-tze (119° 12′ E., 42° 26′ N.). In 1910 the former was producing at the rate of $150,000 per year and the latter $15,000 annually. There are numerous placers throughout the province, and Hoover estimated the total production for 1908 at $1,000,000. In Shantung similar conditions prevail, except that the deposits are not so abundant.

The best-known mine in China is that of Chou-Yuen, about 40 miles southwest of Chefoo, where a quartz vein from 40 to 90 ft. wide has been uncovered for more than a mile in length. Curle states that 200,000 tons of ore, worth $10 per ton, has been developed. The ore is about 40% free milling, and many years ago a chlorination plant was in operation upon the tailing from the stamps. The mine has been closed for many years, by Government order, but there has been constant effort on the part of foreign companies to secure the concession, and recently the governor of Shantung petitioned the Peking Government to allow the Chinese owners to operate the mine, fearing lest it might otherwise be lost. The nearby mines at P'ing-tu are probably of considerable value. In spite of the Government prohibition of mining, a certain amount of work is carried on quietly, and Hoover estimated the gold production of Shantung at $12,000 annually. With the few exceptions noted, there seems little probability that deposits of sufficient size can be developed to justify the construction of modern milling plants, the cost of labor being so low that primitive methods give cheaper working costs. The tailing from the chlorination plant, mentioned above, was bought by the neighboring farmers, who carried it home and, in the dull season of agricultural work, ground it in native mills and panned it. The deposits near Wei-hai-wei have been described by Verschoyle, but are of little importance. In northern Manchuria, which has not been adequately prospected, large-scale workings may perhaps be developed, but throughout the rest of the Empire progress is likely to take the form of increase and improvement of native workings, efficient and inexpensive pumps being the most-needed equipment of native mines. Hansen has recently reported that between Lanchow, on the western border of Kansu, and the border of Thibet numerous placer workings exist, carrying as much as 2 gm. of gold per cubic yard. Quartz veins also occur, containing 1½ to 2 oz. gold per ton, but as these statements are apparently based upon the reports of Chinese, they must be received with caution. A modern stamp-milling plant is now in course of erection near Lanchow.



GOLDFIELDS OF MANCHURIA. (After Purington.)

Throughout the rest of the Empire, quantities of gold are produced in many places, most of which are known to be of little importance. Ssu-chuan and Yunnan have been of much interest, since they are but little known.

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*Abstract of a paper presented at the San Francisco meeting of the Amer. Inst. Min. Eng., October 10 to 17.

[1] 'Northern Manchuria.' *Mining Magazine*, January 1911, p. 53.

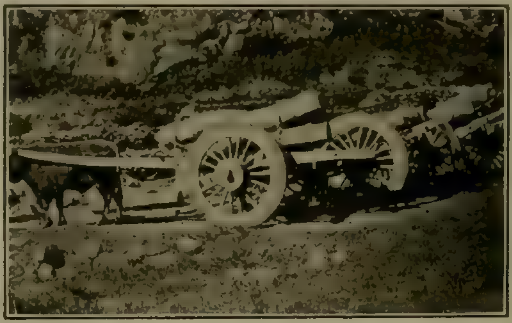
[2] One pood of placer gold is worth about $9000.

The upper waters of the Yang-tze are known as the Chin sha or 'golden sand,' but this does not necessarily indicate, as has been assumed, that especially rich alluvials exist along its course. Many travelers have mentioned the known or rumored existence of gold deposits in these two provinces—LeClere, Duclos, Baber, Hosie, Garner, Jack, and Johnston, to name but a few—but definite information is only meagre. At Mo Lo in Ssu-chuan (102° 05′ E., 28° 15′ N.) important quartz deposits have been worked since 1880 by a combination of foreign and native methods. Small quantities of alluvial gold are reported from a great number of places, but in nearly every case the name of the district is given in such a way that identification is difficult or impossible. In giving the native name of little-known places, either the Chinese characters should be employed, or else the latitude and longitude should be given. In Yunnan the most notable mines are at Ta-lan-tung (101° 45′ E., 23° 30′ N.), at an elevation of 7300 ft. These quartz-veins in Paleozoic rocks are worked by native methods, yielding some $60,000 per year. At Kin-Kiang, 60 miles from Ta-li-fu, rich conglomerate beds are worked by the natives. On the maps prepared by La Mission Lyonnaise the following places are marked as productive of gold: Ssu-chuan (99° 36′ E., 30° 55′ N.), (99° 45′ E., 30° 40′ N.), (99° 55′ E., 30° 20′ N.), (101° 50′ E., 32° 40′ N.), (101° 40′ E., 32° 0′ N.), (102° 15′ E., 31° 40′ N.), (102° 0′ E., 29° 0′ N.). Yunnan (98° 45′ E., 23° 45′ N.), (99° 50′ E., 23° 20′ N.). (These are degrees east of Paris, not of Greenwich.) Numerous other localities are mentioned in the references given, and with the great recent increase of transportation facilities in Yunnan it is not at all impossible that the gold-mining industry will greatly develop.

Gold is known to occur in Kansu, and there are quartz veins in the upper valley of the Han-ho in Shensi. Along the lower reaches of the Han-ho, in Hupeh, there is a small amount of gold washing constantly carried on. The same is true of Fukien, where in the Shao-wu district, 150 miles northwest of Foochow, valuable deposits are said to exist. In Anhwei mines were formerly worked, and deposits are known to exist in Hunan and Kwangsi, but they are not much worked. The mines in Kwangtung are said to be valuable, but in all these cases it is probable that the deposits are limited in extent and of no great richness. It may be said, in conclusion, that with the exception of Manchuria and the southwestern provinces of China (Yunnan and Ssu-chuan) the gold-mining industry gives but little promise of growth. In the districts mentioned the introduction of modern pumping machinery and the removal of the restrictions which the authorities and superstition have placed upon the industry is likely to lead to a considerable development.

Silver

Silver is of great interest in China, since it is the chief medium of exchange. But the domestic production of silver is small, and China is, accordingly, a heavy buyer of the metal. An interesting subject for speculation is found in the source of supply of this metal during the period when China maintained but little communication with the outside world. About the time of the beginning of the Christian era there was a great deal of traffic with the countries on the southwestern border, where the mining and smelting of argentiferous galena seems to have been a considerable industry, and the Burma Mines, Ltd., is now engaged in exploiting ancient silver-lead mines at Baudwen, 60 miles west of the Yunnan frontier. The best-known silver mines are those in the northern part of Chili province, near Jehol. At the time when Li Hung-Chang was viceroy, foreign engineers were employed in their exploitation. Woo, who has described the native methods of mining and smelting these silver-lead ores, which occur as veins in quartz-porphyry associated with Paleozoic sediments, says that the lack of success of the foreign enterprise was due to the high cost of the coke used and to the unsuitable character of the milling machinery employed. The general and probably correct impression is that these veins are too limited in extent and too irregular in character to allow of their being worked with a profit upon a larger scale than that employed by the natives. The production in 1903 was estimated at from 80,000 to 100,000 oz. per year. In the mountains to the west of the line of the Peking-Hankow railroad, numerous small occurrences are known, but the production is probably insignificant. References to the occurrence of silver in nearly every province may be found, but do not seem to warrant much attention. Duclos mentions numerous places in Yunnan where silver is produced, being usually associated with lead and zinc. The production at 'Pei-cha po' he estimated as 10,000 oz., and says that small amounts are produced at 'Koung-chan', 'Fou-lay-tchang', 'Siao in-tchang', 'Tchou-tsin-tchang', 'Sin-pao-tong', 'Ta-lang-tchang', 'Tchen-pien-tchang', 'Mo-lay-tchang', and 'Sin-tchang' in Yunnan. At 'Tsai-tse-chang' in Kweichou, silver is obtained from an argentiferous galena. At 'Mou-pin' in Ssu-chuan an argentiferous galena containing a little gold occurs; silver is also found toward the north of the province, at 'Pe-tsoa-pa' and 'Hou-koua-tou'.



ONE METHOD OF TRANSPORTATION IN THE ORIENT.

On the maps prepared by La Mission Lyonnaise the following places are marked as productive of silver: Ssu-chuan (101° 45′ E., 32° 10′ N.). Kweichou (104° 20′ E., 25° 12′ N.), (104° 35′ E., 25° 05′ N.), (104° 15′ E., 28° 10′ N.). Yunnan (98° 45′ E., 23° 45′ N.), (99° 50′ E., 23° 20′ N.), (101° 0′ E., 26° 30′ N.). Kwangsi, (106° 55′ E., 23° 0′ N.). Kwangtung (108° 20′ E., 21° 40′ N.), (109° 45′ E., 22° 20′ N.), (110° 50′ E., 25° 10′ N.), (111° 0′ E., 24° 50′ N.), 111° 05′ E., 22° 20′ N.), (112° 15′ E., 22° 50′ N.), (114° 05′ E., 23° 25′ N.), (114° 05′ E., 24° 15′ N.).

A Chinese company is now mining silver at Kwei-Hsien in Kwangsi. The Jun Wah Sut Yip Co. was organized a few years ago, with native capital, to develop silver and other mines in Kwangsi, and is carrying on extensive exploration and development work. Several foreign companies have attempted the development of silver mines in southern China, but without much success. It must be admitted that, on the whole, silver mining in China is of no great importance.

Copper

Copper has always been an important metal in China, as brass and bronze, employed for objects of use and adornment, and as media of exchange, have played a prominent part in the national life from the earliest times. But in the case of copper, tin, nickel, zinc, and lead, the discussion of the metals separately offers difficulties, since the ores are associated and are often smelted together, giving rise to natural alloys. By far the most important supply of these metals is derived from the southwest. Yunnan is the most important, but copper also occurs in the neighboring regions. Duclos gives a long list of places where copper is produced in Yunnan and describes in some detail the work at San-Kia-Chang (99° 35′ E., 24° 40′ N.), where he estimated a yearly production of 42 tons. LeClere has summarized as follows: "The total production obtained by reduction with charcoal was, in the seventeenth century, at least 6000 tons, but has decreased to from 1000 to 1500 tons. The decrease is not due to the impoverishment of the deposits, but to the disappearance of the forests, the scarcity of fuel permitting only the exploitation of deposits of unusual richness at the places most favorably situated in respect to transportation. The copper minerals are various. Phillipsite, cantonite, and more rarely cupriferous pyrite are found in veins in the Carboniferous schists, but are almost abandoned. Sheets of cuprite with barite, and of native copper, intercalated in porphyrite, are highly esteemed, but the lack of explosives often makes it impossible to work them. Sandstones impregnated with copper carbonate are often found in the Trias. The principal deposits are in Triassic limestones; the network of veins has been converted into carbonates, with only a trace of pyrite. The principal mining centres are: (1) 'Toung-tchouan' (101° 0′ E., 26° 30′ N.), the mines in Ssu-chuan, near the Blue river, are connected with these; (2) 'Oui-si,' near Li-Kiang (97° 15′ E., 27° 15′ N.); (3) the neighborhood of 'Ouei-ning' (102° 15′ E., 26° 45′ N.), in Kweichou, produces zinc and lead principally, and is directly governed by the mining official of Yunnan-hsien. The works will not take ores of lower grade than will give a smelting mixture of from 20 to 30% copper; the latter is more common. This richness is obtained by careful hand-sorting at the mines. The ores lower in grade than 15% are piled up and form large dumps. The old slag-dumps are common near the old smelting centres and contain about 3% copper. These facts demonstrate that Yunnan has extremely large resources of copper minerals, especially in the parts not workable by native methods." There are Government mines at Pai-shui-ho, in the Pêng-hsien district of Ssu-chuan. An Anglo-French syndicate has a concession to develop the mineral resources of seven of the prefectures of Yunnan, but has been unable to proceed because of local opposition.

Copper occurs in many other parts of China. While in Kiangsi in 1908, the local officials told me of a large copper mine at Chang-pai-ling in the west-central part of that province which had recently been extensively developed, but was not successful. Clark has described the copper ores of Lao-Pao-chi in Anhwei; this is probably the area which was subsequently granted as a concession to Lord Lister Kaye. Clark also describes the production of copper by native methods near Jehol (118° E., 40° N.), and I have seen unimportant native workings in many other places. C. H. Hansen, who has recently been engaged in the work of constructing, under Government auspices, a 50-ton copper smelting plant at Yao-kai, 70 miles west of Lanchow, on the western border of Kansu, states that there are numerous mines within a radius of 80 miles from that point. The ores are said to yield 7.5% copper.

The mining of copper has always been rigorously under the control of the Government, probably because of the importance of the metal as a medium of exchange. The native supply has not been equal to the demand for many years, and considerable amounts are imported, chiefly from Japan.

Nickel

Nickel is of much technical interest because of the ingenious way the Chinese have of smelting mixtures of nickeliferous copper ores with tin, lead, and zinc ores, forming the alloy *pai-t'ung*, or *pakfong*, as it is called in southern China. This is a kind of german silver, which is extensively used in the manufacture of candlesticks and other household objects. Nickel is never produced separately, and the entire supply is apparently drawn from southwestern China, where in Yunnan (100° 20′ E., 28° 50′ N.), and in Ssu-chuan (100° 20′ E., 26° 45′ N.), Duclos has noted the occurrence of nickeliferous copper ores. The mines at Hui-li-chou, in Ssu-chuan, are under Government direction.

Tin

China is an important producer of tin, furnishing at present about 5% of the total production of the world. A certain amount of the product comes in native boats down the Yuen and Hsiang rivers, probably originating at some point in Kweichou. Kwangtung also produces a notable amount, which is exported through Wuchow. On the maps prepared by La Mission Lyonnaise the following places in Kwangsi and Kwangtung are marked as productive of tin: (105° 10′ E., 24° 12′ N.), (110° 15′ E., 24° 45′ N.), (110° 45′ E., 22° 15′ N.), (112° 0′ E., 23° 30′ N.), (112° 45′ E., 22° 50′ N.), (114° 10′ E., 23° 40′ N.). There are also deposits in Fukien, and a small amount is shipped from Foochow. But by far the larger part of the production comes from the well known mines at Ko-ch'in-ch'iang (100° 50′ E., 23° 20′ N.) in Meng-tze-hsien, Yunnan. Here the deposits, which LeClere says "*ne sont nullement alluvionnels: leur origine filonienne est des plus evidentes*," are scattered over an area 25 miles long and 20 miles broad, and 30,000 workers are engaged in mining and smelting the product of 150 mines. The workings are both surface and underground, and only native methods are employed. Collins, Duclos, and LeClere have described these deposits in detail. Theoretically the deposits belong to the central Government, which, according to the mining regulations, exacts a royalty of 25%, but the amount actually paid is somewhere between 12.5 and 18%. The reports as to the production of these mines do not agree, but the customs returns for 1909 was 4700 tons, corresponding to about 90% of the total production for the Empire. The crude tin, in slabs weighing 74 lb. each, is exported to Hongkong, where it is refined. A large part of the tin was formerly shipped down the Yang-tze and West rivers, but now it is shipped over the French railroad. Recent newspaper reports are to the effect that efficient smelting and mining machinery is to be installed by a native company, about $1,200,000 having been subscribed for the purpose, and the erection of a slag-cleaning plant has been proposed. It is not unlikely, therefore, that the production of tin in China will considerably increase in the near future.

Lead

There is a considerable demand for lead in China, which is largely met by imports, 10,707 metric tons of pig lead having been imported in 1908. The domestic production is not inconsiderable, lead ores occurring in 8 of the 18 provinces; Kweichou, Ssu-chuan, and Yunnan are the most important, but about 1500 tons of ore was derived from Hengchou and Yangchou prefectures in Hunan province in 1908. The larger part of this is exported to Great Britain and Belgium, but considerable quantities are smelted at the works of Carlowitz & Co. at Wu-chang. Three hundred and fifty tons of pig lead was brought down the Yang-tze through I-chang in 1907, and 300 tons in 1909. A good deal of lead ore comes down the Yuen and Hsiang rivers, both from Hunan and Kweichou. Duclos has described the production of lead at 'Tcha-tze-tchang' (102° 50′ E., 26° 45′ N.) in Kweichou, and notes its occurrence at (102° 40′ E., 26° 30′ N.). In Yunnan the mines contain mixed ores of lead, zinc, copper, and silver. In the neighborhood of 101° 0′ E., 26° 30′ N., at 'Kong-Chan-tchang', 1,450,000 lb. of lead is produced; at 'Pe-cha-po', 700,000 lb. of lead; at 'Koung-chau' the lead produced is cupelled for silver. Near 102° 20′ E., 26° 45′ N. there is a considerable production, both of lead and zinc. In many places argentiferous lead ores are worked (see 'Silver'), the bullion being cupelled; the resulting litharge often being thrown away. LeClere estimated the annual production in southwestern China at around 3000 tons. The lead ores of Kwantung and Kwangsi are mentioned under 'Silver.' On the maps prepared by La Mission Lyonnaise the following points in Kwangtung are marked as productive of lead: (109° 50′ E., 21° 58′ N.), (110° 15′ E., 23° 57′ N.), (114° 05′ E., 23° 58′ N.). The native methods of metallurgy are so imperfect that it is not improbable that in many cases deposits exist which could be worked by modern methods. But, as mentioned under 'Silver,' it has not infrequently been found that the veins are too narrow and irregular to yield a profit when exploited on a large scale.

Zinc

The whole domestic supply of zinc in China is derived from the southwestern provinces, chiefly Kweichou. Duclos has described the native metallurgical methods followed at 'Ma-lou-kio' (102° 50′ E., 26° 45′ N.), and mentions the occurrence of zinc in Yunnan at (102° 20′ E., 26° 45′ N.) and (101° 40′ E., 25° 30′ N.). LeClere says that the workings are only superficial and that the distillation methods are so imperfect that much ore which could be utilized by modern methods has been discarded. He estimated the annual production at about 2500 tons. The spelter from Kweichou, which I have seen, was obviously impure, but it is used in the provincial mints in making brass coins without any attempt at refining.

Antimony

China possesses the distinction of being first in the production of this metal. The condition of the industry has been changing rapidly of recent years. My notes were made on a visit to the chief centre of production in 1908. The ore comes from a number of places to the northwest of T'ung T'ing lake in Hunan, I-yang being the chief centre (110° E., 29° N., approximately). It is carefully hand sorted at the mines and is brought in native boats to Changsha (112° 45′ E., 28° 15′ N.), where it is liquated in pots of about 15-in. diameter. The methods were entirely Chinese at that time, but I understand that furnaces of modern construction have since been installed by the Hua Chang Antimony Co. of Changsha. The regulus is sent to Hankow, and so much as desired is converted into metal. The residues have been exported to France, Germany, and the Netherlands for further treatment; more recently large quantities have been sent to the United States. Carlowitz & Co., who operate a smelter at Hankow, are also engaged in the work of smelting and refining both antimony and lead, but as strict secrecy is observed, details are not obtainable. The production for 1907 from this district in Hunan, according to customs returns, was 3957 tons of regulus and 14,810 tons of ore. In 1908 the production of regulus increased to more than 8000 tons, and the ore shipments decreased to less than 2000 tons. The native company which operates the smelter has trained metallurgists in its employ, and the industry is likely to further increase in importance.

Antimony also occurs in Kiangsi, Kweichou, and Ssuchuan, but Kwangtung is the next most important province after Hunan. Recently a smelter under Government auspices was established at Wuchou (111° 30′ E., 23° 30′ N.), but was not a success and has since been closed. A more extended discussion can be found in the *Mineral Industry* for 1908 and 1909, and in the volume 'Antimony' by C. Y. Wang (London, 1909).

Quicksilver

Quicksilver has a steady demand in China, most of the metal being used in the production of vermilion, which enjoys high favor as a pigment, a less important use being in gilding by the Chinese method. The native production fluctuates greatly, the amount reported by the customs authorities being 30 tons in 1907, and 65 tons in 1908. It is impossible to determine what relation exists between the total amount produced and that reported by the customs. Most of the demand is supplied by imports, largely from California. The occurrence of quicksilver is reported from many parts of the Empire, but the deposits in the province of Kweichou are, apparently, the only ones of commercial importance. As I have not visited these districts, my information is entirely derived from published statements. Duclos has noted several places in Kweichou where quicksilver is produced; 'Oa-tchouan' (105° 50′ E., 28° 30′ N.), Pei-ma-t'ong (104° 15′ E., 26° 48′ N.), Lan-mou-chang (103° 15′ E., 25° 28′ N.), and Yang-li (104° 20′ E., 25° 0′ N.) are the most important. He estimated the production at Pei-ma-t'ong as 6500 lb. per year, and says that at Yang-li there is "*une enorme exploitation*". He also mentions the occurrence of quicksilver in Yunnan (101° 10′ E., 23° 30′ N.). LeClere was not favorably impressed by the mercury deposits, and remarks, accurately enough, that the native methods of work can treat ore of quite as low grade as would be profitable by foreign methods. Brelich says that the deposits at Wen Shan Chiang in Toon Yen prefecture are the largest and most extensively worked in Kweichou. They occur in nearly horizontal beds of magnesian limestone: (1) impregnating well defined beds, (2) along joints and planes of stratification, (3) in isolated bunches and vugs, (4) irregularly disseminated. The ore is hand sorted and retorted in native furnaces. According to Brelich, the miners work for daily wage, which is unusual. The Anglo-French Quicksilver & Mining Co. began work at Kwei-yang in 1899, with a capital of £310,000, operating the Wen Shan Chiang mines, which are 12 miles north of the Yuen river. These are apparently the mines which Brelich describes. The area of the concession was 4 square miles. Two 12-ton Granitza furnaces were constructed, and the production from 1899 to the end of 1902 was 32,500 lb. of quicksilver and 500 lb. of cinnabar. The company has had a somewhat checkered career, and the concession has apparently never been a profitable one.

Arsenic

Arsenic is of no little importance in China, but detailed and accurate information regarding its occurrence and production is not obtainable. According to the customs returns 5000 tons was produced in 1908, but only 400 tons in 1909. Apparently the ore occurs in or near the principal antimony district (110° E., 29° N.), since the product passes through the same custom house. About 700 tons of arsenic ore from China was imported into Germany in 1908. A recent French report estimates the annual production of orpiment and realgar in Yunnan at 600 tons. This probably obtained from the mines near Chao-chou and Mêng-hua, in Ta-li prefecture, Yunnan. The customs house at Tengyueh reports that 491 tons passed through in 1909, mostly destined for Burma.

Petroleum

The best known petroleum-producing district is in Ssuchuan, where, according to Coldre, in the neighborhood of Yun-hsien (102° 10′ E., 29° 38′ N.) and Fu-chuan (102° 43′ E., 29° 27′ N.) there are 30 to 40 wells, from 1000 to 3500 ft. deep, in which petroleum occurs associated with gas and brine. The gas is employed in evaporating the brine, and the petroleum, which varies from '*blanc de petit lait*' to '*noir*' is burned in crude lamps without any attempt at refining. Duclos describes the wells at 'Tze-liou-tsin,' which is between Yun-hsien and Fu-chuan, nearer the latter, giving the number as about 150, but probably this refers to the total number rather than those which actually produce petroleum. But neither gives any estimate of the amount of actual production. Richard refers to the occurrence of petroleum in Kansu, but does not give the locality.

A field that is of present importance occurs near Yen-chang (110° 0′ E., 36° 30′ N.) in Shensi. A native company has been at work there for some years, has recently constructed a refinery, and is now selling oil throughout Shensi in active competition with the foreign product. I have been unable to obtain reliable detailed information regarding this field, but it is probably of a great deal of importance, since it is rumored that the company is considering the construction of a light railway from the wells to Singan-fu, 200 miles distant. Apparently petroleum occurs only in the western and southwestern parts of the Empire, but in these places a considerable native industry is likely to develop when the areas are provided with adequate transportation facilities.

The aneroid and the compass, for use in connection with railroad reconnaissance, are regarded by some railroad engineers as little better than toys. It is seldom that the railroad engineer has any opportunity to compare aneroid readings with those of a mercurial barometer at a base station. And with instruments delicate enough to give sufficiently close readings, assistants to read them, and methods of obtaining distances and directions sufficiently accurate to determine, even approximately, the possible rate of grade on a long supported line the expense incurred and the time consumed would be very little, if any, less than would be required to run a rough stadia line which would give much more and better information of the kind wanted by the railroad engineer.

The Problem of Transportation in Alaska

By Duncan M. Stewart

*Every Alaskan harbor south and east of Cook inlet is ice-free and open to navigation all the year round. Though the ports of Quebec, Montreal, St. John, Albany, and Buffalo are absolutely closed to navigation during the winter, all of the more important ports of Alaska, excepting Nome, Fairbanks, and St. Michaels are open to winter transportation. Ketchikan, Juneau, Skagway, Cordova, Valdez, and Seward enjoy at least a weekly mail service from the United States, and the last three are situated on harbors that are unexcelled by any on the Atlantic or Pacific coasts. These three places, Cordova, Valdez, and Seward, are the winter ports for Alaska proper. Skagway is an important port, but is mainly used in winter for going to Dawson, which is in Canada, and not in Alaska, as many Americans seem to think.

These three seaports are the logical and natural termini for railroads to the interior—for what we may call trunk lines—but only at Cordova has the steel been laid for any distance. There the Copper River & Northwestern railroad has trains in operation for something over two hundred miles, and has been hauling ore that distance from the Bonanza mines since last April. This is a standard-gauge road of heavy construction, with steel bridges and well ballasted track. This road has opened to the prospector an area otherwise closed to them, and hundreds of people are now living along its route, and towns springing up that were not on the map before this enterprise became effective. This is what is known as the Morgan-Guggenheim road, so popularly believed in the East to be 'bottling,' rather than opening up the country. Yet this road has made it possible for men to penetrate far into the mountains and valleys in search of precious metals that would have been inaccessible without it. Before the advent of this railroad it would take a man many months to get a camp equipment and an outfit of supplies as far into that part of the country as he can now go in twenty-four hours.

At Valdez there is not enough track laid to dwell on the features of railroad transportation there, but that is the starting point of the Government trail to Fairbanks. All roads and trails built by the Government in Alaska are in charge of a Road Commission, under the War Department, and are properly described as military roads. This road, from Valdez to Fairbanks, is one of the best and has been of tremendous importance to Valdez and the country generally in opening up the mining territory tributary to Fairbanks and the Tanana river, and in developing a great gold producing district.

At Seward a standard-gauge railway has been completed for 72 miles and surveyed for 700 miles, including branch lines, through the very centre of Alaska. This road, which is known as the Alaska Northern railway, gives a very efficient electric car service, daily except Sundays for passenger and express freight, with an occasional steam locomotive freight train, as traffic demands. This company does not operate in winter, as it is undergoing a financial reorganization, which, by the way, was brought about by the action of a Federal judge who granted a receivership on the petition of one man, without according a hearing, or even giving notice, to any official of the railway. He appointed his own brother-in-law receiver at a salary of $1500 per month and expenses and then immediately adjourned his court six months, thereby effectively preventing the owners from removing the receiver and re-obtaining the management of their own property. This corrupt judge was removed from office later in punishment for this crime, and that is about the extent of the aid the present administration at Washington has given to this particular enterprise. The passenger traffic of this road is heavy in summer and its right of way affords excellent traveling for dog teams in winter, being used as part of the Seward-Iditarod trail for about eighty miles.

Although primarily intended to tap the resources of the Kenai peninsula, Kuskokwim, Susitna, and Tanana river valleys, the *raison d'etre* of this line now is the coal of the Matanuska valley, which Government authorities claim to be the most valuable of all known coalfields in Alaska. In this section recently Gifford Pinchot traversed part of the survey route of this railway, and had to do so on foot, by the way, which I trust emphasized in his case the desirability of improved transportation facilities. The route to these coalfields is at present only a horse trail. The Government did nothing toward it and it cannot even be dignified by the title of military road. It is an expensive business getting in supplies; in short, there are no transportation facilities. But build a railway into that country, open up the coal mines and operate them, and the people would flock there; a local market for food products of the rich soil would be at once created, and the land would yield plentiful crops to the agriculturalist.

Transportation is the most important problem confronting Alaska today. Others have given accurate, as well as graphic, information about its coal, but let me assure you that there can be no real cure for Alaskan troubles that does not include transportation. All questions affecting the physical development of Alaska are indissolubly connected with the one great question of transportation.

The opening of the coal lands is absolutely essential to the building of railways through central Alaska by private capital. Officials of the Alaskan Northern railroad informed me that they are unable to operate trains hauled by steam locomotives so long as they have to pay $14 or $15 per ton for imported coal, as they do at present, and I understand that competent officials of the Pennsylvania railroad say they could not operate that great system profitably at a coal fuel cost of $12 per ton. At Seward, the terminus of the railroad, private individuals pay $17 per ton for coal, whereas if the Matanuska coal were available the article could be bought for $5 to $7 per ton, and a much better grade of coal at that. While the coalfields of Alaska are withdrawn from entry it becomes a crime (larceny) to use local coal. The anomaly thus created is best illustrated by the plight in which the Tanana Valley railway finds itself. There is an abundance of good steam coal along the right of way of this road, and a scarcity of timber, but it is forced to leave the coal and burn wood at a cost of about $12 per cord.

There are eight lines of railroad in Alaska, with about 500 miles of track. Five of these are purely local, catering to the traffic of the mines in their respective territory. The other three, namely, the Copper River & Northwestern, White Pass & Yukon, and the Alaska Northern are the most important to the country generally, and of these the White Pass & Yukon railroad is the only one affording transportation facilities into the interior of Alaska, by way of the Yukon river, partly through Canadian territory with only 112 miles of track all told. This route to the interior can only be used advantageously in summer, as the Yukon river is frozen in winter. This road, which was a financial success from its inception, was built with English capital and has been of great value in developing American territory on the Alaska side of the border.

What these two railway enterprises have accomplished in the way of developing the latent wealth of certain sections, and much more besides, can be achieved by the building of a trunk line along the projected route of the Alaska Northern railway, and the people of Alaska do not care who builds it; they will extend a hearty welcome to the owners of such a project whoever they may be. There is not a coast town in Alaska today that is not envious of Cordova, because it has a real live road, making its way into the heart of the territory contiguous to that terminus. The people of Alaska differ among themselves on political and economic questions, and they are far from unanimous as to the best method of exploiting its resources, but they are a solid unit on the subject of transportation. They are quite indifferent as to whether private capital or the United States Government builds trunk lines, and good wagon roads, so long as they are built, and that soon.

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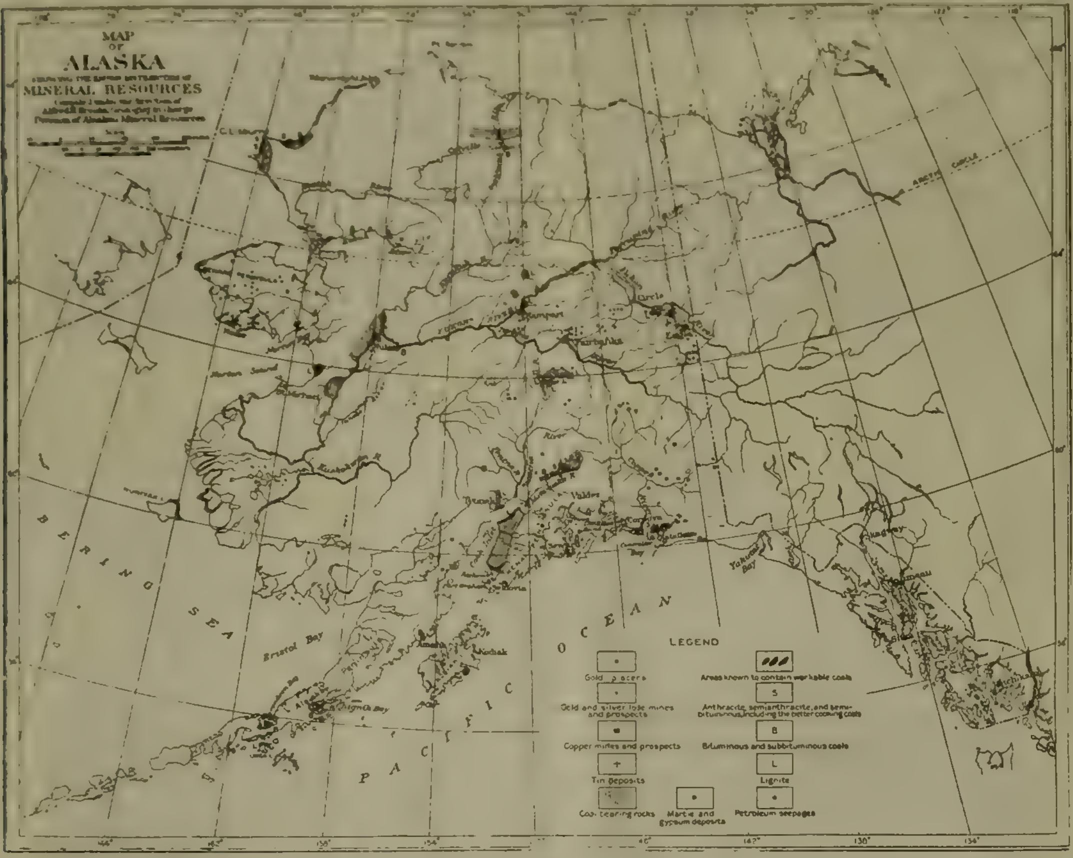
*Abstract of a paper presented at the American Mining Congress, 1911.

But the building of trunk lines, or any other lines, of railroad is not the only essential; there is even a more crying need for good wagon roads. The appropriation for roads and trails in Alaska is woefully inadequate, and the methods of expending it are distinctly bad. I could point to instances where new trails stopped short in the middle of the woods, having reached nowhere because the appropriation for that particular piece of work became suddenly exhausted. I have seen the necessary repairs to an existing Government road discontinued at a critical spot for the same reason, although a surplus remained after the completion of other specific work, but it could not be utilized, under the regulations governing these funds. The adoption of such methods in the building of roads by private capital would end inevitably in bankruptcy and failure. And let me say here that the excellent gentlemen who are charged with the administration of the Alaska Road Commission are not to blame for the unfortunate conditions to which I have alluded. The people of Alaska owe a great deal to the Road Commission for the zeal and efficiency it has displayed and the work it has accomplished in the face of red tape and ridiculously inadequate appropriations. These gentlemen do the best they can, but the results, nevertheless, are inadequate. Some of the Government roads in Alaska are a disgrace to the Nation. Even the Government employees themselves are ashamed of them, and with a view to bringing home to Congress and the people of the United States the wretched results of their efforts, as compared with those achieved under a policy of enlightenment and common sense, they have inserted in some of the official publications issued at Washington illustrations taken from actual photographs of American and Canadian roads in Alaska and the adjoining Yukon Territory. On one page you will see a beautifully smooth, well drained level road, fit for automobiles, while on the opposite page you will see a strip of mud, roots, and rocks, unfit for the use of man or beast, and positively ruinous, both to a man's soul and body.


MAP
OF
ALASKA
MINERAL RESOURCES
BERING SEA
PACIFIC OCEAN
Bristol Bay
Yakutat Bay
LEGEND
Gold placers
Gold and silver lode mines and prospects
Copper mines and prospects
Tin deposits
Coal-bearing rocks
Marble and gypsum deposits
Areas known to contain workable coals
S
Anthracite, semianthracite, and semi-bituminous, including the better coking coals
B
Bituminous and subbituminous coals
L
Lignite
Petroleum seepages
130°
142°

MINERAL RESOURCES OF ALASKA. (Brooks, 1909.)

In the administration of justice and the building of public roads and trails in the far Northwest, the Canadians have us completely beaten. We have just the same kind of a country they have, yet they have more people and infinitely better transportation facilities on their side of the imaginary border line. Why should this be? I have given you the facts and leave the answer to you. I venture one reply to this question, and it is, that the average member of the Canadian Parliament is in much closer touch with the actual conditions prevailing in his country as a whole—even to its remotest corners—than is the average member of the United States Congress regarding his great country. Indeed, ignorance would seem to be at the bottom of most of Alaska's troubles; ignorance of its immense area; ignorance of its climate and of its ample resources; and, what is worst of all, ignorance of its people. The most widespread misconceptions are probably those regarding its climate and people. The generally accepted notion is that Alaska is a land of perpetual ice and snow, inhabited mainly by Eskimo, while the facts are that not more than one-third of it is within the Arctic Circle, and that the majority of its present population is white—being a mixture of the best elements of the Caucasian race—the same class of red-corpuscled people who placed Oregon, California, and Washington among the great producing States of this Nation. Every trunk line of railroad in Alaska can be operated daily in winter. The White Pass & Yukon railroad runs trains every day in the year except on Sunday; the Copper River & Northwestern railroad runs trains often enough to accommodate the traffic, and maintains its line open the entire winter. The Alaska

Northern can operate on as regular a schedule in winter as in summer, while the Tanana River railroad, which is in 65° north latitude conducts train service all the year round. After dispelling the ignorance and disseminating the truth, after getting these well-meaning people to understand the actual conditions in some measure as those who live in Alaska know them, I believe the adoption of relief measures which will lead to the development of Alaska on a scale commensurate with its size and the importance of its potential resources can be hopefully expected.

The solution of the transportation problem will cause most of our troubles to vanish, but it cannot be solved by [illegible] and abuse, especially of the powers that be. I believe that the President and Secretary of the Interior are alive to the real situation and needs of Alaska, and that they are sincere in their desire to bring order and good out of existing errors, but they and their successors in office are powerless without the support of Congress, and I think that is the real body to address. If the sympathetic ear of a majority in Congress can be obtained, the Government may be authorized to render some assistance to private capital, either by way of guarantee of bond interest, or a land grant, or a coal grant, and thereby insure the building of a great trunk line of railway with which to unlock this treasure box, to the enrichment of the whole Nation. Or, Congress may decide to have the Government build and operate such a line, and thereby retain the key in its own hands. That it will be a paying investment for the owners, whoever they may be, is not doubted for a moment by anyone familiar with pioneer railroading in the Northwest, and particularly so in this country, under an enlightened policy of trail and wagon-road building, which would create feeders and great arteries of traffic for the main line.

In a new country capital, for obvious reasons, expects greater rewards than in older and more settled communities, and with the inducements which are being constantly offered in such countries as Mexico, Brazil, Argentina, Russia, China, and Africa, it behooves us to see that no unnecessary handicaps are placed upon capital seeking investment in Alaska, and above all when such capital is seeking investment in the all-important line of transportation. I believe the enormously enhanced value of properties caused by the building of such a line in connection with a proper system of wagon-roads, and trails, would amply repay the Government for any assistance it might render to private capital in the promotion of such a laudable enterprise. On the other hand, while I am not an advocate of Government ownership on general principles, I have no hesitation in saying that if the people of the United States were to build such a trunk line system for themselves, and operate it on business lines, the return on the investment would be comparable only to that made in Egypt for the people of Great Britain by that far-sighted statesman, Benjamin Disraeli, when he purchased for the nation the shares of the Suez canal which subsequently proved assets of enormous value.

Long before any locomotive was constructed in Europe John Stevens had clearly worked out, in his own mind, the theory of such an application of steam, and the actual form in which it could be advantageously made, as well as the best mode of constructing and working a railway for the use of locomotives. Long before there was any experience to justify his anticipations, he said and published, "that there was no limit to the speed of a locomotive on a rail, but the strength of the materials, indeed it might easily be made to run as fast as a pigeon could fly;" and it is one of the striking incidents connected with the early days of the Camden & Amboy railroad, now part of the Pennsylvania system in New Jersey, that a flock of pigeons, which had settled on the track, being disturbed by the rapid approach of the engine, took wing in the direction the train was moving, and one of them, attempting to cross in front of it, was struck down, thus most literally verifying the prediction made.

The 'Cement Gun' at Panama

An endeavor has been made to use the 'cement gun' process to retard the erosion of the surface of the soft rock uncovered by the excavation along Culebra cut in the Panama Canal, which has been a source of the gravest anxiety to the constructors of this great waterway. This rock is a fine-grained clay transported and deposited by water, comparatively hard when first exposed by the steam-shovels, which crumbles into dirt with alarming rapidity when it comes in contact with the atmosphere.

A great many suggestions have been made as to the best method of dealing with the problem. These range from the construction of the most elaborate retaining walls to the planting of grass seed. However, the Commission decided to make a series of practical tests. One of these consists of a concrete revetment anchored to the rock by means of rods driven into holes previously drilled into the mass. Another section of the same concrete revetment was reinforced with old French rails, of which there are miles on the Isthmus, this fact probably being the primary cause which suggested their utilization for this purpose. This work must of necessity be very tedious and expensive, as a great deal of hand work must be done to remove the weathered surfaces, as well as grading to accommodate the rails and heavy forms for the gravel concrete. The cost of this experiment convinced the authorities that this method would be prohibitive, considering that the Culebra cut is nine miles long and that this soft rock occurs throughout nearly all of its length on both sides of the Canal.

Following the contours of the rock with the 'cement gun' each nozzle man can cover a great deal of surface. The ratio on this class of work was 1200 sq. yd. of surface coated with five men by the 'gun' process in the same time that it took to cover 183 sq. yd. with the forms with fifteen men and a foreman. The 'gun' process used about 1.25 cu. ft. of material per square yard of surface coated as against 10.50 cu. ft. per square yard by the form process. No reinforcing was used with the 'cement gun' process.

Preliminary sluicing is required to remove the soft rock and earth and give a good surface for the concrete to bed on. This is done by the cement gun equipment by simply shutting off the dry sand and cement and using the water stream under pressure.

The sun in this region is, of course, very hot, and to prevent too rapid 'solar dehydration,' as it might be called, the finished work is sprayed every few hours, in the same way that the preliminary sluicing is done. This together with the frequent rains, should lessen the danger from crazing and cracking. The process is analogous to the way in which a housewife seals preserves with paraffine. At present it is not possible to speak positively in regard to the outcome of this application. Future developments will be watched with interest.

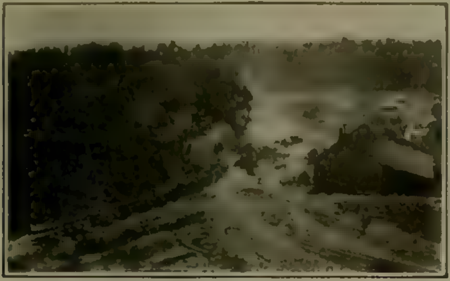
German contractors, according to *Tonindustrie Zeitung*, use a type of cement gun in placing the plastering on large areas of wall space, like those of factories and apartment houses. The cement gun works in combination with a mortar-mixing machine, which mixes the mortar or plaster, as the case may be, in the proper proportions, and drives it, by means of compressed air, into a line of hose from which it is forced against the sides of the wall in a steady stream. The entire portable plant is on a truck, and consists of a mortar-mixing machine, a mortar pump, the compressed-air plant, and the driving motor. The pump takes the mortar furnished by the mixer and forces it into the lines of hose. At the other end of this hose is the nozzle, through which the compressed air from the compressor forces out the mortar at a pressure of 1½ atmospheres. A workman, standing about 5 ft. away from the wall, directs the nozzle and can cover about 1000 sq. ft. in one hour. The pump handles about 70 to 105 cu. ft. mortar per hour, which is sufficient to place a ⅝-in. thick coat of plaster on 1200 to 1700 sq. ft. of wall surface.—*The Cement Age*.

Modern American Phosphate Plants

By JAMES A. BARR

Phosphoric acid is one of the most important fertilizing ingredients of the soil. Since corn removes 11½ lb. of phosphorus per acre for an average crop, wheat and oats 8 lb., and alfalfa 18 lb., it can easily be seen that there is a limit to the producing ability of most soils. As this deficiency of the soil in phosphorus is most conveniently supplied by phosphate rock in some of its numerous forms there will be a growing demand and a good future for the phosphate industry.

There are two distinct types of phosphate rocks in Tennessee; the brown and the blue. This article will first deal with the methods of treating brown rock. This variety of phosphate occurs in platy strata, interbedded with clay and occasionally with limestone and flint pebbles. The clay must be washed out, as the iron and alumina it contains are objectionable in the manufacture of acid phosphate. Flint and limestone lower the grade of the raw material and must also be removed. As a result of several years of experimenting at the Arrow mines the Charleston S. C. Mining & Mfg. Co. has just erected a new phosphate plant at Wales, Tennessee, for washing, drying, screening, and stocking brown rock.


OUTCROP MINING WITH STEAM-SHOVEL, MAYFIELD MINES.

ARROW MINES. WASHING AND DRYING.

The mining is done in open pits by steam-shovels loading into 3-yd. side-dump cars. The heavy stripping will be done by a drag-line excavator, but at present the overburden is light and is being economically removed by wheeled scrapers. The mines are connected with the washer by 3000 ft. of 36-in. gauge track. Two 7 by 12 locomotives are used to haul the rock and serve the steam-shovel. At the washer the rock is dumped from the cars into a spring-roll spike-tooth crusher and reduced to 1½ in. The springs are set so that the flint and limestone will pass through without being crushed. This is to facilitate the hand picking.

From the crusher the material is elevated by an 18-in. rubber-belt bucket-elevator to a height of 50 ft., where it is dumped into the first set of log-washers. These are of the double type and constructed of steel. Here most of the clay and mud is removed and run off at the tail gate. The first set of log-washers discharges into a second set, where the washing is continued with the addition of fresh water. The second set discharges into a rinsing screen, which has a 3-in. spray pipe extending through the centre. The opening in the screen jacket is about ¼ inch.

The oversize from the rinsing screen passes to a slow moving belt where the limestone, flint, and mud balls are picked out. The undersize from the screen, together with the overflow from the tail gates of the washers goes, by means of a series of distributing launders, to 6 riffle troughs, or sand washers. These sand washers are designed to thoroughly elutriate the clay and collect the sand from the large volume of water coming in with the feed. The tail water from the riffle troughs, containing clay and a small percentage of sand of finer size, flows into a primary mud pond where the sand is settled out, the clayey water flowing off through an adjustable gate to a second pond, where the water is clarified before running to the creek or being used over again.

The sand and water from the head end of the riffle troughs flows into a dewatering box, which discharges the thickened pulp on a sloping drainage platform. Here the sand collects in a pile which gradually spreads out from the launder and the remaining muddy water is given an opportunity to flow off through a screen across the foot of the drainage platform. The overflow from the dewatering box goes into a sand bin, of which there are three, 15 by 20 ft., and the sand allowed to settle out. The overflow from the sand bins goes to the primary mud pond.

MAYFIELD PLANT.

MAYFIELD MINES. YARD AND OUTCROP.

The sand from the drainage platform and the contents of the sand bins, together with the rock discharged from the picking belt, is conveyed to drainage piles in the wet-storage space by a clam-shell electric mono-rail trolley. After standing for several days the drained material is removed to hoppers by the same electric trolley. From the hoppers the phosphate is fed automatically to two driers 5 ft. in diameter and 50 ft. long. The driers are driven by direct-connected motors through a system of reduction gears.

The hot rock coming from the driers is elevated to a steel storage tank by a single-strand continuous-bucket chain elevator of 82-ft. centres. From the storage tank the rock is distributed into piles, according to size, in the dry-storage shed by an electric-driven side-dump car. A screen is placed over the storage tank so that it can receive the discharge of the elevator and separate the phosphate into two sizes. The screen jacket is punched with ⅛-in. holes.

The rock from the storage piles is loaded for shipment by an electric clam-shell trolley, either by dumping directly into loading chutes which discharge into a box-car which is placed on a 100-ton track-scale, or upon a cross conveyor which loads cars on a second side track. The rock from the elevator may either be run directly to the cross-conveyor or carried to the loading-chutes by the electric distributing car.

Steam is furnished by two 200-hp. return tubular boilers, operating under 125-lb. pressure. Power is supplied by a 22 by 18 automatic high-speed engine, belted through a counter shaft to a 150-kw. 250-volt D. C. heavy-type generator. The washer is also driven from the main counter shaft. A 1000-gal. capacity duplex-compound pump supplies water under 60-lb. pressure to the washer. A separate 750-gal. duplex pump is connected to the fire lines and can also be used for washing purposes. The water mains are connected to a 20,000-gal. steel tank on a 90-ft. tower, for fire purposes.

The plant at Mayfield is used solely for handling Tennessee blue rock. This variety of phosphate is a tough, granular, bluish rock, resembling limestone. It is not amenable to washing for the purpose of removing the impurities, hence the operations are confined to mining, crushing, drying, screening, and stocking. The phosphate-bearing material occurs in comparatively flat strata, overlying blue phosphatic limestone, and overlain by a shale. The mining is done by the room and pillar system. Much of the rock near the outcrop was mined by blasting the shale and stripping with steam-shovels. Underground the rock is overcut by air-drills and blasted to this face. A low-grade stratum which lies between the phosphate strata and the shale makes this method of mining possible.

The rock cars are taken to the mouth of the adits by mules and are made into trains and pulled to the crusher yard track by small locomotives. On this track the cars run by gravity to an incline, where they are hauled up to the crusher dump by an endless chain. Before being dumped the cars are weighed. The rock is crushed to $1\frac{1}{2}$ in. by a gyratory crusher and fed directly into a 5 by 50-ft. rotary drier. The hot rock coming from the drier is fed to a pair of rolls by a pan conveyor and crushed to $\frac{1}{2}$ or $\frac{3}{4}$-in. size, according to the amount of fine material desired. The discharge from the rolls is elevated by a bucket-elevator to a screen, where it is separated into three sizes.

A cable-operated end-dump car takes the rock from the storage bins under the screen and dumps it into different piles in the storage shed, according to size or grade. All of the rock is loaded by hand into box cars for shipment. In order to supply the demand for ground phosphate a dry-grinding mill is operated, which receives any desired size rock issuing from the screen above the driers. The rock is ground so that 90% will pass through an 80-mesh screen. The mill grinds about 6 tons per hour, with an expenditure of 100 horse-power.

Steam is furnished by a battery of six return-tubular boilers, operating under 100-lb. pressure. The crushing and drying machinery at the receiving end of the plant is operated by a rope-drive from the main counter-shaft, which is belted to a 250-hp. Corliss engine. The remaining machinery is belted direct or through counters from the main shaft. A 2000-cu. ft. double-stage cross-compound compressor supplies the air for the mining operations. There are two smaller air-compressors held in reserve. The electric light system is supplied by a 15-kw. 250-volt D. C. belted generator.

ENGINEERS and contractors of sufficient experience can, by riding over a railroad route, make a fairly close estimate of the probable cost of the grading and bridging. As the result of long experience on many lines in different kinds of country, they can estimate in round figures how much per mile certain lines or sections of lines will cost for the grading and bridging; and, as this represents usually only about 50% or less of the total cost of the complete line with equipment, the other 50% being for items the cost of which can be determined quite accurately with little reference to topographical conditions, any variation in the total cost is usually well within the allowable limits for preliminary estimates. As a method of quickly obtaining an approximate estimate of the cost of a proposed line this has many advantages.

Engineering Features of Steam-Shovel Work at Bingham

By H. C. GOODRICH

*Some time in the eighties the Bingham & Camp Floyd constructed a narrow-gauge railroad so that ore from the district could be delivered to the smelters, then in the valley. The railroad was constructed on a 4% grade, extending into Bingham canyon as far up as the grade would allow. From this point a survey was projected, using a $7\frac{1}{2}$% grade, the average grade of Bingham canyon from the present Denver & Rio Grande depot to the buildings of the United States Mining Co. at the mouth of Bear gulch. A horse tram-line was constructed on this survey, accommodating the Starless, Utah Copper, United States, Commercial, and other mines. About 1890 the narrow-gauge railroad from the valley to Bingham was rebuilt as a broad-gauge line.

I first visited Bingham canyon in 1900. This was the first time I had ever seen freight transported as it was on the horse-tram. A string of twenty or more mules and horses would haul up the small empty ore cars to their several destinations. The drivers would tie strings of these horses together, tail to head, and turn them loose on the wagon-road in the bottom of the canyon. The drivers would then get on the loaded cars, running them down the grade by gravity to the loading station, where the railroad would pick up the ore for the smelter. The horses and mules would be on hand for another haul up the hill. I was sent to Bingham by the Rio Grande Western Railway Co. to reconstruct the horse-tram into a railroad. The instructions were to follow the horse-tram as far as possible, using as maxima $7\frac{1}{2}$% grades and 40° curves. This railroad was constructed from the Rio Grande Western depot to the Commercial mine in the spring of 1901. This was the first standard-gauge railroad that was built to the mines in Bingham canyon. It is necessary to use a special type of engine for these grades and curves, the one most commonly used being the Shay. In 1903 a branch line was built up Carr fork to the Yampa mine and later extended to the Boston Consolidated ore-bin. About this time the Utah Copper Co. began building a mill of 800 tons capacity at Copperton, and other mines were actively producing.

These details are in order to show that the style of railroad originally built for the handling of the Commercial mine ore was not able to handle the tonnage later turned out by the various mines. The United States, the Highland Boy, and the Yampa had to construct aerial tram lines down to the main railroad in order to get their product to market. The Utah Copper, Commercial, and other mines were not able to dispose of the ore they were mining on account of the limited capacity of this road. It is an expensive railroad to operate, and while probably better than a horse tram, one should hesitate before adopting it for handling freight in large quantities.

The Utah Copper Co. in trying to take care of its output, made surveys at different times for a railroad on lighter gradients and curvature from its mine to the mill at Copperton. These plans finally culminated in an entirely new site for its mill and a great deal larger capacity. This radical change in the location of the mill and its large tonnage necessitated a low-grade railroad with light curvature which must be built right into the orebody. The Boston Consolidated was trying out several plans for its property, finally building its mill in the Garfield district, which necessitated handling of this tonnage over the new line. The Denver & Rio Grande Railroad Co., formerly the Rio Grande Western Railway Co., started the location and construction of this railroad in the spring of 1905. I had the pleasure of having charge of the construction of this line from the Utah Copper mine in Bing-

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*A paper read before the Utah Society of Engineers.

ham canyon to the American Smelting & Refining Co. plant at Garfield. In order to handle the construction material at the mills, it was deemed advisable to start the work of building the railroad to the mills first, while the location at the Bingham end was in progress. This construction work was completed in November 1906. During this time several plans had been under consideration for the Bingham end and extensive surveys had been made. Finally a plan was adopted using 2½%, compensated grade and 16° maximum curves. This line was completed on January 2, 1907, when the first train was run over the new line to the Utah Copper mine.

In describing the operations at the Utah Copper mine, I will confine myself to the steam-shovel operations and railroad construction only. Prior to my connection with the company, it had been decided that this ore could be extracted more economically and a larger saving could be made by using steam-shovels. The orebody is one large deposit, covered with capping from 40 to 200 ft. thick. The problem is to remove the capping from the ore and deposit it on ground away from the orebody, and remove the ore to the railroad yards below. These operations extend vertically from elevation 6340 to elevation 7840, or 1500 ft. All of this territory was not embraced within the property of the Utah Copper Co., but plans were being formulated on a broad plane to handle the property economically. Owing to the steep, thicky populated canyon it was found, on account of the expensive railroad construction, that the economical height of the steam-shovel benches should be not to exceed 75 ft. This has proved to be correct, and wherever it has been found possible, the levels have been made a lesser height. The machine shops are placed at convenient points. It is necessary to place coal and other supplies at each steam-shovel level and bring the equipment to the machine shop at more or less frequent intervals.

BEGINNING OPEN-CUT WORK IN BINGHAM CANYON.

The surface of the orebody is irregular, so that in the removal of the capping there are times when thousands of tons of ore are loaded. These are some of the important factors that went toward deciding on railroad connections to the different steam-shovel levels. It certainly makes the most flexible arrangement to be had. Owing to experience with the steep-grade, heavy-curvature railroad, and our own experience during the first operations, it was decided to build these permanent tracks on 1%, compensated grades and 16° maximum curves, with as few of the heavier curves as possible. These are the tracks that are in course of construction now to the upper levels on the Carr Fork side of the property. I wish to make a comparison now of the handling of ore over the new lines with the old lines. The new way, the saddle-tank locomotive is used with a crew, all cheap labor. This locomotive handles 240 tons of ore at ten miles per hour over these grades. The old way was to use Shay engines, the crew all expensive labor, handling 150 tons at five miles per hour. You can draw your own conclusions. The steam-shovel benches are at a maximum of 75 ft. high. These levels extend from the main level A at elevation 6340, in alphabetical order to letter U. Each level is connected into this system of railroads so that coal and other supplies can be delivered to each steam-shovel level, and ore removed from these levels whenever met.

There are four ways of breaking the rock employed at the steam-shovels; the gopher method; keystone holes; toe-holes; and pot-holes. Where there is plenty of room a gopher-hole is driven into the face of the level for 40 or 50 ft., and a T driven, making two pots for the powder. Then a sufficient amount is put in to break the rock. This method breaks the largest amount of material. The keystones are used to strip the ore and also to break the rock where the room is limited. The toe-holes are driven along the base of the level, keeping it in good line and allowing the steam-shovels to work closer to the bench. The pot-holes are for breaking loose rock off the face of levels, and aiding in the stripping of the ore. In addition to this, gangs of men are constantly employed breaking down the loose rock that does not come freely. This work saves a lot of labor and expense, as sometimes a very small rock keys up thousands of tons of rock above it. Black powder (FF) and 60% Monobel is used on this work. The present equipment used in steam-shovel operations at the Utah Copper mine is as follows: 25 steam-shovels, 53 locomotives, and 408 cars, which are moving approximately three-quarters of a million yards of material per month.

The Bingham & Garfield railway, extending from the Bingham district to the mills and smelters at Garfield, was first planned during 1908. Construction work started in April 1910, and completed in April 1911. This railroad is a low-grade line, having 2½% compensated grades and 8° maximum curves, with the exception of the Dry Fork crossing, where two 10° curves are used. The Mallet type of locomotive is used for the freight service, and hauls forty empty ore-cars up the grade at twelve miles per hour. These cars are all 60-ton capacity, making 2400 tons of ore moved each trip. The characteristics of construction on this line were the three large steel viaducts crossing Carr fork, Markham, and Dry fork, and 4800 ft. of tunnels. There was an enormous amount of work done during the thirteen months required to complete this line. In that time 1,780,000 cu. yd. of material was handled; 12,000 cu. yd. of concrete was placed; 1400 lineal feet of drain tunnel was built; 4800 lineal feet of tunnel was driven; Carr fork bridge, 680 ft. long, 182 ft. high; Markham bridge, 640 ft. long, 225 ft. high; Dry fork bridge, 670 ft. long, 188 ft. high, were built. One mile of this road cost over half a million dollars.

Bingham canyon now has better railroad facilities than any other mining district I know of. This system of roads will accommodate any probable future development, has ample capacity to handle the tonnage, and can assure all the mines of steady handling of the product of the future.

Plymouth Consolidated Mine

By An Occasional Correspondent

A mining operation that will be watched with considerable interest is the reopening of the old Plymouth Consolidated mine in Amador county by an English company, as mentioned in the *Mining and Scientific Press* of October 21. This mine has been idle since October 1892, after a number of successful years, during which time it was one of the largest producers in the State.

The Plymouth Consolidated was a consolidation of the Empire, Amador, Pacific, and Plymouth companies formed in 1883. The mines were all well developed and had produced, according to reports at that time, in the neighborhood of $2,500,000. Since then the mine produced over $4,000,000, and the property therefore can be credited with a total production approximating $6,500,000.

The property was worked continuously until 1888, when a fire occurred in the mine, breaking out between the Pacific and South Empire shafts, in which considerable damage was done, and work was not resumed for some months. The fire was extinguished only after sealing up the mouths of all the shafts. A short description of the property may be of interest.

The vein was from 40 to 70 ft. wide and dipped to the east about 57°. The main ore-shoot consisted of a body of ribbon quartz 30 to 50 ft. wide and about 400 ft. long. The mine was opened by four shafts, three following the vein on the incline, and one, the Pacific, a 3-compartment vertical shaft 1700 ft. deep. The main shaft was equipped with self-dumping skips of 1½ tons capacity. The mine was comparatively dry, and buckets were used for baling, hoisting about 18,000 gal. daily.

The property was equipped with two 80-stamp mills, one having 750-lb. stamps, the other 1000-lb. stamps. Water was used for power, there being 23 wheels in all on the property, of which three were turbine wheels used at an approximate head of 80 ft., and the others Pelton, Knight, and Donnelly wheels at a head of about 550 ft. The mill had a capacity of about 300 tons per day, and in 1887, though hampered at times from shortness of water, crushed 97,000 tons.

The concentrate averaged from 1¼ to 1½%, and was currently supposed to average in excess of $100 per ton. It was treated at the company's chlorination works at a stated cost, inclusive of all charges and proportion of general expenses, of $13.40 per ton of concentrate.

The average yield from ore in 1886 was $6.18 per ton, and in 1887 $7.59 per ton, the cost of production being given as follows:

Mining	$2.34
Milling	0.39
Concentrate expense	0.17
General expense	0.17
Total	$3.07

After the fire the shaft was found intact, but a number of cave-ins had occurred throughout the mine. Considerable development and exploratory work was done in various places and 40 stamps kept running during a part of 1889 and 1890, but in 1891 only 10 stamps were run and then only a part of the year, starting in April and closing down in October. The following from the ninth annual report of the company may be of interest, showing that dividends of $2,280,000 were paid during the nine years following the consolidation:

Cash on hand at time of organization, Jan. 1883		$ 153,320
Production to January 1, 1891	$4,045,983	
Production for 1891	19,775	
Total production	$4,065,758	
Miscellaneous receipts	5,667	
		$4,071,425
Total cash received		$4,224,745
Operating expenses	$1,723,337	
Construction	217,682	
57 dividends paid	2,280,000	
		$4,221,019

It is understood that final arrangements for the sale have been completed and the property has now changed hands. The results of systematic development by the new company will be of much interest.

Copper Producers' Association Statement

The Copper Producers' Association October statement shows a decrease during the month in accumulation in this country of 5,897,214 lb. The details are as follows:

	Pounds.
Stock of marketable copper of all kinds on hand at all points in the United States October 1, 1911	140,894,856
Production of marketable copper in the United States from all domestic and foreign sources during October	118,255,442
Deliveries of marketable copper for consumption and export during October	124,152,656
Stock of marketable copper of all kinds on hand and at all points in the United States November 1	134,997,642

The changes in surplus since January 1, 1911, have been as follows, in pounds:

	Increase.	Decrease.
January	20,409,295	....
February	14,198,280	....
March	5,370,164	....
April	3,547,974	....
May	440,024	....
June	....	8,561,768
July	....	19,695,306
August	....	4,297,357
September	7,453,355	....
October	....	5,897,214

L. Vogelstein & Co. give the following figures of German consumption of foreign copper for the months January to September, 1911:

Imports of copper, 143,203 tons; exports of copper, 6610 tons; consumption, 136,593 tons, as compared with consumption during the same period in 1910 of 122,503 tons. Of the above quantity, 125,649 tons were imported from the United States.

Discussion

Readers of the Mining and Scientific Press are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Surface Indications of Ore-Shoots in Depth

The Editor:

Sir—In your issue of October 28 Mr. H. C. Cutler contributes another interesting chapter to the discussion of the relation of ore-shoots to gulches and depressions which may cross the strike of a vein. I regret, however, that Mr. Cutler, like several others who have been good enough to enter into this discussion, seems to have misunderstood my original statement, which I have several times repeated, to the effect that my observations refer to the condition at the surface and near it only, and not to those found in depth. I have not, in any of my own contributions to this subject, offered any explanation for the occurrence of the phenomena described, but have contented myself with a description of conditions as I have found them. In the issue of the *Mining and Scientific Press* of May 29, 1911, Mr. F. L. Ransome described in considerable detail the various causes of gulches and depressions, and I agree fully with his conclusions as to the various causes of such topographical inequalities of the surface, but I will once more endeavor to make my meaning clear, and to this end it seems essential that I do so graphically; therefore the accompanying sketches. Fig. 1 illustrates a longitudinal section in the plane of a vein, in which occurs an ore-shoot that outcrops on the hillside in the vicinity of a gulch. The ore-shoot, in its downward trend along the plane of the vein, *passes beneath the gulch*, but the outcrop of the ore does not—it stops upon reaching the gulch.

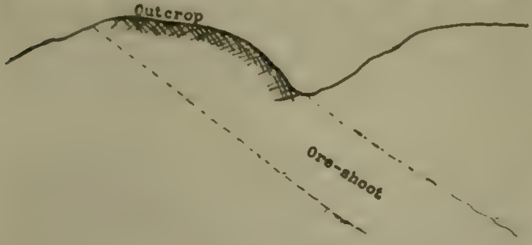


FIG. 1.

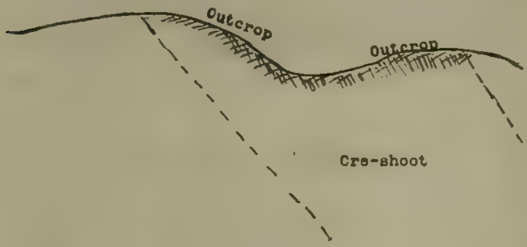


FIG. 2.

Fig. 2 is also illustrative of a longitudinal section of a vein in which an ore-shoot occurs at the surface and *does cross* the gulch. This is the condition that I maintain rarely occurs, particularly in schistose and slaty rocks. For the good of the cause, and also to please those who entertain opinions adverse to my own concerning this matter, I will say that since my last contribution on this subject I visited the Mariposa mine at the town of Mariposa, California, and there found that the vein at the surface—ore-shoots and all—crosses the gulches which intersect it, entirely regardless of my theory and with small respect for my opinion. However, the Mariposa vein occurs in an extremely hard, massive, diabase-porphyrite, and it seems that veins occurring in massive rocks of this description do not always conform to 'the rule,' although I know of numerous instances where the reverse is the case in massive granite, in rhyolite, in quartz porphyry, and in other massive rocks, these instances being no exception to the conditions which have been referred to by me as most commonly occurring.

I hope I have succeeded in making my position more clear. Even the illustration accompanying Mr. Cutler's contribution is in accordance with the views expressed in my original and subsequent contributions to this subject. The vein, on its downward trend, passes on beneath the gulch, but the outcrop of the ore-shoot appears on one side of the depression only. This is 'according to Hoyle.'

WILLIAM H. STORMS.

Berkeley, California, October 30.

Gasoline From Natural Gas

The Editor:

Sir—Your editorial of October 28, urging your readers to comment upon articles appearing from week to week is well taken, and has encouraged me to somewhat criticize your 'Concentrate' of October 21, wherein you state that although it is not impossible to make gasoline by compressing and cooling natural gas, it is not probable.

We have in the Buena Vista hills, Kern county, California, the greatest gas belt in the world, and from this gas, by means of a commercial process consisting of compression and cooling, a gasoline, or more truly a naphtha, has been produced—one thousand feet of gas yielding five quarts of this naphtha. A complete gasoline-making plant has been set up by the Honolulu Oil Co., which will, no doubt, manufacture gasoline from natural gas, if it does not first sell out to the Standard Oil Co. In the Fullerton region gasoline and naphtha are also being extracted from natural gas, and for a considerable time gasoline has been manufactured from natural gas in the Eastern fields.

This product of so-called gasoline is of very high gravity, and is so volatile that it is unsafe to transport and is ruinous to an engine using it. The Eastern States have legislated against its transportation by the railroads. It is, however, capable of being reduced to a normal gravity gasoline by topping it, and this, in fact, is done; the lighter products are eliminated and the residuum is merchantable gasoline.

WILLIAM R. JEWELL.

Bakersfield, California.

[Our 'Concentrate' was intended to prevent too hasty belief in too extensive claims for the new process. As Mr. Jewell states, the resulting product is not a true gasoline, but a naphtha from which a certain quantity of gasoline may be obtained. And a definite statement of the cost of production would be of great value.—EDITOR.]

NEARLY a third of a billion dollars was added to the wealth of the United States from the mineral production of the Western States during 1910, according to the figures of the U. S. Geological Survey. This includes about $66,000,000 worth of coal, the remaining production, principally metals, having a value of practically a quarter of a billion dollars. The total figures of Western mineral production as compiled by the Survey are $313,944,881. This is about one-fourth the total agricultural production of the same area, the proportion between mineral and agricultural production being about the same as for the entire United States. The agricultural production of the Western States, derived from figures of the Department of Agriculture, was approximately $1,394,791,000. The area considered includes the belt from the Dakotas south to Texas and the territory westward.

IN SOME PARTS of California it is necessary to store enough water to provide for the consumption for a period of from 5 to 7 successive dry years. The run-off generally exists from January to May, and the stream beds are dry for the remainder of the year.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

OLD VARNISH may be removed from a metal surface by dipping it in equal parts of ammonia and 95% alcohol.

CARBONADO is a black variety of diamond which is without cleavage. It is therefore useful in drilling, and commands a high price.

GUANO DEPOSITS, when occurring in caves, would presumably be subject to location as placers, following the ordinary procedure as to annual labor and patent.

TO TIGHTEN a screw-cap, put it over the end of a round stick and, with a nail or centre punch, make small dents in the thread about $\frac{1}{4}$ in. apart. This makes the thread deeper and will usually hold very well.

CUPRITE may be occasionally confused with hematite, as both are often the result of oxidation of sulphide minerals. They may be distinguished by the difference in the color of the streak and by simple blow-pipe tests.

NATIVE COPPER is not objectionable in copper smelting operations, and the presence of native copper in sulphide ores does not decrease their selling value. Copper smelters situated near large cities often buy scrap copper to add to the smelting charge.

TO GLUE ASBESTOS to iron, use silicate of soda. Brush the glue on the metal and then stick on the asbestos fibre, using the asbestos freely. This glue will withstand the heat and hold the asbestos firmly in place. It can usually be obtained from druggists and always from dealers in asbestos.

SATISFACTORY prints can be obtained from cracked negatives, if the film is not injured. Place in the frame carefully and cover with tissue paper or ground glass to diffuse the light as much as possible. Rotating the frame during the printing operation is also beneficial. By making prints in this way the cracks will hardly be perceptible.

NICCOLITE is a massive mineral of a copper-red color, sometimes with a white metallic crust. It has the composition NiAs (Ni 43.9%). On charcoal it gives off arsenic fumes, but the reaction for nickel in the borax bead is usually obscured by the presence of a small amount of cobalt. It is soluble in nitric acid, and the ordinary qualitative tests for nickel may be made on this solution.

BITUMINOUS COAL of which the content of volatile combustible matter is too high is not satisfactory for use in the boilers now in service in the Navy, because it produces too high temperature in the uptake and an excessive amount of soot, but such coal is used by steamships whose requirements are not so exacting as those of the Navy, by railroads, and for domestic and commercial purposes.

A SERVICEABLE chuck for holding drills and small work can be made from an old brace. With a hacksaw cut the chuck off the brace, leaving almost two inches of the rod on the chuck. The rod portion is then heated, straightened out, and turned up true. Then drill an old lathe centre to receive the rod portion and drive the chuck in. Drill a small hole for a spanner wrench, and the chuck is complete.

COPPER MINERALS are objectionable in cyanidation, because they consume cyanide, and the copper which goes into solution interferes with precipitation of the gold by means of zinc. The use of ammonium salts has been recommended to prevent this, but has not received wide application as yet. In some cases the cheapest method of treatment for ores containing copper is the use of cyanide, but some method of precipitation not involving the use of zinc should then be employed.

A DAMP-PROOF COATING for walls is made in the following manner. Dissolve 30 parts tin in 40 parts hydrochloric acid and add 30 parts sal ammoniac. Prepare a powder of 60 parts freestone, 20 parts zinc oxide, 15 parts powdered glass, 10 parts powdered marble, and 5 parts calcined magnesia. Make the powder into a paste with the liquid first prepared. Add coloring matter if desired. This composition may also be used for repairing stone work.

PIPES supplying air to rock-drills should be of a size to permit the passage of air at a velocity not greater than 25 to 30 ft. per second, while all bends and angles (especially short ones) should be avoided, as they add greatly to the friction of the air, and thus decrease the pressure. The friction of the air is proportional directly to the length of the pipe, and to the square of its velocity. For this service, pipes up to 5 in. diam. are provided with couplings; above that, with flanged joints made up with gaskets. Great care must be taken that these joints are perfectly tight, as the loss, even from a pin-hole, is considerable.

IN DEVELOPING the water of a particular stream the first necessity is to know how much water must be provided for—the volume that descends in the channel from day to day and from month to month. This necessity has its counterpart in the ordinary conduct of business. Every business man recognizes the necessity for taking account of stock. Every bank is required to keep an accurate record of its resources. There is no difference in principle between these operations and taking an inventory of water resources. To handle and develop them properly it is necessary to keep an account of stock.

A CLAIM larger than that allowed by the statutes is not void, except in case of fraud or a mistake of the grossest kind that presumes fraud. Where the purpose was to make the claim of the statutory size and the error occurred inadvertently, the claim is only invalid to the extent of the excess. In the case of a location notice calling for a stated number of feet in each direction from the discovery or location stake, the bounds of the valid claim can easily be determined by measuring off the required distance in both directions along the lode line, and undoubtedly the locator can be held to his description, though in the absence of protests and adverse claimants he can elect where the excess shall be deducted. Where the claim is not laid out from a specified point, the locator will have the right in all ordinary cases to say from which part of the claim the excess may be deducted.

ONLY public domain is open to mineral location, and there are parts even of it that are not open to location, though it is not necessarily true that only unoccupied unclaimed public land can be located as mining claims. It is the policy of the Government that the public land should be put to its most useful purpose, and in accordance with this policy, the Land Department will receive a protest, and, under proper conditions and satisfactory representations, will undertake to determine for what purpose the land is most valuable, and will render judgment accordingly, up to the time the land leaves its jurisdiction by the issuing of patent, or until by some specific act of congressional or presidential legislation, the land is removed from its jurisdiction. However, the Land Department will not undertake any determination of the rights of rival claimants under different classes of possession or entry, until patent is asked for the land in question, except in flagrant cases of its being occupied in bad faith to the detriment of good public policy and the exclusion of *bona fide* locators and entrymen.

Special Correspondence

LONDON

Encouraging Outlook at Mexico Mines of El Oro.—Increase Shown in Value of Year's Production.—Larger Ore Reserve.—European Interest in Imbert Process of Slime Treatment.

It will be remembered that about a year ago the affairs of the Mexico Mines of El Oro assumed an unpleasant complexion owing to the French shareholders and the Pearson interests becoming restive at the conservative policy of the controllers, the Exploration Company. This is all past history, and it is not necessary to revive memories of unfortunate personal disputes. Suffice it to say that the Exploration Company, being in the minority, had to resign control and management. Fergus Allan succeeded A. F. Main as manager and André P. Griffiths was appointed consulting engineer. The unfulfilment so far of the gloomy views expressed by R. T. Bayliss, the chairman, and by Mr. Main, as to the future of the mine, is noteworthy. In September of last year Mr. Bayliss uttered a solemn note of warning to shareholders advising them to expect a decrease in the value of the ore, and in December a circular announced that the reserves were not being increased to keep pace with the mill. It also was stated that the output would have to be reduced owing to the necessity for retimbering the South shaft, and the unpreparedness of the new North shaft for handling the required amount of ore. It must be a pleasant surprise, therefore, to find that these prophecies of disaster have not yet come true, and that both the performance of the mine and the views of Mr. Griffiths put a more cheerful complexion on affairs. For instance, the amount of ore crushed during the year ended June 30 last was practically the same as during the previous 12 months, the figure being 136,408 tons, and the yield was gold-silver bullion worth $1,528,229, as compared with $1,392,336 a year ago; and in spite of large expenditure on retimbering, it was possible to distribute £144,000 as dividend, being at the rate of 80% on the capital, as compared with £126,000 the year before. Similarly, the ore reserve, instead of falling, has increased, and stood at 318,720 tons on June 30, as compared with 283,735 tons a year ago, the average content being practically the same at 9½ dwt. gold and 6 oz. silver. The retimbering of the South shaft and the sinking of the North shaft have been carried on so rapidly that little or no inconvenience was caused in hoisting. Mr. Griffiths has just returned from the mine and has issued a lengthy and interesting report.

MEXICO MINES OF EL ORO.

A few weeks ago I sent you some information about the Trollhättan electric furnace in Sweden that is being used for treating zinc-lead sulphides, and I reported that an English company had been formed, called the Hydraulic Power & Smelting Co., to acquire the rights and expand the operations. Since writing, *The Mining Magazine* has published a critical survey of the finance and technology of the electric zinc industry, in connection with this particular furnace. Many of the firms who furnished money for the test were not sufficiently satisfied with the results, and the Sulphide Corporation is the only Australian company that is sending its slime to be treated at Trollhattan. In the meantime these firms have been making investigations into the Imbert process as adapted by F. A. J. Fitzgerald of Niagara Falls, and in all probability something more will be heard of it before long. Mr. Fitzgerald read a paper on his invention at the celebration of the fiftieth anniversary of the Massachusetts Institute of Technology in the spring. At the time few of the technical papers appreciated the importance of this furnace, and the paper attracted little attention. The Imbert process is a modification of the old reaction whereby molten iron takes the sulphur from zinc or lead sulphide; his invention consisting of a special bath in which the reaction can be effected rapidly and continuously and at a comparatively low temperature. His difficulty was a mechanical one, and the Hohenlohe Hütte in Germany, where the process was being tested, invited Mr. Fitzgerald to come over and advise as to the application of electric heating. One of the obstructions in the path of the electro-metallurgist is the enormous wear of electrodes. Mr. Fitzgerald discarded arcs and electrodes in contact with the charge, and designed a 'resistor' in the form of an arch immediately above the surface of the charge. The heat is transferred by radiation, and the wear and tear of the resistor is accordingly small. Mr. Fitzgerald found that the loss of heat with this resistor was too great for success. Another method has since been adopted, but no definite information as to the substitute is at hand.

In the process the zinc is distilled, the lead and silver falls to the bottom, and pyritic material forms a matte. Mr. Fitzgerald has not told us much about the working of the process, but before long something will be published. E. Gibbon Spilsbury examined it some time ago. One advantage of the process is that no roasting is required. This is of importance not only on account of the elimination of an expense, but because losses of silver by volatilization are avoided. The furnace, like others used in beneficiating zinc ores, will not successfully treat ores containing much gangue, so that if the slime material is of such a quality it must be first concentrated by means of a flotation process. It is remarkable to find how many old and silent mines with finely mixed complex ores have sprung into life again since the electric smelting methods have come forward. For instance, the mountains of massive fine-grained sulphides from New South Wales, Newfoundland, and elsewhere are now once more attracting attention. There is, I believe, a large amount of these sulphides in the United States, especially in Colorado. They will all be benefited one day by flotation and electric smelting, but the time is not yet.

From time to time I have recorded various incidents in connection with the development of the Ferrobamba copper deposits situated in the department of Apurimac, Peru. The reports by W. E. G. Firebrace and Claude Vautin were so glowing as to the immense possibilities that few people in England believed them, and eventually, in order to obtain adequate capital, A. C. Burrage, of the Amalgamated Copper, was approached. He bought shares and took an option enabling him to acquire the property and float an American company for its development. This scheme was not carried through, and subsequently he proposed to acquire a lease on the property and work it at a small royalty. This proposition was rejected by the shareholders. In the meantime he has been purchasing shares privately, from all sources, and at the present time he is practically in control. As further capital is required, the shareholders have agreed to issue 60,000 new shares of 10s. each to rank equally with the existing 120,000 shares of £1 each and entitling the holders to receive all the profit up to 15s. per share. Mr. Burrage is also a creditor to the company for several thousand pounds advanced, and this will be repaid out of the new issue. There are so many ins and outs in connection with the finance of this company, that an outsider finds it impossible to follow all the history. Nevertheless, the deposit and its development will have interest technologically.

JOHANNESBURG, TRANSVAAL

Individual Power Plants Growing in Popularity.—Increase in Gold Output. Decrease in Coal Production. Government Investigation of East Rand Proprietary Mines.

It can scarcely be said that the Victoria Falls & Transvaal Power Co. has come up to expectation, with its undertaking formed for the object of supplying the gold mines on the Rand with electric power and compressed air for mining purposes. Quite apart from the initial difficulties attending such an ambitious scheme, there are many which might and ought to have been avoided. From the outset the restrictions placed upon the company in connection with the raising of the necessary capital have not tended to smooth working, for had it been free to purchase its plant in the open market, instead of being compelled, for the most part, to go to Germany, it is possible that a far more reliable and cheaper equipment could have been secured. There have been mishaps, such as, for instance, disasters at sea, for which the company cannot be held responsible, but it is anything but pleasant for the mines, **having once changed over from steam to electricity, to** find that the power company cannot supply the necessary power. There was no alternative but to revert to steam in many instances, and in others where the whole plant had been arranged to be electrically driven, a steam plant as a standby became imperatively necessary. It may be that only in a few instances has this backwardness of the power company resulted in any serious loss of output, but it has caused many inconveniences, and indeed not a little surprise, because it is generally admitted that the Rand offers, with its compactness and natural facilities, an ideal field for the use of electrical power. It has long been contended on the Rand, by electrical engineers, that despite its suitability as a field for large-scale power operations, individual properties can generate their power quite as cheaply as they can purchase it from the Victoria Falls power company. Instances of this may be seen at Randfontein, where the cost is only about half of that charged by the power company, and at Kleinfontein, where a new station has produced power at the power company's ordinary charge, although only one-fourth of the plant is at work. The load factor is such that the cost of the power (0.75 of a penny per unit) must be at its maximum. With such striking successes as those achieved at Randfontein, East Rand Proprietary Mines, and Kleinfontein, in the face of the many disappointments suffered by its customers at the hands of the power company, it is not at all unlikely that in the future more individual concerns will establish their own power stations.

The total mineral output of the Transvaal, excluding diamonds, for the 3 months ending with August, according to the report of the Mines Department, is as follows:

Gold:	June.	July.	August.
Rand	£2,795,550	£2,892,974	£2,899,725
Other districts	116,934	129,930	130,813
Total	£2,912,484	£3,022,904	£3,030,538
Coal	87,845	93,029	90,144
Tin ore	34,971	45,009	24,833
Lime	11,091	11,983	12,562
Silver	8,055	8,416	8,189
Copper ore	8,718	5,567	5,907
Flint	1,120	613	1,504
Magnesite	75	....	50
Miscellaneous	167	79	190
Total	£3,064,526	£3,187,600	£3,173,917

It will be seen that, despite the increase in the gold output, the total mineral output declined in value during the month of August, principally through a fall in the shipments of tin ore. This, however, is only temporary; actual **shipments, not output, being taken into consideration.** Coal also declined in tonnage and value. The average selling price for August was only 4s. 7.79d. per ton, the lowest recorded price yet attained for the whole of the collieries in the Transvaal. The nine collieries situated outside the two leading coal districts of Springs and Middelburg fared even worse, attaining an average selling price of only 4s. 2d. per ton, the average selling price for Middelburg being, however, 4s. 6d. per ton. This is a striking result, when it is borne in mind that every producing colliery of importance is in the Transvaal Coalowners' Association.

One of the principal mining topics of interest has been the announcement to the effect that the Government has seen fit to appoint a commission to investigate the alleged loss of gold at the East Rand Proprietary Mines and at the same time to enquire into the circumstances surrounding the serious depreciation in the market value of the **company's shares. The resident magistrate of Johannesburg,** H. O. Buckle, has been appointed as chairman, and Ross Frames, of the Premier Diamond mine, and the government mining engineer, constitute the other members of this interesting commission.

BUTTE, MONTANA

October Production of District 21,400,000 lb.—Anaconda to Resume Producing in December.—Kennedy Creek G. M. Co. Starts Operating.

The production of the district for the past month does not differ much from that of the previous month, when **the output was 21,400,000 lb., including all the producing** properties in the district except the East Butte company. During October the Washoe smelter turned out 16,000,000 lb. and the Great Falls smelter 5,400,000, making a total of 21,400,000 lb. **In this is included the Tuolumne production** of about 500,000 lb. and the North Butte output of 2,100,000 lb. The East Butte is not included in the above figures; the production of that company amounted to about **900,000 lb. The Anaconda company is working its properties** well within the curtailment agreement, and according to present calculations the production for November and December will be about the same as October.

It is expected that the Anaconda mine will take its place among the producing properties again about the first of **December, after having been closed down for slightly over** one year. In that time the shaft has been retimbered from the 800-ft. level to the lowest level, which is the 2400-ft. Three years ago the Anaconda was closed down in consequence of a fire in the St. Lawrence, the gas and smoke having worked its way through to the different levels of the Anaconda. While shut down the shaft was retimbered from the surface to the 800-ft. level, and mining was resumed in September 1909. Last October, one year ago, **there was another shut-down, and the remainder of the** shaft was retimbered. The starting up of the Anaconda does not indicate any increase in production, for some of the other mines will be closed down for repairs just as soon as the Anaconda starts up. According to present arrangements, the mine will be one of the last to be equipped for hoisting ore by the compressed-air system.

The Kennedy Creek Gold M. Co., which was organized seven years ago to develop placer property in Missoula county, and which over one year ago passed into the hands of San Francisco capitalists on a 15-year lease, has started operations. Last April work was started on a dredge. A few days ago this dredge, built by the Risdon Iron Works of San Francisco, commenced operations. It has a capacity of 75,000 cu. yd. of gravel per month and is constructed to dig to a depth of 30 ft. As the average sounding on the 200 acres of property gives 28 ft. as the maximum depth through to bedrock, the dredge will answer all purposes. It is being **worked day and night, and the results** are satisfactory at the outset. There are 34 buckets, having a capacity of 5½ cu. ft. There is a bountiful supply of water at hand and all the wood required to operate the dredge. Tests made of the ground show the gold content of the deposits ranges from 20c. per cubic yard near the surface to about $5 per cubic yard at the bottom of the gravel. From the data obtained in tests, after reasonable allowance is made for boulders, which in the lower part of the section constitute about 10% of the material, the deposit in the southern part of the basin seems to contain on the average about 80c. per cubic yard, including everything from the surface down to bedrock, or about $4 per bedrock yard.

W. A. Clark has not yet reached any conclusion as to his plans for the future in regard to finding a concentrator for the treatment of the zinc ore from his Elm Orlu mine. It seems certain that the Anaconda company will not rebuild the concentrator building destroyed some two weeks ago, as Mr. Clark's lease on the mill expires in June, and the company would not have any use for it. What seems the probable outcome is the erection of a concentrator by Mr. Clark on the ground which he has selected for the building of the zinc smelter, but even if he does decide on this course, before the material can be secured and the machinery erected, the winter will be well advanced, and little if any work can be accomplished before spring. The ore-bins at the Elm Orlu mine are full, and, so far as hoisting ore is concerned, all work has been stopped, the men being informed that the shut-down is indefinite.

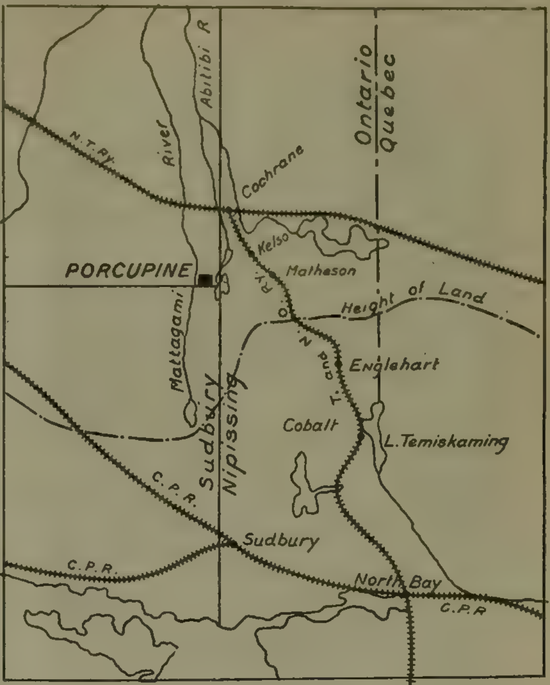
TORONTO, CANADA

Close of Navigation Approaching.—Dome Mine Visited by Stockholders.—Mine Developments.—Report on West Shining Tree.—Other Notes.

The close of navigation is rapidly approaching in the Porcupine district, where some severe frosts already have been experienced, and during the month or so which usually intervenes between the suspension of traffic by boat and the freezing of the lakes sufficiently to allow teaming over the ice, communication will be much interrupted. Recent heavy rains have resulted in a deluge of surface water, which has seriously interfered with operations in some of the mines, and managers find much difficulty in keeping the shafts dry. The double-compartment permanent shafts are now made with cement collars in order to prevent flooding.

The Dome mine was visited October 25 by a large party of the directors and stockholders, principally from the United States, including many men of prominence in financial and industrial circles. Ambrose Monell, managing director, pointed out that diamond-drill work over an area of 1000 ft. had considerably improved the condition of the property. They had positive proof of good ore to depth, the golden sidewalk vein having been cut at 200 ft., although the drilling showed a wide variation in ore content. Provided sufficient labor can be secured for the completion of the mill, it is hoped to have the plant in running order by the new year. At the Dome Extension the main shaft is down 115 ft. It is proposed to sink several hundred feet and cut the anchor vein to the south at each 100 ft. down. A new discovery has been made about 500 ft. from the shaft, consisting of a vein of quartz-porphyry 8 ft. wide. The Foley-O'Brien company is sinking a shaft about 140 ft. from the southern boundary and has reached a depth of 70 ft. A number of small veins of good ore have been found. On the East Dome a porphyry dike has been found containing many quartz stringers in which free gold appears. The shaft being put down on the Davidson claim of the Crown Chartered reached the 100-ft. level on October 15. At the American Goldfields a depth of 70 ft. has been reached in the shaft and a hill has been tunneled for 80 ft. A quantity of rich ore has been taken out. Charles E. Watson has resigned as manager of the Dobie and Tisdale companies to assume the management of the Plenaurum and Armstrong-Booth properties. He is succeeded by George E. Farish, who has a wide American experience. The first vein of the Miller-Middleton, adjoining the Hollinger, has been tapped by a cross-cut at the 75-ft. level. It is from 3 to 4 ft. wide on the surface and maintains its width where cut.

A report has been made to the Ontario Department of Mines by R. B. Stewart, of Toronto University, of an investigation of the new goldfield of West Shining Tree. This includes the townships of Asquith, MacMurchy, Churchill, and Fawcett, lying around West Shining Tree lake, about 70 miles north of Sudbury. Mr. Stewart describes the country as level, with no prominent elevations and few rock exposures except where it has been swept by fire. The geology is rather complex, the formation where the claims are situated being of Keewatin age. The discoveries for the most part are situated on zones of weathered schist, containing veins and stringers of quartz that generally conform to the strike and dip of the schist. The quartz widens in places to several feet, but does not carry this width far till it breaks up into stringers or disappears. Thirteen locations were visited, on several of which free gold was seen in place. The property known as Gosselin's, which has attracted most attention, showed apparently a very large body of quartz with free gold in several places. Seven samples of quartz were collected from properties on which no gold was seen. The results of assays of these showed that six of them were worth from 40c. to $6 per ton.



PART OF ONTARIO.

The statement of the Nipissing for October 2 shows ready assets of $459,000 on hand after the payment of the dividend. The treatment of high-grade ore by the Butters plant having been successful, experiments are now being conducted to test whether by some slight alteration in the process the large amount of low-grade ore accumulated by the company cannot be treated by this system. Should the results be satisfactory a 200-ton mill will be erected for the purpose. At the annual meeting of the Little Nipissing held here October 25, the shareholders authorized the issue of 500,000 shares of preferred stock bearing cumulative dividends of 2% per annum. This will be offered to shareholders at 20c. per share, redeemable in five years at 40c. per share, together with any dividends remaining unpaid. At the Drummond a vein of rich ore averaging 1½ in. wide has been found on the surface, paralleled by a wider calcite vein with good silver content. The annual statement of the City of Cobalt shows a production of 292,694 oz. of silver from 392 tons of ore. The ore developed on October 1 was estimated at 181,650 oz. valued at about $95,366. The cash in bank amounted to $31,954 in addition to ore at smelter valued at $26,860.

J. H. Plummer, president of the Dominion Steel Corporation, in speaking at a banquet given by the city council of Sydney, Nova Scotia, to the directors last week predicted an increase in the finished steel output from 220,000 to 400,000 tons per annum. He said that according to their present plans the corporation before long would control 20 collieries, a number not exceeded, so far as he knew, by any company in England or in Canada.

NEW YORK

STEEL PROSECUTION DAZES WALL STREET.—POSSIBILITY OF ATTACK ON SMELTER TRUST DISCUSSED.—CACTUS BUYS COMBINATION KEATING.—GIROUX PLANS ANNOUNCED.

As may readily be surmised, the recent action of the Government attacking the United States Steel Corporation has been the principal and by far the most important factor for the week and the main topic of discussion among those who hang over the Wall Street tickers. There are in Wall Street probably more varying opinions regarding the present situation than there are anywhere else in the country. The lack of cohesion in the market to give a decided trend to the course of trading has put many of the older and more experienced heads into something of a daze. The Street has played politics for many years, but never from its present position. The Eastern financial centres have small use for the iconoclast, and there are many who walk daily in the shadow of Trinity Church that proclaim this to be the day of the iconoclast and no time for the old staid citizen to expect any consideration.

There has been a good deal of discussion concerning the possibility of an attack upon the smelter trust. American Smelting & Refining has at several times during the past few days been under strong selling pressure, from which it rallied in a rather half-hearted way when an official statement was given out that no suit had been begun as yet by the Federal law department. That the smelter trust has been among those under close scrutiny by the Government is not to be doubted, and if some of the smaller independent operators throughout the West were to be allowed to conduct the investigation and sentence the offender, the result would never be for one moment in doubt.

The smelter trust, as the term is used, includes the American Smelting & Refining Co., the Smelters Securities Co., the Guggenheim Exploration Co., and in turn the chain of porphyry coppers which have been the controlling factor in the copper world for the past two years. The copper mines that are allied directly with the Guggenheim interests include Utah Copper, Nevada Consolidated, Ray Consolidated, Chino, Braden, the Alaska properties, and others of less note. The holdings in copper which the Guggenheims have built up within the last few years, comparatively speaking, will soon give them first place as sellers of copper. Holders of the Guggenheim shares in one enterprise or another are scattered all over the world. Chino is largely held in France, as is Ray Consolidated, and a movement is on foot now to list both on the Parquet department of the Paris Bourse. Braden is about to be listed on the New York Stock Exchange, on the strength of which the shares have been pushed upward and have enjoyed a strong market recently. The entire copper list has been something of a mystery, the movement in Braden could perhaps be accounted for as a move preparatory to forsaking the outside market and going indoors, but all of the copper shares have apparently been stronger than conditions in the metal market would seem to justify. The statement is not infrequent with owners of large plants that the present volume of business is not sufficient to pay expenses, which is only quoted to show that there is something more in the copper situation than mere unwillingness to stock up in the face of increasing production. The latter being an argument much used by would-be bulls in the metal market.

The Cactus Copper Co., which at one time was looked upon as a low-grade milling copper of great promise, but which was very unfortunate in being unable to develop any body of commercial ore on the ground near Globe, Arizona, where its first development was undertaken, is to make an effort to save something for the shareholders. The Cactus company will acquire the Combination Keating near Radersburg, Montana, on a stock basis, using the reserve in the treasury of the Cactus for development purposes. The new property is a gold producer of some promise and it is hoped to win back the original investment for the holders of the Cactus. N. L. Amster has finally severed his connection with Arizona Commercial, and Charles Sumner Smith, president of the Old Dominion has taken up the management of the reorganized company.

George Martin Luther, president of the Granby Consolidated, says that the Granby will be in operation again by the first of the year. The coal strike in British Columbia has finally been settled, but it will take sixty days to get fuel supplies on hand and the idle furnaces blown in. Mr. Luther, who is also general manager for the Nichols Copper company, says the Granby can make $50,000 net on the present metal market when again operating at capacity. The Nichols Copper Co. operates one of the largest refineries in the country at Laurel Hill, on Lond Island, and handles a great deal of copper ore for Phelps, Dodge & Co.

The Giroux management has at length broken silence. T. F. Cole, the president, in a recent interview unfolds plans for increasing the capacity of the concentrator to 1000 tons and says that the supply of concentrating ore already blocked out and demonstrated in the underground workings on the sulphide zone is amply sufficient to keep the proposed plant in steady operation for many years to come and in the meantime new orebodies of the same nature will be developed in various sections of the company's vast mineral estate. Giroux shareholders will be glad to know that they are to have a plant and that it will be kept going for years to come, but they would doubtless relish a more definite statement. Giroux has been one of the mysteries of the copper list. Many mines have been made and brought to the point of production since work on the Giroux was first started, and it is still in the formative stage.

Utah Copper's last quarter broke records for monthly output of copper and also established a new low cost record. The cost sheet for the entire quarter shows an average cost of 7.56c. per pound, against 8.02c. for the preceding quarter. September costs were 7.18c., the lowest yet made for any one month. For the quarter, the company earned $361,700 over and above dividend requirements. For the first nine months of the current year, surplus above dividends is $554,000.

It is said that the Phelps-Dodge company will probably cut its annual dividend from $12 to $10, in view of the conditions prevailing in the metal market. On the other hand the Greene-Cananea is expected to come back into the dividend list within a short time.

The echoes of the Calumet & Hecla merger litigation have not all died out. The Ahmeek interests, headed by the Chadbournes, not content wtih having blocked the merger, are praying the court for a decree of perpetual injunction against the consolidation, which would rather appear to be rubbing it in.

Nipissing is to have a Butters mill for the reduction of its low-grade ores. Charles Butters is now at Cobalt making preliminary tests to determine just what kind of a plant shall be erected. The two leaders in the Cobalt list have somewhat disappointed their followers during the current year. Nipissing has a large territory, by far larger than any in the camp, and heretofore has been able to prospect always with good results; of late, however, diligent trenching has not opened the usual number of good showings. The market has reflected conditions faithfully and Nipissing has sold off on what appeared to be real liquidation. La Rose has been divided against itself. Some months ago the dividend rate was lowered, and a considerable surplus has been accumulated. In the meantime known ore reserves have apparently not been increased and the management has felt that surplus funds were needed for some broader exploration work. Some of the stockholders have clamored for a return to the previous dividend rate, and the whole matter has been postponed till after the first of the year. There has been very little of interest as regards Porcupine recently. The most important deal recently was the sale of a controlling interest in the North Dome to the Temiskaming Mining Company.

General Mining News

ALASKA

Juneau

The report of the Alaska United G. M. Co. for the 15 days ended September 30 shows a net profit of $15,620. The mills of the Ready Bullion and 700 Ft. claims treated 18,730 tons of ore, from which 400 tons of concentrate was saved. The realizable value of the production from the two claims was $44,159.

The Alaska Mexican G. M. Co. in the 15 days ended September 30 crushed 8976 tons of ore, from which 238 tons of concentrate was saved. The net profit for the period was $7589.

RAY, ARIZONA, SHOWING CENTRAL PORTION OF ORE-ZONE.

Ketchikan District

(Special Correspondence.) The Wetzel property at sea-level has been bonded to a company represented by M. M. Churchill. A tram is being built to tidewater for shipping ore taken out during the process of development. The ore content principally is gold. About 700 tons of high-grade ore is nearly ready for shipment at the Rush & Brown mine. The development is being carried on by the owners.

The Princeton M. & M. Co., at Dolomi, is blocking out and prospecting orebodies preparatory to erecting a 20-stamp mill. Patrick Heaney, of Butte, Mont., has charge of the mine. Several discoveries have been made on the Salmon river at the head of Portland canal. The latest of these was by Ickis & Polson, about 7 miles up the river, and is a well defined quartz fissure vein nearly 4 ft. wide, heavily mineralized with galena and iron pyrite. A similar vein was located last year by Lindeburg Bros., about 400 ft. to the north and parallel to it. It has been traced over 2000 ft. by stripping and open-cut work. Both of these veins cut through granite. Johnson & Rowlee, Peterson and Pearson, McGrew company, and several others have made promising finds on the American side of the line during the summer.

Some important surface showings of galena ore have been exposed on the headwaters of the Salmon near the boundary between British Columbia and Alaska. Development is being carried on by the Indian Mines Co., Cascade Falls M. Co., Salmon Bear River company, and the Bruggy group of claims. These claims are on the British side of the boundary line.

The winter season will soon put a stop to prospecting in this part of the country until next spring. Surveys are now being made for a proposed railroad up the Salmon river, this being the only feasible route that will give direct connection to tidewater.

Ketchikan, November 1.

ARIZONA

Gila County

Press reports state that rich chalcocite ore was discovered recently on the Miami Development Co.'s property, which lies between the Live Oak and the Barney.

Pima County

Development work at the Camp Madera mine is to be started in the near future. The new machinery for the mine has been erected. In the equipment are a 35-hp. engine, an air-compressor, and a 1¾-in. drill. H. E. Brandt, formerly of San Francisco, is president of the company.

Pinal County

(Special Correspondence.)—The Ray Central Copper M. Co. is making preparations for the construction of a mill and surface plant which will include shops, compressor-house, hoist-house, steel head-frame, crusher-house, and power-house. The mill will have a nominal capacity of 1500 tons and will be designed by H. Kenyon Burch, designer also of the Moctezuma Copper Co.'s mill at Nacozari and of the mill of the Miami Copper Co. Mr. Burch is now at the mine working on the preliminary plans. E. Horton Jones, formerly constrution engineer for the Ray Consolidated, will occupy a similar position with the Ray Central. A new working shaft will be sunk near the east end of the Isabella claim. It will have four compartments, will measure 7 by 28 ft. in the clear, and will be 500 ft. deep. Ore will be hoisted in six-ton skips. An adit will be started at the elevation of the present first level and will be driven to the shaft. This will be used only for timber and supplies. The shaft will be driven almost entirely by raising, and driving is in progress on several levels toward its proposed location. Assessment for the current year on all unpatented claims has been completed. F. H. Probert, consulting engineer, is now at the mine.

The Ray Con. Copper Co. is mining and milling 4000 tons of ore per day with four of the eight units of the mill in operation. The ore is coming from the stopes of No. 1 mine and from the development work in No. 2 mine. The surface plant at No. 2 shaft is practically completed and will soon be ready for operation. Messrs. Jackling, Penrose, Aldrich, and McNeill are expected at the mine in a few days.

Globe, November 2.

CALIFORNIA

Butte County

The Superior Channel Mining Co., of Arizona, has been formed by E. Conger and F. C. San Souci. A branch of its principal place of business is to be at Chico.

Nevada County

(Special Correspondence.)—The Pennsylvania M. Co. is erecting the 10-stamp mill recently purchased from the Morning Star company. It will give a milling capacity of 30 stamps. The company is concentrating its activities on the Pennsylvania portion of the group, and arranging for heavy production. The Lucky vein has been found near the 600-ft. level of the Union Hill by the diamond-drill. The 500-ft. cross-cut will be driven about 50 ft. farther to open the vein, and connections made with the 300-ft. level. The new mill is rapidly nearing completion, while a large reserve of milling quartz is blocked out in the main Union Hill workings. Clifford Graham is superintendent of the property. The North Star Mines Co. has installed new cables in the Providence shaft of the Champion group, Nevada City district, and the electric pumps soon will be in position. The Andy Fitz company has decided to continue operations at the Fruitvale mine throughout the winter. The adit will be continued until the vein is tapped, and a raise put through to surface, a distance of about 400 ft. The property is situated on the Middle Yuba river, below Moore's Flat. Andy Fitzgerald is superintendent. The Oakman company has purchased the 10-stamp mill formerly operated at the Kentucky Ridge mine, and expects to have it in commission early in January. The Oakman is situated four miles above Washington and is owned by Massachusetts people. The 1200-ft. adit recently intersected a vein of free-milling ore at a depth of about 600 ft. The vein is 6 ft. wide and assays about $8 per ton. Frank Dillon is manager of the mine.

Grass Valley, November 6.

The electric conduit to be used at the Champion mine in connection with the electric pumps is now being placed, states a report from Nevada City.

Sacramento County

Amended articles have been filed by the Natomas Consolidated providing for thirteen instead of eleven directors.

Shasta County

George Bayha, a mine promoter representing German capitalists, has bought the Golinsky group of copper mines, west of Kennett, for $100,000 from Bernhard Golinsky. Mr. Golinsky located the claims, 14 in number, fourteen years ago. Four years ago the Guggenheim interests took a bond on the properties, the price to be $100,000, to be paid for with 50% of the returns from the ore extracted. The Guggenheim company built a railroad three-fourths of a mile long to connect with the Holt & Gregg line, and in less than six months shipped 3500 tons of ore to the smelter at Garfield, Utah, while Mr. Golinsky expected the ore to be smelted at Kennett, although the place was not specified in the bond. The ore milled 9% copper. The 1907 panic is said to have been the direct cause of the Guggenheims not taking the property.

Sierra County

(Special Correspondence.)—The upper and lower levels of the Tightner mine have been connected by a raise, and a bulkhead will be placed in the upper adit to prevent damage to No. 4 level by cave-ins. The lower adit will be continued to the Red Star vein, and ore will be extracted from the Tightner vein in the meantime. In the upper workings sufficient ore has been proved to keep the 10-stamp mill in commission during the winter, it is said. C. C. Derby is manager of the property. The new company which recently acquired the Sixteen-to-One is planning vigorous development. It is believed the vein will be recovered by further driving. Electric power has been obtained by the North Fork Placer company to operate the drills and pumps. A cross-cut is being driven toward the Uncle Sam vein. George F. Stone is manager.

Dan McGonigal and associates are planning extensive work at the Kate Hardy. The main vein is reported to range from 20 to 40 ft. wide, with occasional bunches of bonanza. The property has been opened by adits driven from the Oregon creek side of the workings. The Poker Flat Deep Channel M. Co. has been reorganized. Sinking of the 350-ft. shaft has been resumed. M. Duvall is manager for the company. The Round Lake M. Co. has made final payment on the Dixie Queen group, near Downieville. The mine is a quartz property and has a good body of milling ore opened. Martin Miller is superintendent for the company.

Alleghany, November 4.

Work has been started on enlarging the Alaska mill, near Pike. Twenty stamps will be added, which will make a total of 40 at the mill. R. L. Hathway, of Nevada City, is in charge of the construction work.

Trinity County

The Trinity Con. Hydraulic M. Co. of America has been incorporated to develop the extensive placer deposits in the Weaverville basin, recently acquired for a group of New York capitalists by W. A. Boland. The rumor that the Guggenheims are interested in the undertaking has been officially denied. Mr. Boland, after inspecting the properties last March, formed the plan of organizing the various properties under one management. Some of them had not been in full operation owing to the lack of sufficient water. Mr. Boland announces that there will be more than enough water available through plans already completed. D. W. Shanks, who is interested in the Rio Plata company of Mexico, and the Trinity Gold M. & R. Co. of California is general manager for the new company, of which Henry W. Miller is president, Mr. Boland vice-president, and J. H. Lee secretary and treasurer. The company already has acquired the Union Hill, the Hupp, and other properties.

Tuolumne County

The extensive caving in of the surface on the Heslep claim at the App property, at Quartz mountain, on October 28, filled the old workings above the depth of 300 ft. and dislodged timbers down to the 600-ft. level, quaking the ground within a radius of four miles. The chasm opened by the falling in of the ground is about 150 ft. deep, 200 ft. long, and 150 ft. wide. The large pipe through which runs the water to operate the mill was broken, causing an interruption in operations lasting several days. None of the workings of the App proper were damaged. Contrary to the original belief, the collapsing of the ground is regarded as rendering easier the extraction of some 100,000 tons of ore.

The Big Four mine, owned by W. D. Deming and George Wilds, and situated near the old Dead Horse, has been bonded to R. E. Edgar, of Los Angeles. Development work is now in progress. The winze started by the owners 500 ft. from the mouth of the adit, in a 2-ft. orebody assaying from $10 to $50 per ton, will be sunk to 100 ft., after which, if prospects are satisfactory, a raise will be run to the surface and hoisting machinery installed. Simultaneously driving will progress from the bottom of the winze.

A small vein of rich ore has been uncovered in the shaft being sunk at the El Dorado mine, at Cherokee. The main vein has not yet been reached. The property is owned by the Sivori brothers of Tuolumne.

Another body of rich ore is said to have been uncovered in the New Albany mine. An assessment of 10c. per share, payable before December 9, has been levied upon the capital stock of the Mohican M. & M. Co. The work of unwatering the Draper mine has progressed to the 400-ft. level.

Improvements are being made at the Harvard for the comfort and convenience of the employees. A heating and drying apparatus and a hot and cold water system are being installed in the new change room, in which will also be put a shower bath equipment and individual lockers for the workmen. The buildings on the property are being painted.

Tuolumne, November 4.

COLORADO

Clear Creek County

(Special Correspondence.)—Von Tilborg and White, leasing on the Gem mine, have uncovered a body of ore 2 ft. wide that assays $100 per ton, and 5 ft. of mill ore. The discovery was made at a depth of 2200 ft. and 1100 ft. east of the lateral run from the Newhouse adit. The Lucania T. Co. will start development upon a number of veins as soon as the contractors complete their work in the adit. John McColl is manager. The Smith property on Santa Fe mountain is showing a streak of ore 3 in. wide that assays 948 oz. silver and 0.40 oz. gold. R. E. Farmer is owner. L. Sternberger, manager for the Pennsylvania M. Co., states that a lateral will be driven eastward 1000 ft. on the J. L. Emerson vein that was recently intersected by the Lucania adit. A raise is to be put through from the Lamartine adit-level to connect with the workings above. It will be 360 ft. high. F. W. Himrod, of New York, is owner.

Idaho Springs, November 5.

(Special Correspondence.)—A vein of ore 2 ft. wide has been found in the lower level of the Millington mine on Columbia mountain that assays 700 oz. silver per ton. Connerry and Eade are operating under lease. Work has been resumed on the Paragon adit situated on Bard creek. Charles Coggswell is manager. A new company has been formed to take over the Sporting Times mine on Alpine mountain. Philadelphia capitalists are interested. C. D. Colburn will be manager of the property. The Tom Payne mine on Democrat mountain has been purchased from E. K. Cass by H. Lendecke. Shipments of ore are being made by the Paymaster mine in East Argentine. The product is a silver-lead and brings $90 per ton. A body of ore 18 in. wide has been found on the third level of the Mineral Chief mine that assays 70% lead and 45 oz. silver per ton. The vein is exposed for a distance of 300 ft. A. L. Stephens is manager. The Mammoth mine on Brown mountain has been taken under a $15,000 bond and lease by W. A. Patton, representing Denver men. Development will start soon. G. Oxley, of Idaho Springs, has taken a lease on the 100-ft. level at the Capital mine. Stoping has been put under way on a 6-in. streak of 2.30-oz. gold ore. Eade & Co., leasing in the west drift on the Aetna vein at the Capital mine, has found a 10-in. vein that assays 2.70 oz. gold, 14 oz. silver, 5% copper, and 22% lead per ton. Shipments have been started.

Georgetown, November 4.

At the Baker mine in the West Argentine district ore assaying from $45 to $60 per ton recently was discovered. Development is to be resumed on a large scale at the Josephine mine on Kelso mountain, as the legal troubles over the property have been settled. Previous to the suspension of work, six months ago, the mine produced about $12,000 per month.

Dolores County

The Rico Mining Co. has been incorporated by D. B. Ellis, S. T. Hawthorne, and C. I. Hawthorne. The company, which will have its main office at Rico, is capitalized at $3,500,000.

Ouray County

Mrs. Julia E. Dunn, of Grand Junction, has purchased the Mirren group of claims, situated near the Camp Bird for $40,000. The Mirren group is believed to be on the extension of the Camp Bird veins.

San Miguel County

The report of the Tomboy Gold Mines Co., Ltd., under the management of the Exploration Company, Ltd., of London, for September, states that the mill crushed 9300 tons of ore, from which $54,000 worth of bullion was extracted. The concentrate shipped amounted to $30,000, making a total production of $84,000. The expenses were $41,500, leaving a net profit of $42,500.

The General Vanadium Co. recently shipped a car of high grade vanadium ore to Liverpool.

Teller County (Cripple Creek)

The Miami Mining Co. has been organized to carry on mining operations in the Cripple Creek district. The main office is at Colorado Springs. The organizers are H. E. Schneider, J. O. Henry, and G. M. Irwin.

The October production of the Vindicator main shaft was 52 cars of ore, assaying about $35 per ton. The ore was principally from the 14th and 15th levels.

TOMBOY MINE.

The Vindicator Consolidated has just paid a dividend of 3%, aggregating $45,000. The total paid in dividends by this company to date is $2,407,500.

Since the resumption of work in the heading of the Roosevelt drainage adit, it has been driven about 100 ft., and the length of the adit is now 15,800 ft. The flow amounts to 6500 gal. per minute. The El Paso company is repairing the track in the Fuller cross-cut preparatory to starting work on the main C. K. & N. vein.

A 3-ft. vein of ore assaying $80 per ton has been discovered on the Kitty Wells claim, on the south slope of Carbonate hill, by W. A. Thompson, lessee of the property, state recent reports from Cripple Creek.

For October the production of the mines in the Cripple Creek district amounted to 77,728 tons, and its estimated gross value was $1,318,199. In the following table the tonnage handled by the smelters and the various mills is given, together with estimates of the value:

Plant.	Tons.	Av. val.	Gross val.
Smelters	3,825	$55.00	229,500
Golden Cycle	23,000	20.60	520,000
U. S. R. & R.	13,050	21.50	280,575
Portland, Colorado City.	9,700	20.00	194,000
Portland, Cripple Creek.	11,520	3.25	37,340
Stratton's Independence.	10,522	3.16	33,240
Wild Horse	1,200	2.30	2,660
Isabella	900	1.20	1,080
Jo Dandy	1,000	4.20	4,200

The October output of the Forest Queen mine on Ironclad hill was 22 cars. The ore, which assayed about $35 per ton, was largely from the flat vein discovered on the

500-ft. level. Richardson & Richardson, last month, operating a block of ground on the El Paso property, shipped 14 cars of ore. The usual production is about 15 cars.

IDAHO

BONNER COUNTY

Work has been resumed on the Diamond Jim, a silver-lead property on the shore of Lake Pend Oreille on Blacktail mountain.

IDAHO COUNTY

The Hydraulic Placer M. Co. of Spokane is ready to begin washing on its gold bar in the Salmon river, 15 miles from its junction with the Snake river. E. M. Bates, who has just returned from an inspection trip, reports that everything is in shape for the operation of the hydraulic system. The flume is ready and the men are completing the sluice-boxes. The company has an unlimited supply of water and will operate two giants under pressure of 100 lb., and expects to wash 1000 cu. yd. of gravel per day. It is estimated the gravel will average $2 per cubic yard.

LEMHI COUNTY

Since the completion of the Gilmore & Pittsburg railway two mines have shipped more than $1,000,000 worth of lead-silver ore, according to recent reports. There are no mills in the camp, and mining appliances are of the simplest character. The Pittsburg-Idaho and Latest Out are the principal shippers. They are sending 3000 to 4000 tons of ore per month to Salt Lake smelters.

The Kirtley Creek Gold Dredging Co. is reported to be successfully operating its 9-cu. ft. dredge, costing $200,000, five miles from Salmon. It is estimated that it will require six years to clean up the ground available. The plant is run by electricity.

MONTANA

LINCOLN COUNTY

(Special Correspondence.)—Wm. Criderman, of Libby, has sold to W. H. Graham and his associates 680 acres of placer ground on Libby creek for $28,000, and it is the intention to install a large hydraulic plant on the property. Mr. Graham is from San Francisco and until recently was connected with the Snowshoe mine. Included in the deal is an extensive deposit of fine marble, in which are 26 distinct colors of the stone. Of the purchase price, a small cash payment has been made, and the balance is to be paid within 12 months. Mr. Graham said he intended to begin operations at once with a prospecting drill.

Arrangements will be made at once to have the ground surveyed for a pipe-line, and in the spring a hydraulic plant will be placed. A pipe-line two miles long will be constructed and two 4-in. nozzles will be used. The pipe and all other machinery will be taken in on the snow during the coming winter. The same drill will be used that was brought in here by J. Y. Ownbey and his associates last summer. This drill was used to sink some holes on this ground, and some remarkable gravel was found. The property lies about 15 miles south of Libby.

Libby, November 3.

SILVERBOW COUNTY

(Special Correspondence.)—The Anaconda company is keeping every mine under its control in a complete state of repair. Whenever a property is closed down, through any cause, the opportunity is at once seized to make a careful examination and make repairs and improvements which might not otherwise be undertaken for six months or a year. This was the case with the High Ore when it was shut down last August to change the engines for operation under the compressed-air system. For quite a long time it was planned to replace the cages for hoisting ore with skips, and while at first it was not intended to do this until next spring, the time was considered a good one, so the work was commenced, and now skips are being installed. The work will be completed about the time that the engines will be ready to go into commission, which will be about the first of next month. The substituting of skips for cages is to prevent trouble in the stretching of the rope attached to the cages in the long haul of 2800 ft., the deepest level of the mine. On a loaded cage on the long haul there is a stretch in the rope of several inches, and while it is not contended that the use of the skips will have anything to do with the lessening of the stretching of the cable, it is believed that there will be less cause for trouble.

The new compressor for the Raven M. Co. has arrived and in the course of a week or ten days it will be erected. Work is to be started as soon as the compressor is in commission to drain the 1300-ft. level, after which it is intended to start uncovering some rich orebodies which are believed to exist on that level. On the upper levels lessees still continue to get a good grade of shipping ore, and according to all reports they are making much more than expenses.

Butte, November 4.

NEVADA

CHURCHILL COUNTY

Press reports state that the vein recently found on the Kinney & Leonard property at Sand Springs is now producing ore assaying 60 oz. of silver per ton, and that the vein is widening.

ESMERALDA COUNTY

The October production of the Goldfield Con. M. Co. was about 30,626 tons of ore, valued at $805,000, according to the preliminary estimate of J. F. Thorn, general superintendent for the company. The operating expenses were about $205,000, leaving a net profit of about $600,000 for the month. The average assay-value of the ore was $26.28 per ton. This is the largest tonnage ever produced by these mines in one month. The company shipped $238,000 worth of bullion on October 25, and $81,000 worth of bullion October 30, to the Denver Mint. The bullion was refined at the company's refinery and was about 950 fine.

Two lessees working on the estate of the C. O. D. Consolidated are making shipments. Six lessees, in all, are operating. The Lowden-Hardwick lease on the Victor has penetrated 3 ft. of ore which assays about $200 per ton, and the Gold Bar lease, in charge of Harry B. Ruhl, is developing a 2-ft. vein which assays about $300 per ton, state recent advices from Goldfield.

The electric hoist for sinking the winze from the 300-ft. level of the Goldfield Belmont is now in operation. A cross-cut will be driven to tap the vein at a depth of about 60 ft. The winze is being sunk vertically.

The Comet mine, operated on lease by a man named Wolfe, has reverted to the owner, T. A. Maher. The latter states that a vein of silver and copper sulphide ore was discovered after the claim reverted to him, and that the outlook is good for extensive development.

NYE COUNTY

The Tonopah Belmont Dev. Co. is to resume sinking its main shaft immediately, and an auxiliary electric hoist and sinking pump have been erected on the 12th level. The erection of the steel frame for the tube-mill is to be started at once. The production last week amounted to 2500 tons of ore, according to recent news despatches.

It is reported that the North Star will start shipping ore in the near future. The company is to build ore-bins and a loading station on the switch of the Montana-Tonopah M. Company.

The monthly report of the Tonopah Extension M. Co. shows that 4420 tons of ore was treated, the recovery being 90.6%, and the average value of the ore $12 per ton. The company shipped 4861 lb. of bullion, valued at $50,000. The estimated net profit, including the clean-up for the latter half of the month, was $23,000.

The Tonopah M. Co. last week shipped 3700 tons of ore. Prospecting is in progress in the vicinity of both the hanging wall and the foot-wall of the main veins, and several new orebodies have been found, according to recent reports. The improvements were in the Mizpah, Silver Top, and Desert Queen mines. The West End Con. M. Co. reports good milling-grade ore found on the 500-ft. level. The latter company last week shipped 500 tons of ore.

The Montana Tonopah company shipped 1043 tons of ore. The monthly clean-up is being made.

Storey County

The October production of the Comstock mines was the largest for several months, according to the weekly reports of the various mine superintendents. The production of the Ophir, Mexican, and Crown Point mines reached a total of $164,981.

The Comstock mines last week produced $38,925 worth of ore, the Ophir mine leading with a production of 348 tons of ore, valued at $20,487. The Mexican mine was second, with a production of ore valued at $15,010. The 2100 and 2200-ft. level stopes of the Ophir continued their noteworthy production, the ore averaging in value $58 per ton. On the 2400-ft. level the development is in quartz, with low grade ore.

White Pine County

Press reports state that the preliminary work for the standard-gauge railroad from the Morris shaft of the Giroux to the concentrator, has been finished, and that construction work will be started immediately.

Development work on the Ely Calumet property is to be resumed in the near future, under the direction of A. D. Myers of Los Angeles, says a recent despatch from Ely.

Work at the Veteran will be resumed probably next week, when the electrical work will have been completed. John McDonald, the new manager of the mine, is now at the property.

NEW MEXICO

Socorro County

(Special Correspondence.)—Two mortars for a new battery have been delivered at the Ernestine M. Co., and a bed plate and a fly-wheel for one of the oil engines will arrive at the works about the middle of next week. The rest of the new machinery will be rushed from Silver City as fast as possible. Last week 742 tons of ore was treated. The bullion production for the second 10-day clean-up in October was 9240 oz. of gold and silver; 4½ tons of concentrate was shipped during the period. The new shaft of the Oaks Co. has been sunk 12 ft. at the north end of the Pacific mine, and timbering the south shaft has been started. The president of the Treasure M. & R. Co. has been on the ground for two weeks, during which period the final survey for a gravity wire-rope tramway was made. White Water creek is furnishing ample power to operate both mine and mill, and steady production is being maintained.

Mogollon, November 3.

OREGON

Baker County

The West Coast M. Co. has been organized by W. J. Woods, F. H. Perry, and S. O. Correl to do a general mining business. The main office will be at Baker.

UTAH

Salt Lake County

(Special Correspondence.)—The Utah Copper Co.'s report, for the quarter ended September 30, shows an increase in production, as was anticipated, and the lowest cost per pound in the history of the company. The output for the three months was 25,851,456 lb., as compared with 25,469,812 lb. for the previous quarter and 21,296,709 lb. for the first three months of the year. The net average cost for the quarter, after deducting allowances for smelter and without crediting miscellaneous income was 7.56c. per pound, while in September it was forced down to 7.18c. for the monthly average. The cost during the previous quarter averaged 8.02c. per pound. The company made a net profit for the quarter of $1,538,712, including $375,187 Nevada Con. dividends. It paid $1,177,012 dividends and added $361,700 to surplus. The ore handled showed a falling off in grade, being 1.4829% copper, as compared with 1.6332% copper for the previous quarter. The tonnage was increased from 1,060,414 to 1,273,373.

Salt Lake City, November 6.

Tooele County

(Special Correspondence.) The Con. Mercur G. M. Co. is showing a remarkable amount of vitality, when one takes into consideration the pessimistic tone of the last annual report, in which the permanent closing down of the mine was foreshadowed as more than a possibility. September showed a profit of about $2000, and October about the same. Prospecting work is being carried on vigorously, and the hope is expressed that new and profitable orebodies may yet be opened up in the old property. The Consolidated Mercur company since its organization in 1900 has produced $9,746,041 in gold, while the constituent properties produced nearly as much before the consolidation. There are 340 men employed at the Con. Mercur, which constituted the sole support of the town of Mercur, and John Dern, president of the company, has promised to keep the property running as long as it can be done without a steady loss.

Mercur, November 4.

CANADA

British Columbia

Development work at great depth will be pushed on the Slocan Star group in the Slocan district, near Sandon, according to Byron N. White of Spokane, who is interested in the property. The group has been consolidated with the Rabbit Paw claims under the title of the Slocan Star Mines, Ltd., with R. S. Lonnie of Vancouver as president. The company is capitalized at $2,500,000. The concentrator will be in operation in a short time. The property has been developed on the Slocan Star, Silversmith, and Heber Fraction claims to 600 ft. It has produced ore valued at $2,500,000 and has paid $542,000 in dividends, in addition to defraying all costs of original purchase, prospecting, development, and equipment, including the mill near Sandon, according to recent reports. The cost of the projected development work, including the remodeling of the mill and the erection of new buildings, will amount to about $40,000. The mine has been idle for ten years, due to litigation over the question of extralateral rights between the owners of the Slocan Star and the Rabbit Paw groups. The controversy has been adjusted.

W. E. Swickey, of Spokane, manager of the Rambler-Cariboo mine, is preparing to start work on the Payne mine, situated in the Slocan district. The adits are being cleared preparatory to opening the property. The plans for development include a lower adit.

Ontario

The O'Brien company on October 31 shipped to London 21 bars of bullion valued at $10,713. The Drummond mine also shipped to London two bars valued at $752. The Nipissing property shipped 65 bars of bullion valued at $40,210.

MEXICO

Hidalgo

The La Blanca y Anexas company has taken options on the Cinco Señores and La Purisima properties, which it is believed, are traversed by the veins of the La Blanca and Santa Gertrudis mines. The price to be paid is ₱600,000, to be paid in two years. The option has been running for some time, and a thorough investigation will be made, state reports from Pachuca. The ground is between the La Blanca and the Santa Gertrudis.

The Santa Ana mine is now making regular shipments to the San Francisco hacienda over the railroad recently completed.

The Santa Ana y Anexas company has completed the extensive precautionary measure planned for the handling of its production. The work was in charge of Thomas Morcum.

Oaxaca

The San Juan M. Co. has prepared plans for a 200-ton mill to treat the ore from its San Juan mine in the Taviche district. The company recently installed a new hoist. Press reports state that it is shipping $100,000 worth of ore per month. The shaft, now down about 700 ft., will be sunk to a depth of 1500 or 2000 feet.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

ALBERT BURCH is at Goldfield.

HENRY JANIN is in San Francisco.

FRANK KEEVER is in San Francisco.

DAVID GOODALE is in San Francisco.

DUNCAN MACVICHIE is in New York.

O. BERGSTROM has been in San Francisco.

COURTENAY DE KALB has gone to New York.

G. W. HEINTZ has returned to Salt Lake City.

S. L. KNOX, of El Paso, Texas, is in San Francisco.

J. L. KING, of Denver, was in San Francisco recently.

GELASIO CAETANI is expected to return from Colorado today.

CHARLES JANIN has gone to the dredging fields of California.

H. W. REED, of Salt Lake City, is at Long Beach, California.

E. H. HOAG, of San Francisco, is at Mazatlan, Sinaloa, Mexico.

MALCOLM MACLAREN is now at Jackson, Amador county, California.

W. F. ENGLEBRIGHT, of Nevada City, California, is in San Francisco.

EDWIN E. CHASE will be at Parral, Chihuahua, Mexico, during this month.

JOHN A. STREET, of Salt Lake City, is at the Palace hotel, San Francisco.

FRANK LANGFORD has left Rancagua, Chile, and is at Eureka, California.

ARTHUR W. BURGREN is engaged in mining operations at Minillas, Zacatecas, Mexico.

C. W. PURINGTON is in London and will return to St. Petersburg early in December.

WALTER W. DAVIS is now general manager for the Smuggler mines at Aspen, Colorado.

ARTHUR L. PEARSE has arrived from London, and is staying at the Palace hotel, San Francisco.

Inquiry is made for the address of JAMES LESTER, who is associated with the Tramp claim in Nevada.

EDWIN J. COLLINS, of Duluth, is examining some gold properties in El Dorado county, California.

L. L. JAMES will return to Fairbanks, Alaska, from San Francisco, where he has spent nearly two months.

WALDEMAR LINDGREN has accepted the office of Chief Geologist of the United States Geological Survey.

CHARLES N. GOULD has resigned as director of the Oklahoma Geological Survey, and will take up private practice.

W. H. EMMONS, of the State University of Minnesota, has been elected director of the Minnesota State Geological Survey.

ALFRED HASELBRINK, who is in the Prussian Government Mining Service, was in San Francisco, and has gone to Salt Lake City.

C. COLCOCK JONES has returned to Los Angeles after a month's absence in the Lake Superior and Pittsburg regions on professional business.

RALPH B. WILLIAMS has moved from Newburyport, Massachusetts, to Minas Pecolotes y Anexas, Santa Barbara, Chihuahua, Mexico.

CHESTER B. ALLEN, resident manager for the United Gold M. & M. Co., has been inspecting hydraulic mining properties in Trinity county, California.

REUBEN W. LEONARD has been appointed, by the Canadian Government, chairman of the National Transcontinental Railway Commission, which has charge of the construction of the eastern section of the Grand Trunk Pacific.

Market Reports

LOCAL METAL PRICES.

San Francisco November 9.

Antimony	11—11½c	Quicksilver (flask)	45.5
Electrolytic Copper	14—15¼c	Tin	45—46½c
Pig Lead	4.50—5.45c	Spelter	7¼—8¼c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50—9.75; large $7.50—8.50

METAL PRICES.

(By wire from New York.)

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Nov. 2	12.28	4.23	6.20	54⅝
" 3	12.28	4.23	6.20	54⅝
" 4	12.28	4.23	6.20	54½
" 5	Sunday.	No market.		
" 6	12.33	4.23	6.20	54¾
" 7	Holiday.	No market.		
" 8	12.33	4.23	6.20	55

ANGLO-AMERICAN SHARES.

(Cabled from London.)

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

	Nov. 1. £ s. d.	Nov. 9. £ s. d.
Camp Bird	1 8 6	1 11 6
El Oro	1 3 0	1 3 0
Esperanza	1 13 9	1 13 1½
Dolores	1 5 0	1 5 0
Oroville Dredging	0 5 0	0 5 0
Mexico Mines	6 18 9	7 17 6
Tomboy	1 3 1½	1 3 0

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing Prices. Nov. 9.		Closing Prices. Nov. 9.
Amalgamated Copper	$ 57	La Rose	$ 3⅞
A. S. & R. Co	70⅝	Mason Valley	8⅞
Braden Copper	4⅞	Miami Copper	19⅞
B. C. Copper Co	3⅞	Mines Co. of America	4
Butte Coalition	17¼	Nevada Con	16⅞
Chino	22⅝	Nevada Utah	⅛
Davis Daly	⅞	Nipissing	7⅜
Doble	1¼	Ohio Copper	1⅛
Dolores	4	Ray Central	2⅛
First National	1	Ray Con	14¼
Foley O'Brien	⅜	South Utah	⅛
Giroux	4⅜	Superior & Pittsburg	17
Goldfield Con	4⅝	Tenn. Copper	36¾
Greene-Cananea	7⅛	Trinity	2⅞
Guanajuato Con	⅛	Tuolumne Copper	3¾
Hollinger	11⅝	United Copper	1¼
Inspiration	8⅝	Utah Copper	47¾
Kerr Lake	3	Yukon Gold	3⅝

COPPER SHARES—BOSTON.

(By courtesy of J. C. Wilson, Mills Building.)

	Closing prices, Nov. 9.		Closing Prices Nov. 9.
Adventure	4	Mohawk	$ 42
Allouez	29	North Butte	25⅜
Calumet & Arizona	49¼	Old Dominion	43¼
Calumet & Hecla	385	Osceola	91
Centennial	9¼	Parrot	9¾
Copper Range	53	Shannon	7¼
Daly West	5¼	Superior & Boston	3⅜
Franklin	7⅜	Tamarack	25
Granby	30	Trinity	2¼
Greene Cananea, ctf.	7¼	Utah Con	15¼
Isle-Royale	15	Victoria	2¾
La Salle	4⅜	Winona	3¼
Mass Copper	5⅛	Wolverine	83

NEVADA STOCKS.

(By courtesy of San Francisco Stock Exchange.)

San Francisco, November 9.

Atlanta	$ .16	Mayflower	$ .03
Belcher	.65	Mexican	3.57
Belmont	8.25	Midway	.25
B. & B.	.13	Montana-Tonopah	.93
Booth	.07	Nevada Hills	2.57
Chollar	.10	Ophir	1.80
Combination Fraction	.08	Pittsburg Silver Peak	.95
Con. Virgina	.79	Round Mountain	.58
Florence	.70	Sandstorm Kendall	.03
Goldfield Con.	4.50	Savage	.12
Gould & Curry	.11	Tonopah Extension	1.1
Jim Butler	.21	Tonopah of Nevada	6.9
Jumbo Extension	.20	Union	1.47
MacNamara	.27	West End	.83

Company Reports

CONSOLIDATED M. & S. CO. OF CANADA, LTD.

The net profit of this company for the year ended June 30 was $202,278. Added to the balance of the profit and loss account of the previous year, this makes a total for that account of $873,289.

The tonnage of ore handled at the smelter was 388,785 tons, as against 487,125 tons in 1910, the decrease being mainly due to the abandoning of the Snowshoe lease. The bank overdraft, however, has been reduced by the sum of $181,980, which is considered satisfactory in view of the unfavorable conditions existing during the year. The capital stock has been increased by the issue of 2500 shares of the par value of $100 each. These were subscribed for at par and realized $250,000 cash. This amount was expended partly in purchasing stock and bonds of the Fort Steele Mining & Smelting Co., owners of the Sullivan mine, and partly in development of other properties.

The property and plant accounts, after writing off $193,342.27 from the profits of the year, show an increase of $171,533.63 over last year. Since June 30 the directors have purchased from the liquidator all the property of the Le Roi Mining Co. at Rossland.

The gross value of metals produced at the company's smelting works for the year was $4,437,901, as compared with $5,911,767 for the previous year, a decrease being shown in all of the metals. There was an increase in the production of the Centre Star and Sullivan groups, the Molly Gibson and Number Seven have entered the list of shippers, and the remainder of properties show a decrease. The large decrease in total production is due to the working out of the St. Eugene, dropping the Snowshoe lease, and to the fire in the Slocan a year ago, which closed down the Kaslo & Slocan railway and caused a large decrease in shipments from that district.

In the Rossland mines, ore developed and shipments have about balanced. Although the tonnage developed was numerically less than for the previous year—194,000 tons as against 245,000 for the year 1910—the average value of the ore developed this year on the lower levels was higher.

BROKEN HILL PROPRIETARY COMPANY, LTD.

The report for this company for the six months ended May 31 shows a profit for that period of £126,800, as against a profit for the preceding six months of £102,928. Among recent improvements by the company is the introduction of mechanical feeders at the Port Pirie smelter, which will eliminate the uncertainty of labor supply. As the machinery allows a saving of about £30 per day over manual labor, it is estimated that it will pay for itself in two years. Construction for the Dwight-Lloyd process, which had been delayed by the non-arrival of the machinery, is being rushed and should be completed by the end of November.

Compressed-air pumps have given place to electric pumps. This form of pump is now being erected at the 1200-ft. level. Important improvements have been made in the concentrating plant. During the period covered by the report 52,441 tons of ore was treated in the old mill, and in the new mill 159,609 tons of tailing was treated. As the sulphuric acid plant has not been working at full capacity the cost of operation has been higher than otherwise would have been the case. The acid produced amounted to 2626 tons, as against 3432 tons during the preceding six months. Three roasters have been in operation on zinc concentrate and treated 1897 tons. The sulphurous gas obtained from the concentrate was equivalent to 376 tons of crude sulphur. The zinc-separation plant, in spite of Christmas and Easter cessations, treated practically the same tonnage as during the previous half-year. A permanent plant for slime treatment is planned, as an experimental 10-ton plant has been quite successful. Owing to the success of the flotation process it is probable that the sintering works will be abandoned.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS

INJURY TO MINER—ASSUMPTION OF RISK

In the operation of a mine it was the duty of the mine owner to furnish props to support the roof and it was the duty of the miner to set such props as the work progressed and the end of the room of the mine was extended. In the operation of the mine the miner was killed by the falling of the roof. The undisputed evidence showed that the deceased was an experienced miner and knew the necessity of propping the roof as he advanced farther in his work and of the danger of its falling if not properly supported, and that when he went to work the morning of his death he, with his assistant, examined the roof and it seemed all right. It appeared also that he worked from two to four days without putting up props and then called on the mine foreman for props and was told to go ahead with the work and the props would be sent and that the deceased did thereafter work extending his room when the unsupported roof fell and killed him. In continuing his mine and extending his room without propping the deceased well knew and appreciated the danger and assumed the risk although the mine owner neglected to furnish the necessary props. It is not a case of a master furnishing a defective appliance or a place which he promises should be repaired and made safe; but it is a case where assurances of safety was given to the servant who was making his own place to work which he knew as well as any one could know would be and was dangerous without using the appliances the master promised to furnish, and which he knew had not been furnished, and he well knew in continuing to work therein he was in danger and was increasing the danger with every stroke of the pick, as he was an experienced miner and well knew the necessity of propping the roof as he advanced. Under such circumstances the deceased had no right to rely either on the statement of the foreman that the top was all right or that the props would be furnished at some future time. Under such circumstances the Federal court held that as a matter of law the deceased, in continuing to work in the mine in the absence of sufficient propping to support the roof in his room assumed the risk of injury from the falling roof and the mine owner was not liable.

Republic Iron & Trust Co. *v.* Thomasino, 176 Federal, 49. Feb. 1910.

CONSTRUCTION OF LEASE OF MINE—IMPROVEMENTS

A lease of a coal mine and appliances provided that the lessee should be paid the value of all permanent improvements made by him, not exceeding $5000, to be ascertained by arbitration. The lessor had the option to pay or not to pay for such improvements, and if he elected not to pay the amount fixed by the arbitrators the lessee had the right to remove such improvements. In an action between the lessor and the lessee it was held by the court that when the lessor elected not to take and pay for the improvements the lessee had the right to remove them; but where the lessor did not elect not to take the improvements, and they were left on the leased premises, the lessor was chargeable with the reasonable value of such improvements not exceeding $5000. It was also held that the amount of damages sustained by the lessor by reason of the failure of the lessee to return the mine in better condition and repair than when he received it, as provided by the lease, was a question of fact to be determined by the jury, and the court on appeal would not disturb the finding of the jury as to the amount of such damages; and in order that the jury might determine the amount of the damages, it was proper for the court to order an inspection of the premises and to permit the lessee to enter upon the property and pump the water out of the mine, so that witnesses could make a proper inspection and testify accordingly.

Henderson Mining & Manufacturing Co. *v.* Nicholson, (Ky.) 126 Southwestern, 139. March 1910.

Recent Publications

University of California Bulletin. Third Series. Vol. V, No. 3. Pp. 48. Berkeley, California, September 1911.

Commercial Fertilizers. By John S. Burd. Bull. No. 221. Pp. 62. Agricultural Experiment Station, Berkeley, California, October 1911.

Clay Products of the United States, 1910, with Corresponding Totals for 1909. U. S. Geol. Surv., Washington, D. C., September 1911.

Honey Plants of California. By M. C. Richter. Bull. No. 217. Pp. 64. Index, ill. Agricultural Experiment Station, Berkeley, California, June 1911.

University of Pittsburg Bulletin. School of Mines Edition. Announcement for 1911-1912, Vol. 7, No. 2. Pp. 181. University of Pittsburg, Pennsylvania, 1911.

Economic Geology of Richmond, Virginia, and Vicinity. By N. H. Darton. U. S. Geol. Surv., Bull. 483. Pp. 47. Index, ill., map. Washington, D. C., 1911.

American Produce Markets. The Annals of the American Academy of Political and Social Science, Vol. XXXVIII, No. 2, Philadelphia, September 1911. Pp. 351. Index.

Zinc and Cadmium in 1910. Smelter Production. By C. E. Siebenthal. Advance Chapter from 'Mineral Resources,' 1910. U. S. Geol. Surv., Washington, D. C., 1911. Pp. 51.

Work on National Consumers' League. Supplement to The Annals of the American Academy of Political and Social Science, Philadelphia, September 1911. Pp. 76. Illustrated.

The Production of Iron Ore, Pig Iron, and Steel in 1910. By Ernest F. Burchard. Advance Chapter from 'Mineral Resources,' 1910. U. S. Geol. Surv., Washington, D. C., 1911. Pp. 36.

Official Publications of Cornell University. Advance Copy. The President's Report, 1910-1911, Vol II, No. 18. Pp. 47, CXV. Cornell University, Ithaca, New York, December 1911.

Avifauna of the Pleistocene Cave Deposits of California. By L. H. Miller. University of California Publications, Bulletin of the Department of Geology, Vol. 6, No. 16. Pp. 16. Berkeley, California, October 1911.

Comparative Statistics of Lead, Copper, Spelter, Tin, Aluminum, Nickel, Quicksilver, and Silver. 17th Annual Issue, 1901-1910. Pp. 103. Metallbank und Metallurgische Gesellschaft, Frankfort-on-Main, July 1911.

A Series of Eagle Tarsi from the Pleistocene of Rancho la Brea. By L. H. Miller. University of California Publications, Bulletin of the Department of Geology, Vol. 6, No. 12. Pp. 12. Berkeley, California, October 1911.

Notes on the Relationship of the Marine Saurian Fauna Described from the Triassic of Spitzbergen by Wiman. By John C. Merriam. Notes on the Dentition of Omphalosaurus. By John C. Merriam and Harold C. Bryant. University of California Publications, Bulletin of the Department of Geology, Vol. 6. No. 13 and 14. Pp. 16. Berkeley, California, October 1911.

Astronomical Field Tables for the Use of Engineers and Surveyors. Instructions Covering Astronomical Tables. The Topley Co., Ottawa, 1911. 16 pp. each. These two booklets, issued by the Topley Co., will prove useful. The tables are issued in four parts, covering the period from November 1910 to August 1913. However, September 1911 is in part 1, with August 1912, while March 1911 is in part 4, with June 1912, an arrangement which scarcely seems likely to conduce to convenience. The instructions for the use of the tables are in a separate booklet, but this has the advantage that an engineer familiar with the use of tables need not cumber his notebook with unnecessary material.

Book Reviews

Any of the books noticed in these columns are for sale by, or can be procured from, the Mining and Scientific Press.

Uruguay. By W. H. Koebel. Charles Scribners Sons, New York, 1911. 350 pp., ill. Price $3. For sale by the *Mining and Scientific Press.*

This volume is the sixth of a series on South America, published by Charles Scribners Sons, the preceding volumes having dealt with Chile, Peru, Mexico, Argentina, and Brazil, respectively. Mr. Koebel, who is well known for his writings on South America, after a general description of Uruguay, devotes eight chapters to its history. This is followed by chapters on Uruguayan manners and customs, the aboriginal tribes, and ten chapters descriptive of travels throughout the republic. Chapters on Uruguay as a pastoral country; departments, climate, and natural history; industries and natural wealth; communications and commerce follow, and a discussion of politics concludes the book. In the chapter on natural wealth the Corrales, Cuñapiru, and Zapucaya goldfields are briefly described, and the occurrence of silver, copper, iron, and other metals is referred to. The volume will prove of much interest to anyone wishing to obtain a general idea of the comparatively little known country.

Technical Analysis of Brass and the Non-Ferrous Alloys. By William Benham Price and Richard K. Meade. John Wiley & Son, New York, 1911. 267 pp. Price $2 net. For sale by the *Mining and Scientific Press.*

This volume is better than its promise, for in addition to methods for the analysis of brass and other non-ferrous alloys an excellent discussion of such alloys and their uses is given. The analysis of such products is a matter of special knowledge and one not easily available to the majority of analytical chemists. In the making of alloys the addition of small amounts of certain elements has a marked effect upon the properties of the resulting product, and only a refined analysis is of any service, therefore, in the judgment of composition. By gathering in so convenient form the accepted methods of procedure Messrs. Price and Meade have conduced to a higher standard of work, and their manual will be of much service. An excellent feature of the book is the devoting of over one hundred pages to applied examples of the analysis of various alloys. To many this will be the most serviceable feature of the volume, and the comprehending of general methods of work is usually much easier than their application to the determination of special cases. The book is likely to prove a most welcome one, therefore.

Catalogues Received

Nelson Valve Co., Philedalphia. 'The Nelson Blow-off Valve.' 12 pages. Illustrated. 5 by 7½ inches.

Bausch & Lomb Optical Co., Rochester, New York. 'Projection Apparatus.' 68 pages. Illustrated. 6½ by 10 inches.

E. I. du Pont de Nemours Powder Co., Wilmington, Delaware. 'Blasting Supplies.' 126 pages. Illustrated. 6 by 9 inches.

Lane Mill & Machinery Co., Los Angeles. Sixth edition of catalogue of 'Lane Mills.' 48 pages. Illustrated. 6 by 9 inches.

Carnegie Steel Co., Pittsburg, Pennsylvania. 'Heat Treated Axles, Shafts, and Similar Parts.' 40 pages. Illustrated. 5 by 7½ inches.

Ingersoll-Rand Co., New York. Bulletin 3109. 'Class NF-1 Steam Driven Single Stage Straight Line Air Compressors.' 12 pages. Illustrated. 6 by 9 inches. Bulletin 3007. 'Class PB Duplex Power Driven Air Compressors.' 24 pages. Illustrated. 6 by 9 inches. Bulletin 3210. 'Class NE-1 Power Driven Single Stage Straight Line Air Compressors.' 12 pages. Illustrated. 6 by 9 inches.

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EDITORIAL

COPPER prices have advanced, which, together with the unexpected decrease in the surplus on November 1, is welcome news to producers.

NIPISSING continues to be a steady producer of a little less than 450,000 ounces of silver per month, and exhibits the fact that silver mining, though unobtrusive, is yet important.

RECORDS of more than one kind have been made at the Panama Canal, and a lasting one will have been established if, as now seems probable, the work of construction will be completed 18 months before the date first set, and within the estimated cost.

KATALLA is a promising oilfield. The Amalgamated Company, which acquired the holdings of the former English company, now has five wells producing, and others are being drilled. A small refinery at Katalla is producing kerosene and gasoline for the local market, and supplies a growing demand.

ILLINOIS has produced more coal than any other State except Pennsylvania; the total tonnage since 1883, when coal mining first began in the State, being 790,333,235 short tons, according to the United States Geological Survey. Last year the production was 45,900,246 tons and the State stood third, Pennsylvania producing 235,006,762 and West Virginia 61,671,019 tons.

UNCERTAINTY seems the foremost characteristic of the industrial situation. One court decision in corporation cases is hailed by the iconoclasts, the next by the conservatives. The American Tobacco decree strengthens the hopes of the latter. And when both sides are alternately pleased and disappointed it is evident that the courts must be hewing pretty close to the line.

CAMP BIRD has been a great mine, and, though it has passed its zenith, is still great. During the year ended April 30, 1911, a net recovery of $1,676,065 was made from 79,186 tons of ore at an operating profit of £267,689, and dividends amounting to £220,000 were paid. The ore reserve is now less than in any previous year, and the Santa Gertrudis is expected to take up the dividend record of its predecessor.

ALASKA'S citizens have united to effectively present their views at the coming session of Congress, and a committee has been appointed to make arrangements for a general convention to be held at some point on the coast in the near future. This is as it should be, and the sentiment of the preliminary meeting that local jealousy must not be allowed to stand in the way of the larger good of all Alaska augurs well for the outcome.

MOTOR-CAR service from Kalgan to Ku-Luen across the Mongolian desert will soon be available, as, according to recent reports from China, the Military Council has already purchased the cars. The automobile has already shown its effectiveness in desert travel in Nevada, and that the Mongolian deserts are not beyond its powers was demonstrated in the Peking to Paris road race. The expedited service is expected to materially aid in the government of the province, which is now inclined to be somewhat out of hand. The Mongol Princes, though primitive in their manner of living, are not unaware of the comforts of civilization, one of them having purchased, upon a recent visit to a treaty port, the entire stock of thermos bottles in the city.

THE SAN JUAN DISTRICT is properly elated over an offer made by the Telluride Power Company to supply electric power for prospecting purposes at half the rate charged operating companies upon 1000-horse-power contracts. This is not only a generous offer, it is also good business. The low rate probably does not involve an operating loss to the power company, and will serve to develop mines that will be profitable consumers. The Colorado gentlemen are on the right tack.

MUCH surprise was created by the recent announcement that three American cardinals would be appointed by the papal consistory to be held on November 27. The impression has been rife that so long as Cardinal Gibbons lived, no additional American cardinals would be appointed. Though the United States is a stronghold of the Roman Church it has never been adequately represented in the college of cardinals, and the announcement is therefore as pleasing as it was unexpected.

PENSION SYSTEMS are becoming more popular in all countries, a notable recent accession to the list in the United States being the gift, on November 1, by J. Ogden Armour, of $1,000,000 to establish a pension system for the employees of Armour & Company. After reaching 57 years of age employees who have served 20 years may be pensioned, while women may retire at 50 years. *En passant*, it would be interesting to know whether the donor regarded 7 years as the average discount to which woman's age is subject.

POSTAL SAVINGS BANKS were hailed with much acclaim at the time of their establishment, and the recent sale of $2\frac{1}{2}$ per cent postal savings bonds, into which deposits are convertible at par, at $92\frac{1}{2}$, comes as something of a shock. The extraordinary discount is attributed to defects in the law establishing the service, and the matter will be investigated, with a view to recommending changes in legislation. It is interesting to note also that a monetary commission recently met in Chicago to codify the national banking laws and to recommend needed legislation to Congress.

WAR, even with the modern improvements, apparently does not differ materially from General Sherman's description of it. The Turkish minister at Washington has lodged a protest with the Government of the United States against Italian methods of warfare in Tripoli. At the same time reports of massacres in Nanking and Hankow are received from the Orient. Reports of this character are usually grossly exaggerated, but nothing is clearer than that when men go to war the elemental savage comes as strongly to the fore in the twentieth century as in the fourteenth.

MINING ENGINEERS in Los Angeles are making commendable efforts to organize a local section of the American Institute of Mining Engineers, with club rooms in a convenient neighborhood. Every such effort should be warmly seconded. The gradual growth of society has, in America, tended to minimize opportunity for social intercourse, and the anecdote of the father who, by special appointment, saw his infant son once before sailing for Europe, has more than humor in it. We are much poorer from the lack of what is too often regarded as 'idle talk,' and anything which tends to promote good fellowship among engineers and intercourse upon other planes than those of business is for the real good of all.

POLITICAL prospects are of universal interest, following the recent elections. Prophets and prognosticators find room for much difference of opinion, as the straws do not all point in the same direction. The lack of strength shown by Woodrow Wilson in his home State seems to indicate that he cannot be relied upon as so strong a Democratic candidate as was once hoped. Apparently neither a paramount issue nor an especially promising candidate has as yet been brought forward. That there is widespread dissatisfaction with the present administration is indubitable; there is a general feeling that the ship of State has often been steered by invisible hands, and ever since the days when men lived in caves they have dreaded the unseen. Theodore Roosevelt conducted affairs of state with a high hand that aroused resentment in many quarters, but gave rise to the satisfactory feeling that matters were in the hands of a vigorous and alert leader who might be mistaken but who was not likely to be imposed upon. The industrial and economic upheaval through which we are now passing is of vital importance; an equally strong though less erratic leader is greatly to be desired. Will he be found?

Conservation of Oil Resources

Oil resources and their conservation are elsewhere discussed by Mr. M. L. Requa, who, as might be expected, illumines the subject with the lamp of knowledge. Reckless depletion of a supply that is not inexhaustible in order to reap quick profits has not always received the condemnation it deserves, and the spectacular features of a Lake View or Potrero 'gusher' serve to obscure the deplorable and uncontrollable waste which they represent. In calling attention to the necessity for restraint and conservation, by private initiative or by governmental control, Mr. Requa performs a service to the industry that should meet with universal support.

Mr. Requa is naturally partial to oil, and, though commending his deductions, yet it is also possible to consider the power-fuel situation from another viewpoint. We have previously drawn attention to factors which militate against the universal adoption of oil as a source of power. As pointed out by Mr. Requa, oil at 30 cents per barrel at the well is approximately on a par with coal at $1.10 per long ton at the mine, the average for bituminous coal in the United States. Obviously, then, the critical factor is transportation, since the basal prices are equal. The field is an open one, oil having the advantage of convenience in use, against which must be set the special equipment necessary for its utilization, the possibility of an eventual failure of the supply, and, in the case of steamships, the fact that it is not obtainable in every port. Nor can oil ever completely displace coal, any more than the automobile has been able to displace the horse; there is room for both, each in its proper field. The high transportation costs, which now place coal at a disadvantage, seem more susceptible of decrease than the cost of production and transportation of oil. The battle will always be fought upon the issue of cost per horse-power hour, with lesser advantages and disadvantages upon either side.

Is 'Cheap' Labor Economical

Certain topics seem destined, from their nature, to perpetually furnish themes for never-settled discussion. One of these is the advantage derived from the use of so-called 'cheap' labor, which is introduced by the author of the interesting review of the Gold Coast, appearing elsewhere. Cheap labor is usually taken to mean unskilled, in the most elemental use of the word, labor, such as that commonly available in abundant supply wherever the white man comes into contact with native tribes whose plane of civilization is low, though sometimes the term is more loosely used to include labor obtainable at a low wage yet possessed of much skill, either native or acquired. In any discussion of the subject the two classes should be sharply distinguished, for generalizations which cover the first class are obviously incorrect when applied to the second. The characteristics of a Japanese carpenter and a Chinese mechanic cannot be grouped with those of a bushman. The question is one that should not require overmuch discussion to elicit exact information, for the amount of useful work obtained from a 'cheap' laborer in return for his daily wage apparently should be susceptible of direct measurement. Actually, however, the output of a laborer is not amenable to a brake test, but must usually be estimated, thereby introducing the fallible element of judgment. Furthermore, the usefulness of a laborer is not capable of determination in the simple terms of horsepower, but includes such elusive terms as teachableness, initiative, docility, endurance, and loyalty, to mention but a few. It is clear that the degree in which these are exhibited will vary not only with the race and the individual, but also with the character and personality of the employer and 'boss.' This alone would serve to explain the wide divergence of opinion among engineers as to the worth of a given race.

The Koreans, for example, are frequently referred to as the best type of native miner. An examination into their character discloses that they are hardy and industrious, as tractable and teachable as children, and with a certain predisposition for mining work engendered by centuries of operation by native methods. The Japanese, on the other hand, are of a more intractable disposition, having acquired in a feudal type of civilization a high-spirited and resilient temperament that is less satisfactory for unskilled labor, but capable of immensely better results where the element of skill is involved. Between the two, and combining many of the good elements of both, is the Chinese laborer. His chief drawbacks are an inbred conservatism, which makes alteration in methods employed difficult, and a tendency to clannishness which is often more effective than trade unionism. This can be easily counteracted by forming gangs of men from different provinces, as they then will not 'stick together.' In the case of a Chinese laborer there can be no doubt that his cheap labor is economical. It may even be put upon a fuel basis: the cost of feeding a Chinese laborer in China may be given as 5 cents per day, regarding this as a fuel cost, the human machine is decidedly effective as compared with any possible application of machinery at the prevailing cost of fuel. It must be remembered that there is no interest and depreciation upon a coolie, and no amortization charges are necessary. Over against this must be set the fact that certain tasks are impossible of performance by any possible aggregation of human units. A lead disk with attached ropes makes a fairly effective steam-roller when welded by a dozen active coolies, but no human aggregate could perform the work of a rail-mill, to name but one of the many types of specialized machinery to perform special tasks. There are certain tasks, therefore, in the performance of which human labor, even at minimal prices, could not be economical, but this does not nullify the advantage derivable in other cases. The problem is obviously not one capable of being treated in sweeping generalizations. Race characteristics, working conditions, the effectiveness of training and supervision, and the task to be performed are all critical factors, and must be carefully considered. Next week we purpose to analyze in detail the characteristics of Chinese labor, as exhibited in the Orient, and our readers are cordially invited to make use of our columns to record their experience with and opinion of other types of native labor.

Potash

Potash has been the exciting cause of no little interest recently, but, as is often the case when technical matters are discussed by the non-technical press, much that is misleading has been put forth. A recent editorial in a leading daily journal is entitled, 'Potash is Better Than Gold,' which is as rational as to say that coal is better than custard. The facts of the matter are, briefly, that potash, like nitrogen, has always been a source of worry in the effort to obtain an adequate supply. The reason for this is much the same in both cases; potash salts and nitrates are very easily soluble, and therefore the leaching action of the rains upon the earth's crust have a tendency to dissolve them out and carry them away. This is further complicated by the instability of the nitrates, leading to their decomposition; on the other hand, the potassium which existed as an original constituent of the earth's crust tends, during the chemical changes attendant upon sub-aerial metamorphism, to lock itself up in clayey minerals from which it can only slowly and with difficulty be wrested by the chemical changes accessory to the growth of vegetation. Animals derive their supply of this necessary element either by browsing upon the vegetation or by devouring animals that have already supplied themselves with potash from the plants. In order to keep up the fertility of the soil, animal waste and decayed vegetation are applied to its surface, and the efficacy of this method is shown by the fact that the abundant crops of the sandy plain comprising all central China, have for centuries been secured by just such means.

When the need of potash for manufacturing purposes was limited to soap-making and a few other simple industries, the supply was easily maintained by leaching the ashes of burned vegetation. But with the great growth of modern chemical industry the demand increased rapidly, and fortunately was met by the discovery of large deposits of potash salts near Stassfurt. These, under the wise policy of conservation adopted by the German Government, will furnish an adequate supply for many years to come. With the increasing cost of labor the expense of gathering and applying animal and vegetable waste as a fertilizer is becoming prohibitive and, in addition, the so-called 'chemcal' fertilizers, which are prepared by mixing the chemical ingredients required by plant life in the exact proportion required by the crops to which they are to be applied, are quicker-acting and produce larger crops. This is in large part responsible for the greatly increased demand. Germany, having a practical monopoly of the supply, is enabled to maintain prices at a level slightly below that at which it would be more economical to utilize the original sources of supply. The search for potash deposits in other countries is correspondingly stimulated, but the results have as yet been meagre. Reports of the discovery of 'potash ore' have usually upon investigation proved to be founded upon feldspar or pegmatite deposits, which, though containing potash, are not as yet possible sources of supply. The old method of leaching plant ashes, seaweed, for example, is still the most promising method of developing a local supply. Arid regions, such as Nevada and neighboring States, may eventually disclose deposits of potash salts of commercial value, and free the United States from dependence upon a foreign country for a supply of a necessary element, though this should be regarded as a possibility rather than a probability.

Present Conditions in the California Oilfields

By M. L. Requa

*California has, during the past two years, developed the Midway, a new and important oilfield. In it was the Lake View gusher, credited with a total production in excess of 8,000,000 bbl. Fortunately for the oil industry of the State, nothing save a crater-like opening now marks its position. The pipe is entirely worn away, and it is seriously doubted whether anything can be done to cause the well to produce again. Fortunately again, no other comparable wells have been found. Midway is noted for large wells of 500 to 2000 bbl., but these decline rapidly and in a few months yield but a few hundred barrels per day. In proved oil territory there have been many changes during the year, but the total area will probably show but small net increase. The principal increases are from extensions of the Midway field, development of the Lost Hills and Bell Ridge, and extensions of the Fullerton-Whittier field in southern California. The fresh area absolutely proved is not much in excess of 3000 acres. Recent developments at Coalinga indicate the possible extension of that field to the south, but at great depth. Coalinga is still the most northerly field of any consequence in the State. The Kettleman Hills, tested to 3500 ft., have to date brought in nothing. Much of the territory proved within the year is extremely deep and expensive to develop and to operate. This, however, is not true as regards a narrow strip in the Lost Hills and the proved tract in the Bell Ridge fields, 26 and 12 miles northwest and north, respectively, of McKittrick. In these fields it is claimed that at depths of 600 to 1200 ft., 200 to 500-bbl. wells are the rule, and the oil is 23° or higher in gravity. At the moment this territory is the most disturbing factor in the State as regards future price of oil. It is too early to predict with accuracy the possibilities of the fields.

Geological ideas as advanced by the U. S. Geological Survey[1] must now be slightly altered. The Middle Miocene deposits are now known to become more petroliferous to the south, and the fact that they dip under the plain, becoming unconformably covered by McKittrick beds, indicates the possibility of commercial oil in the latter as well as the Vaqueros sandstone, and is important. Oil has actually been found in the McKittrick formation in the Lost Hills.

Naturally the sudden increase in production caused by the developments in the Midway field has led to a large surplus. Consumption has not kept pace with production, and it is highly improbable that consumption will, at any time in the future, increase as in the past few years.‘ Home markets are largely supplied, and future increase in consumption must depend upon larger population and more numerous shipments to South America. If a present daily production over 8 months ending September 1, 1911, be taken at 211,000, and the surplus at 34,500, the daily consumption amounts to 176,500 bbl., or 64,422,500 bbl. per annum. Compared with 1909, in which year consumption was 58,000,000 bbl., the increase is not large. The field price at present is approximately 30c. per barrel for fuel oil and 45c. for refining. There is no real reason why this price should not rule lower, as there are apparently some producers willing and anxious to sell at prices considerably below these figures.

Drilling is still active, although much of the work is being done by the Southern Pacific Co., which is reported to be running over 90 strings of tools. On January 1 last the number of rigs drilling was 567; on July 1, 492. For the six months the total production was 38,000,000 bbl. Consumption has not materially increased in 1911, and, on the contrary, has been falling in the past 90 days. The present amount of petroleum above the ground is approximately 40,000,000 bbl. The average daily surplus for 8 months ending August 30, 1911, was approximately 32,000 bbl. per day.

It is exceedingly to be regretted that the oil producers of California do not apparently as a whole realize the real cost of production. The older fields cannot hope to materially improve production costs, but on the contrary, as the deeper territory is drilled, and present producing wells decline, costs must inevitably advance. From territory of 2500-ft. depth total costs will approximate 30 to 35c. per barrel. For direct production, including pumping, cleaning, and pulling, 10c. per barrel may be safely assumed. For maintenance of surface equipment and rigs, 4c. is conservative. For exhaustion of oil land and redemption of capital, 6 to 10c. must be reckoned, and for drilling to maintain production, 12c. is not excessive. These figures total a minimum of 32c. and a maximum of 36. It is obvious that in any business where the risk is as large as in drilling oil wells, the profit should be in direct proportion to the risk. Under existing conditions in California, this is most emphatically not true.

Recent agitation that has brought about the dissolution of the Standard Oil Co. has in no way benefited the small producer. On the contrary, the situation has, if anything, been rendered more acute. Because of its self-contained character—that is, being at once a producer, transporter, refiner, and marketer—the Standard Oil Co. is able to earn a profit where the small producer is confronted with loss. Regulating prices by agreement, even within modest limits, is apparently today criminal. Because of this it is not possible to reach any agreement with the great factor in the California oil industry, and the Standard is exerting a stronger and stronger domination while the small producer is getting deeper and deeper into the mire. The utter failure of 'trust-busting', so far as commercial relief for California oil producers is concerned, is self-evident. It would be much more to the point if conditions were frankly faced as they exist, and regulation of output and prices permitted, if necessary, under Government supervision. What is being aimed at might be accomplished in that way. It is certainly not being accomplished by the present absurd methods. The Standard Oil Co. of California can quite as effectively dominate the field as ever did the parent company. Unless the country turns anarchist, confiscates property, and ignores vested rights, there is absolutely no way of curing the trouble save by pools and agreements recognized and encouraged by law. What is true of the Standard, as to cost of doing business, will apply, though in less degree, to the Union Oil Co., and to the Associated Oil Co. in still less degree since the latter is not in the refining business. To the small producer who depends for his profit on taking the oil from the ground and selling it to the transporting and marketing companies, the present conditions spell ruin unless corrected in the near future.

The waste of oil is appalling. Brought to the surface, it is allowed to lie for months in open earthen sumps. Storage tanks of steel, concrete, and earth are full to overflowing, and yet the daily surplus of 31,000 to 51,000 bbl. accumulates and is in part dissipated by evaporation. Probably not less than 4,000,000 bbl., and possibly double this amount, was lost last year by seepage and evaporation. This year will see quite as much similarly wasted. Much of this loss could be eliminated by agreements among the producers. Practical conservation would be along the lines of restricted production, permitting the oil to remain in its natural reservoirs underground until it can be produced and sold at a reasonable profit. To improve prices and relieve surplus, the suggestion has been made that large quantities of oil be burned. This would be an attempt to increase prices at the expense of natural resources. The mere suggestion of such a remedy for a condition that need not exist if sane conservation were effective, is suffi-

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*Abstract of a paper read before the A. I. M. E. at San Francisco, Oct. 11, 1911.

[1] Bull. 357, pp. 120-124; Bull. 406, pp. 206-209.

cient comment on the utter inability and ineffectiveness of theoretical cures. Thanks to existing laws, it seems that reckless squandering of resources must continue and the State be robbed of one of its greatest assets without satisfactory returns.

On the Pacific Coast of North and South America there has as yet been developed no deposit of coal equal in quality to the best Eastern, Australian, or Welsh. The cost of the non-uniform coal which is found and mined in Washington and British Columbia is much higher, as must also be similar coals awaiting development in Peru and Alaska. Excess in these coal costs and the poor quality of the article has, heretofore, not only retarded various industrial developments, but hindered manufacturing enterprises on the Pacific Coast. This condition, however, paved the way for the introduction of, great demand for, and marked success of the fuel par excellence in steam generation—California oil. A few comparative statements showing its superiority to coal in point of heat value and economy in firing boilers follow.

California oil in general use and under identical conditions gives uniform results. The evaporative power of the Pacific Coast coals varies greatly. Under horizontal boilers one pound of California oil should evaporate from 13 to 15 lb. of water. One pound of the best coal in use on the Pacific Coast will hardly exceed 9 lb., and 6 lb. is the figure for the lower grades. Taking the ratio of the two fuels in point of evaporative efficiency as 14 lb. to 8 lb., or 1.75 to 1, 1280 lb. or 3.8 bbl. of fuel oil is equivalent to one long ton or 2240 lb. of coal. In transportation the advantage in favor of cost by pipe-line is so great that the cheapest rail transportation cannot compete, although water transportation comes near doing so. Loading and unloading cost, in point of cheapness, loss from wastage and theft, and the decrease in stoking expenses, are to a high degree in favor of oil. Tests made by the A. T. & S. F. railroad,[2] extending over 30 days, with coal at $6.65 per ton and oil at $1.33 per barrel, showed a cost of 23.2c. per engine-mile with coal, and 14.4c. with oil. In this extended and practical test the gain in economy from use of oil was 38%. Geo. W. Dickie has furnished figures for a steamer of 3000 indicated horsepower steaming at 11 knots. With oil at $1 per barrel, the cost of fuel per day would be $300. In order to equal this with coal, it is necessary to have a delivered price of $4 and a fuel of 12,000 B.t.u. efficiency, when the cost becomes $288.16 per day. For coal of 10,000 B.t.u. delivered at a cost of $6 per ton, the daily fuel bill becomes $488.75. A vessel engaged in the coastwise trade between California points affords the following comparison:

Oil consumption per trip, 4000 bbl., cost	$4000
Firemen, wages and food	275
Total	$4275
Coal consumption, 1200 tons @ $4	$4800
Firemen, wages and food	1000
Total	$5800

This shows a saving of $1525 per trip in favor of oil, or, assuming two voyages a month, of $3050; a yearly saving, with 11 months operation, of $33,500. This at 6% is interest on a sum slightly under $560,000. Oil at $1 per barrel delivered on San Francisco bay is equivalent to about 65c. per barrel at the well.

The U. S. Geological Survey has estimated the probable minimum content of the known oil lands of the United States at 10,000,000,000 bbl., of which half is credited to California. The maximum was estimated at 24,500,000,000 bbl., allowing one-third for California. Personally, I believe that the maximum will unquestionably be in excess of 8,500,000,000 bbl. for California. The total production to September 1, was approximately 434,000,000 bbl., leaving a very large percentage still in the ground. It is safe to say that California oil will dominate the fuel market on the Pacific Coast during the present century and probably far into the next. Unless consumption is tremendously increased, this is undoubtedly true. These figures are, of course, only relative approximations, but are sufficiently accurate to warrant the assertion that California oil will dominate the fuel market of the Pacific at least through the present century.

Comparing California oil with Alaska coal, it is apparent that oil has complete control of the field. According to A. H. Brooks[3] Alaska coal can be landed at Puget Sound ports for approximately $4 per ton. Assuming 3½ bbl of oil to equal one ton of coal and oil at 50c. per barrel at the well, its comparative cost with coal per ton on Puget Sound would be $3.50. With oil at 75c. at the well, this cost should not exceed $4.20. At prices even in excess of this, consumers would not return to coal owing to the many indirect advantages accruing from the burning of oil. Costs at other points depend upon distance by sea. Assuming Valparaiso, Chile, as the southern, and Douglas Island, Alaska, as the northern extreme, with oil at 60c. per barrel at the well, coal must sell at $5 per ton at Valparaiso and $3.50 at Douglas Island to compete with oil in cost. This takes into consideration due allowance for interest, redemption funds, depreciation, and transportation. When the prices of oil are higher, coal still cannot compete, because the oil is so much more satisfactory. It is fair to assume that during the life of the oilfields there will be no fear of competition from coal until oil is selling at above 75c. per barrel.

LAKE VIEW WELL ON NOVEMBER 18, 1910.

Recent experiments indicate the possibility of oil being used for domestic purposes even in small dwellings. I am using it in my home for both cooking and heating, to the entire exclusion of coal, and a more recent device seems to make the first cost so small as to open the entire domestic field to oil consumption. If so, the consumption of coal will practically cease in California, and the public will cut fuel bills more than 50 per cent.

The action of the Government in withdrawing certain territory is a step in the right direction. Additional drilling at this time would benefit no one and would be an additional menace to an already overburdened situation. There is no storage so satisfactory as that afforded by the underground reservoirs from which the oil comes. It is free from cost of any kind, and seepage and evaporation are entirely eliminated. Some plan, however, should be decided upon whereby the land will become available as needed. Leasing under certain restrictions would seem to be a logical solution. At present it would be folly to open in any way this withdrawn area. Territory now producing can care for consumption for an indefinite period. As a suggestion I should say Government land should not be leased so long as oil at the well sells for less than 60 to 70c. per barrel, and that on leases so granted no new drilling should be permitted when prices rule below this figure. This would be sane and practical conservation, as it would permit production only in times of need and would conserve a great natural resource that, once exhausted, can never be replaced.

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[2] Report U. S. Naval Liquid Fuel Board, p. 16.

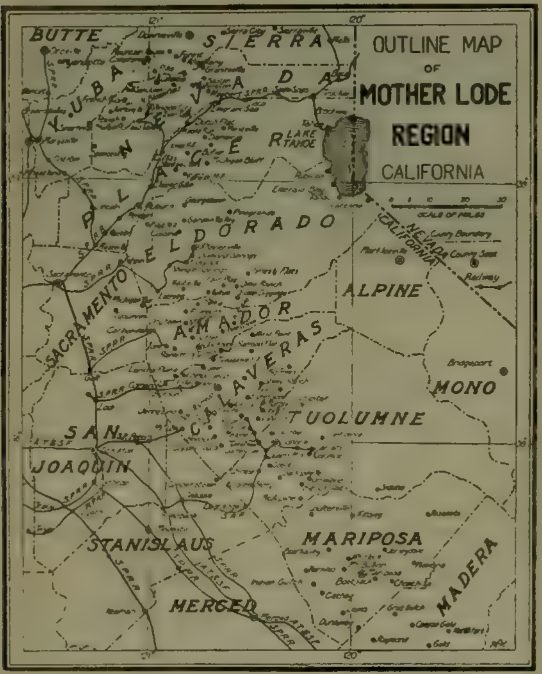
[3] U. S. Geol. Surv., Bull. 442-A.

Possibilities of the Mother Lode in Depth

By William H. Storms

Recent development on the Mother lode of California has stimulated in no small degree a renewed interest in the possibilities of the great lode in depth. Investigations as to probabilities, based upon the result of the development of the noted mines of the lode, particularly as to their features and the distribution of ore-shoots in depth, are daily being made concerning property that is absolutely without development. Obviously, every mine must depend for its success upon the conditions, geological, physical, and economic, obtaining within itself. While no two mines are more than similar, yet by comparison of various mines much may be learned that is of interest, and the close observer is enabled in this way to make fairly safe deductions from the observed facts.

If there were but one or two mines developed along the line of the Mother lode it would not be defensible to assume that these were typical of all other properties, as yet undeveloped, for these one or two examples might be unfortunately chosen, for the reason that at several places on the lode large sums of money have been spent in a fruitless and, in some instances, hopeless search for profitable ore. While it is not given to anyone, no matter how experienced, to see far into the ground, yet, observing geologists and mining engineers have learned by experience that along the Mother lode there are areas where the hope of ever developing a profitable mine is slender, to say the least, while in other places the conditions are such as to invite exploration with a reasonable probability of success in the development of a valuable mine. In this the ore deposits of the Mother lode are peculiar. The generally recognized limitations of the extent of the Mother lode are from the vicinity of the old village of Bridgeport, in southern Mariposa county, and extending from there in a northwesterly direction to northern El Dorado county, a distance of about 120 miles.



If, in traveling the length of this remarkable gold-bearing belt or lode, it is found that every mine that has been largely profitable has been characterized by a noticeable set of conditions, and it is also observed that every unprofitable mine is accompanied by another set of conditions, unlike the first, it must be concluded, whether unwillingly or not, that in undeveloped ground where the conditions that have been recognized as unfortunate are present, the proposal to undertake the development of such a piece of ground would very naturally be looked upon as one extremely risky, or at any rate, as one involving a risk greater than that which might be anticipated in a locality where the physical conditions were of that type that had been recognized as being constantly associated with those mines which have been profitable.

Since certain physical conditions are known to be the accompaniment of valuable mines, a pertinent question is: What are these conditions? Briefly, every profitable ore-shoot outcropping on the Mother lode is situated either on a smooth, unbroken hill, or on a nearly level tract of land, not cut by ravines crossing its strike. In contemplating this phenomenon it is necessary to discriminate between ore-shoot and mine, for a mine may have several ore-shoots. It has been observed by myself and a number of others, that on the Mother lode no ore-shoot *at the surface* crosses a gulch or depression, though an ore-shoot outcropping on a hill, may, in its downward trend along the plane of the fissure in which the shoot occurs, pass *in depth* beneath a neighboring ravine. The only explanation I have to offer for this remarkable fact is, that gulches, ravines, and depressions at the surface are usually the physical expression of geological disturbances beneath the surface. The primary cause may have been a fault, a fold, or it may have been caused by the fact that the rocks have been somewhat softened by crushing—the result of compressive stress—and therefore more easily eroded.

Thus far, throughout the length of the Mother lode no very profitable mine has been developed in an area where the surface is cut into a series of short ridges by ravines crossing the strike of the lode. It is needless to mention the mines on the Mother lode that are characterized by the 'favorable indications,' for the reason that every largely profitable property, beginning with the Princeton, in Mariposa county, and going as far north as the Union mine in El Dorado county is, without exception, situated on a hill, or in a flat area uncut by transverse gulches, or depressions, or, if such do occur, the ore-shoots lie between the depressions. Careful investigation fails to find a mine that has been largely profitable in a locality where the lode passes through a series of short broken hills. Ore-shoots may, and do, occur in such localities, but they are short and generally do not justify the extensive development and equipment for their proper exploitation.

For years the effort has been made to determine, if possible, whether there is any uniformity or system in the distribution of ore-shoots in the great lode, but thus far the data available fail to indicate any such regularity in the distribution of the ore. However, with the careful compilation of all the data that may be obtained, it is not improbable that some very valuable information would be forthcoming. It is a fact that in most of the mines the profitable ore was entered at from 100 to 600 ft. below the surface, and in one instance, that of the main orebody of the Central Eureka mine near Sutter Creek, the shaft was sunk in the fissure to a depth of 1000 ft. before profitable ore was found. At the Union mine in El Dorado county, the first pay-shoot occurred at the surface, though there were several shoots, or zones of rich ore down to the 1700-ft. level. At the Plymouth Consolidated mines in Amador county, the first rich zone outcropped at the surface, but within a hundred feet became poor, the shaft passing through an impoverished zone to a depth of about 600 ft., where rich ore was found that continued to a depth of 1600 ft., this shoot producing, it is reported $6,500,000. The depth of the shaft is 1700 ft., the lowest level being at 1600 ft. A disastrous fire occurred in the lower levels of this property about 1889, which caused a suspension of activities there, and the mines have remained practically idle ever since, but very recently Bewick, Moreing & Co.

have taken over the property and are arranging to unwater the levels so long flooded.

At the Gover mine of the Fremont Consolidated the good ore began at the surface and according to the management, has extended to the present lowest level of the mine, at 1680 ft. (1280 ft. vertical). Sinking is in progress to 1900 ft. in the inclined shaft. This property has produced over $5,000,000. It has had a varied career, having been repeatedly closed and reopened. It is only during the past few years under the present management that the mine has had the proper equipment.

The Keystone is one of the great mines of the lode. It has produced about $17,000,000, the most of which came from veins in the black clay slate and within 800 ft. of the surface. What there may be in that part of the mine below 1000 ft. vertical is wholly problematical. It seems not improbable that there may be other great orebodies there if development is undertaken in the right direction.

The ore-shoot that made the Lincoln mine famous forty years ago outcropped at the surface and extended downward to a depth of 350 ft., where it was terminated by a fault. This particular shoot of ore has never been rediscovered, I believe.

The Wildman-Mahoney mine, which joins the Lincoln on the south, also developed an ore-shoot at the surface. The mass of ore was wide and was worked by open-cut methods. Other shoots have since been discovered and worked out in these mines. These shoots have occurred at various levels. One of the latest developments in the Wildman mine was that of a mass of ore which, starting as a narrow vein a short distance south of the Wildman shaft, widened until it measured 170 ft. across. This discovery was made on the 1400-ft. level, and as no work has been done on it elsewhere, its real extent is unknown. It is unlikely, however, that it comes to the surface. All of the ore discovered in these mines in recent years is low grade, yet if the property were equipped with a modern plant of large capacity it is more than probable that it would again become a profitable mine.

The Eureka Consolidated mine, at Sutter Creek, is one of the most noted mines on the Mother lode. It was discovered in 1850. An ore-shoot outcropped at the surface, but it was too low grade to meet the expense of operation in those days, and it was not until a depth of about 200 ft. had been reached that rich ore was found. From that time forward for many years the Eureka was a large and profitable producer. It is credited with an output of $20,000,000. It is said that the profitable ore extended to a depth of 1700 ft., where the vein was 'broken up.' Just what really took place at that level I have never been able to ascertain, as the miners who worked there whom I have met are unable to explain the condition, not understanding it themselves. Many believe that if the workings were carried to greater depth (the deepest are now about 2200 ft. below the surface), good ore would again be found, which seems not at all improbable in view of the success attending deep mining at the South Eureka and at the Kennedy and Argonaut, all lying on the lode to the southward. It is said of the Eureka that the average of the ore to a depth of 500 ft. was $10 per ton, but that much of the ore below that level went $30 per ton.

The Central Eureka joins the Eureka Consolidated on the south. A shaft was sunk on this property about 1894, to a depth of 1000 ft. before reaching any ore. Three short shoots of ore were found at that level, and these were found in greater depth to have lengthened and, finally overlapping at the ends, formed a single shoot of good ore. This shoot extended downward to the bottom of the deepest workings, nearly 3000 ft. on the incline, and yielded dividends for a long period. North of this shaft a shoot was discovered in the early days and was worked until it dipped to the north into the adjoining Badger ground. This shoot, which was low grade on the surface, is said, at a depth of 165 ft., to have milled $25 per ton, although the vein became smaller in depth.

The South Eureka mine joins the Central Eureka on the south. There is no ore known to outcrop on the surface of this property, much of which is covered with the débris of an ancient river channel, chiefly andesite cobbles and boulders. In this mine a very valuable shoot of ore was found about four years ago by cross-cutting into the foot wall. Although this has since been extensively developed, no one as yet knows where it will be found to apex. It may come to or near the surface, but it is at present impossible to say. The discovery was made on the 2750 ft. level, and development has since been carried on both above and below this level, for a distance of several hundred feet.

The Oneida mine is situated just south of the South Eureka, and has recently come into the possession of the latter company. The Oneida has been developed to a depth of 2000 ft. and has had several ore-shoots. One of those first discovered outcropped at the surface where it was 300 ft. long, and 400 ft. long at the depth of 400 ft. The average yield of this ore was stated in the Government reports to have been $17.50 per ton. Another shoot of ore was found three years ago in grading for a narrow-gauge railroad which crosses the property. Some of this ore assays over $100 per ton, and it is said to average $40, but whether this is without sorting I am unable to say. In this property the ore-shoots are not continuous, but succeed each other to the lowest level.

MT. BULLION MINE.

The Kennedy mine is one of the noted gold mines of the world, not because of its richness, but rather from the simple fact that its management has been in the hands of men sufficiently progressive to sink shafts through barren or unprofitable zones, after passing through those that had been largely profitable at higher levels, until their shafts have attained a depth greater than those of any other gold mine in America. At present the lowest level is 3450 ft. vertically below the collar of the main shaft, which is about 150 to 200 ft. lower than the outcrop of the vein on the hilltop. The shaft is over 100 ft. lower than this lowest level. The result of this enterprise on the part of the Kennedy company, which, as indicated above, has together with the other mines of the Mother lode, seen its dark days, has been to demonstrate not only that the fissures of the great lode persist in depth, but ore, as profitable as was ever found in the mine at higher levels, has been developed in the lowest levels, at depths ranging from 2500 to 3450 ft. vertically below the surface; about 4500 ft. on the vein.

KENNEDY 100-STAMP MILL.

As previously indicated, the Kennedy mine has had its vicissitudes. In its early history, during the sixties, work was confined to that portion of the vein within 700 ft. of the surface. A quartz outcrop extends along the summit of the hill, marking the course of the vein, but this outcrop of quartz is poor in gold and most of it may still be seen in place. Somewhat deeper, however, good ore was found, and the early miners exploited the vein to a depth of 300 ft. near the north shaft and 700 ft. in the vicinity of the south shaft. At these depths, and along a line connecting them, the quartz disappeared, only the fissure filled with the slaty gouge remaining. The fissure was strong and continued in its course, both in depth and longitudinally. At 950 ft. in the south shaft quartz, mixed with slate, again made its appearance in the fissure and continued for hundreds of feet, forming a valuable shoot of ore. Near the north shaft the quartz did not reappear in the fissure until a depth of about 1400 ft. had been reached, but from that level downward it continued for several hundred feet. There were two distinct shoots of ore in this part of the mine, in the ore of which there was a marked dissimilarity, though both shoots were highly profitable. In the vicinity of the 2000-ft. level the condition of the mine was far from satisfactory. There was always some ore, but much of it was too low in grade to meet the expense of mining and milling. However, on the 2100-ft. level a vein was found which was a great surprise, as it came from the foot-wall greenstone to the westward, from which direction nothing was expected. This vein proved to be profitable, and was, perhaps, the salvation of the mine, as it gave the company the much-needed courage as well as the means to continue the exploration of the vein to still greater depth. Each year the workings were advanced to increasingly greater depth, the zone of impoverishment being at length passed. Below the 2400-ft. level it was found that the ore had improved wonderfully, and it has continued to not only hold its own, but to be even better than at some of the higher levels. The fact that the Kennedy is now producing over $100,000 per month with 100 stamps, and that the ore is all practically from levels below 2500 ft. vertically from the surface, including the deepest levels, is significant of what may be anticipated on the Mother lode at great depth. I consider it the best argument in favor of the deeper development of these mines, and that others think so too is shown by the present renewed activity on the lode.

The Argonaut mine, which joins the Kennedy on the south, is practically identical with it, the fissures extending from one property into the other. In depth of its workings it is next to the Kennedy, the South Eureka being third in this respect.

The Gwin mine in Calaveras county is one of the interesting mines of the lode, having produced several millions in gold. The statement is made in the sixth report of the State Mineralogist of California, p. 32, that the value of the ore in the early history of the Gwin mine was $8 per ton in free gold, besides which there was about 2% sulphides, which were worth $100 per ton. The first ore-shoot discovered in the Gwin mine outcropped at the surface and was worked to a depth of 1500 ft. The second shoot was discovered while driving north on the 1200-ft. level, and proved to be a more important orebody than the first. It seems, from what can be learned of the early history of the mine, that the management was, if not incompetent, at least improvident, and after a number of years of successful operation the mine was closed and remained idle for a long time, being reopened in 1892-3, when a vertical shaft was commenced to reach the vein below the old workings. For several years after reaching the vein this enterprise was successful, but, like the other mines of the lode, a zone of ore too low in grade to be profitable was entered, and then the struggle for existence began, which ended in the property being once more indefinitely closed, notwithstanding a decided improvement in the value of the ore in the lowest level, at 2650 ft. vertically below the surface. I can discover no reason why, under the existing conditions, the Gwin mine with deeper development may not once more become a profitable mine.

There are no mines having a depth as great as 2000 ft. in Tuolumne county, on the Mother lode, and yet there have been some profitable mines in that part of the lode, the most noted being the Rawhide, which was successfully reopened after a long idleness. The Jumper also has made a large production, about $3,000,000, largely from masses of gold occurring at vein intersections. The workings are over 1800 ft. deep, and it is said a large body of low-grade ore has been developed in the bottom of the mine, but whether of profitable grade I am unable to state.

At Quartz, the App-Heslep is a property with an interesting history. The early Browne and Raymond reports speak in favorable terms of these mines, but they, too, have had several periods of activity and idleness. Recently this mine has had a disastrous cave-in, the cause of which is the usual one, a failure to properly fill the stopes with rock instead of depending too much on square-set timbering.

Another famous mine is the Princeton, in Mariposa county. In the early days this mine produced $4,000,000 to a depth of 600 ft. The Princeton vein occurs in clay-slate, and outcropped along the crest of a ridge. The ore-shoot was terminated at the north end by a gulch, and on the south end by a depression. This, of course, at the surface. At and near the surface the ore was too low grade to afford a profit in those early days, but a decided improvement took place at a depth of 100 to 150 ft., below which the mine was very profitable. Development was not carried far below the zone of profitable ore at that time, although the levels were extended horizontally some distance beyond it. The mine was closed and remained idle for many years, but was reopened in 1900, when it was fully equipped with hoisting and milling machinery. Since that time the output of the Princeton has been swelled to over $5,000,000. The operations of the past ten years have shown the presence of much good ore scattered here and there throughout the mine. The Princeton vein possesses many of the distinguished characteristics of Mother lode mines. It occupies a fissure of great persistence, both in vertical and horizontal extent; there are occasional branches into the walls, a feature quite common to these veins; it has its zone of rich ore, as well as those that are poor; a gouge is generally present on one wall or the other, and there are other features which stamp it as a vein of great possibilities in depth. The lowest level is at 1600 ft., equivalent to 1250 ft. vertical, a depth only about one-third as great as that of the Kennedy mine. To me this mine seems to offer every inducement for further and deeper exploration, and it is gratifying to know that active steps looking to the reopening of the Princeton mine are at present being taken, and it is my belief that if the development is carried far enough the Princeton will again become a large producer.

In reviewing the facts herein presented it may be observed that: All of the profitable mines of the Mother lode of California have had zones of profitable ore, and zones that were too low in grade to be profitable, and that these are not uniformly distributed. The upper zones of profitable ore have been found to occur at any level between the surface and 600 ft., and in one instance, that of the Central Eureka, 1000 ft., but no definite depth seems to have been established at which profitable ore has been replaced by that which is poor, nor has it been determined at what depth ore that is poor may be expected to be succeeded by that which is rich. In fact, so far as present knowledge goes, it has been learned that good ore may be found at any depth between the surface and 3450 ft. vertically below it. However, when all the available data are collected and careful comparison made it may be found that there is more regularity in the occurrence of ore-shoots on the Mother lode than a casual glance may indicate. To me it seems that proper geological conditions are of greater importance than all other considerations, and that where these are present there is every reason to anticipate the recurrence of rich ore in the fissures to a depth as great as lies within human skill and mechanical means to reach. There are so many authentic instances where a mine once profitable has been found to be so again at greater depths, that a similar result may be expected in every case where idle mines have a good record of earlier production. Moreover, in the case of undeveloped properties, where the geological and topographical conditions are favorable, the probabilities for successful development in depth may be considered as most promising, even where the ore at the surface is too low in grade to afford a profit, for some of the best mines on the lode were of this character at the surface, as has been indicated.

Precipitation of Copper From Mine Waters

By Floyd Bushnell

Although copper has been hovering around the 13c mark for the past four years, the precipitation of copper in the Butte district has not decreased as much as might have been expected. Several of the smaller and less prosperous plants on Silverbow creek on the south side have been compelled to discontinue operations, but the larger are running at full capacity.

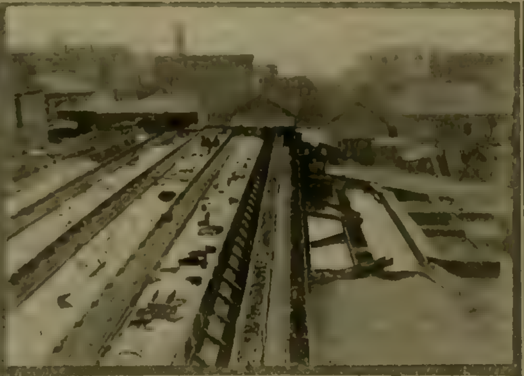
Twenty-three years ago the making of copper through the employment of mine-water was unheard of, and it is difficult to say just how much copper went to waste in the early days through failure to utilize this method. A Welshman named Morgan was the discoverer. In 1880, while living near the gulch through which ran the waters from the Anaconda and St. Lawrence mines, he noticed that tin cans thrown into the water soon disappeared, leaving a dark-red sediment in their place. He had this sediment assayed and was surprised to find it contained a large percentage of copper. Morgan died before he attained any great degree of success. Fred Miller then took up the work, and while his methods were crude compared with those of the present day, he was more successful than the discoverer. Miller dammed up the water into small ponds, into which he threw tin cans and scrap iron; after the metal disappeared he drained the ponds and scraped up the precipitate. Others became interested and encroached upon his rights, whereupon he became discouraged and quit the business.

William Ledford, in 1901, was the first to put copper precipitation on a business basis. He secured a three-year lease on the water from the St. Lawrence and Anaconda mines at a 25% royalty. Ledford was subjected to much criticism because of his so-called foolish venture, but during the life of the lease he cleared $100,000. During this lease the copper water became so strong that in a short time it corroded the pipes through which it was pumped to the surface, whereupon the companies weakened the water by passing it over iron underground. Ledford contested this on the ground that he was to have the sole right of precipitation. He sued the Anaconda company and was awarded several thousand dollars damages. After this successful venture the companies refused to give further leases, and the larger companies have since been doing their own precipitation; the Amalgamated, the Boston & Montana, Gagnon, Original, and other mines have plants at their properties. However, there are a few smaller companies that lease their copper water.

The plant at the Original mine has about the most economical system in Butte. Three men take care of 1400 linear feet of boxes. This company is the first to use the hose-washing system, which is decidedly effective. City water, under good pressure, is piped to all parts of the boxes, and at regular intervals the precipitate is washed from the half-eaten metal and from the bottom of the boxes. The precipitate is protected by means of a shelf, 2 in. from the bottom, and once it is separated from the metal, is unimpeded in its course to the tanks. This system is so arranged that the copper water may be shut off from any part of the plant. The high-grade precipitate is flushed into tanks 2 by 7 by 9 ft. in a steam-drying room. There are two tanks, each holding 21 tons and are filled several times per month.

The plants which secure their water direct from the mines and those operated on the sites of abandoned smelters have water with by far the highest copper content. The water as it comes from the mines averages from 0.04 to 0.06% copper. With the 0.06% water precipitate as high as 90% is secured, and from this it runs as low as 30% copper. Some of the operators are so fortunate in the situation of their plants that they can cause the water to

MANY SMALL PLANTS EXIST ON OLD SMELTER SITES, WHERE WATER SEEPS THROUGH TAILING AND SLAG PILES.



BOX SYSTEM AT THE ORIGINAL MINE.

ONE OF THE TOWERS BELONGING TO THE B. & M. COMPANY.

COMBINATION BOX AND TOWER PLANT IN THE WINTER.

flow through the tailing heaps of abandoned plants, thereby materially increasing the copper content of the water.

There are at present two methods of precipitation, the box system and the tower system, the latter being generally conceded to be the more successful, as the towers occupy less space and the water is brought more thoroughly into contact with the iron. The box system consists of a series of troughs from 1 to 3 ft. wide and 1 ft. deep, covering a great deal of surface. The boxes are so arranged that there is a gentle incline and the water flows naturally through them. The scrap iron and tin cans are thrown into these troughs. The copper precipitate, after being washed through the many compartments, sinks to the bottom of the receiving-tank, which is cleaned out about once a month.

The tower system was introduced about eleven years ago by Huddleston & Turner. The usual tower is about 3 ft. wide, 20 ft. high, and 30 ft. long, and is partitioned off by means of floors 18 in. apart. These floors are made of 2 by 4-in. scantlings, placed 3 in. apart, running lengthwise. Tin cans and scrap iron are placed on the several floors. By means of a small pump the copper water is raised to the top of the tower, where it is distributed equally over the scrap iron. The tin cans and smaller pieces of iron are eaten away in a comparatively short time, but the larger pieces must be scraped regularly to remove the precipitate. The latter is washed to the bottom and then into tanks alongside the towers.

The operators sell their output to the smelters at 4c. less than the market quotation for copper; the shippers must pay a treatment charge of $5 per ton. The cost of making a pound of copper is estimated at between 7 and 8c., so that with the present price of copper there is not a very large profit. Theoretically a pound of tin or iron will precipitate its chemical equivalent in copper. Tin cans are used where the water is weaker, and iron and steel are sought after by those who have stronger water. A test made with the same water shows that tin cans produced a 33% copper precipitate, and iron 50%. At many of the plants one or two men do nothing but remove the paper from and punch holes in cans in order that the free passage of water may not be interfered with.

It might be thought that the plants would be compelled to close in winter, but such is not the case. The water coming in from the mines is quite warm, and the chemical action of precipitation liberates heat. The water has a greater percentage of copper in it during the winter months because there is no surface water to dilute it. As a matter of fact, almost as much copper can be made in winter as in summer. One peculiar feature of this work is that the streets and alleys of Butte are kept free of tin cans and scrap iron. Because of the increased demand for scrap iron for precipitation purposes during the past five years the price of old iron has increased from $7 to $12 and $14 per ton; $10 is the average price for a ton of tin cans. Men and boys make a living in the larger towns of the State securing material for these plants. It is hard to give the exact amount of precipitate produced in the Butte district, but a conservative operator places it at 700 tons per month. If anything, this estimate is low.

The Boston & Montana plant, at Meaderville, securing its copper water from the two Leonard mines, the West Colusa, and other properties, is one of the largest and most up to date in the district. Two flumes, 1000 ft. long and 4½ ft. wide, 800 linear feet of boxes, and four large towers are operated by this company. The towers are 100 ft. long, 30 ft. high, and 6 to 8 ft. wide. The lower towers have two electric elevators to raise the iron to the top of the towers. The precipitate is dried to 8% moisture, barreled, and shipped in 30-ton lots to Great Falls for treatment; three shipments per month is the average output. The average strength of the Boston & Montana copper water is 0.05% copper. But during the fire that raged several years ago in the underground workings of the West Colusa and other mines, the percentage of the water ran as high as 0.32%. While the water was at this great strength 90% copper precipitate was produced and the average monthly shipment of precipitate was 9 carloads. Under normal conditions the precipitate averaged 60% copper.

The charge was made in a recent issue of a mining journal that the methods employed in Butte are crude and wasteful as compared with the plants at the Rio Tinto mines, where the water runs as high as 0.2 and 0.3% copper. A comparison between the methods employed by these two camps is absurd; the water from the Rio Tinto mines, after having run through the precipitating plants, is as strong as the water coming from the Butte mines. The charge was also made that strong copper water flowed down Silverbow creek, past all the precipitating plants. Such a statement is absolutely false. An assay of the water after it passes the last precipitating plant shows the exceedingly small percentage of 0.0002 copper.

Mining at San Jose de Gracia, Sinaloa

By G. L. Sheldon

San Jose de Gracia, Mexico, is situated in the northeastern part of the district of Sinaloa, State of Sinaloa, about 70 miles northeast of Bamoa, a station on the Southern Pacific Mexican railroad system. There is a wagon-road for about one-half of the distance, by way of Bacubirito. The town is on the Alisos, commonly called San Jose de Gracia *arroya* (creek), about 12 miles above its mouth, where it empties into the Sinaloa river, at San Ignacio. The altitude at San Jose is 1300 ft. Adjoining the town on the east and southeast, is a basin, near the confluence of two or three small *arroyas* which join the Alisos just below the town. This basin has been the centre of considerable eruptive activity; the small hills and higher mountains to the north and east are highly colored, and at a distance (as one comes down the mountain to the east, on the Calabacillas trail) much resemble those of the San Juan, Colorado, except for the difference in altitude.

The rocks in the basin are chiefly andesite, extending to the east, about two miles from San Jose *arroya*. Here slates, shales, and limestone appear, and are continuous to the east to the top of the mountain (altitude 4500 ft.), which forms the State line between Sinaloa on the west and Chihuahua on the east. To the east of the divide similar rocks persist for several miles, but are cut by andesite and trachyte dikes. The town of San Jose was settled in 1828 by some Spaniards, Mexicans, and Indians from their main town or mission at Sinaloa, on the river of the same name, in the lower agricultural country. For years there had been rumors of gold in the mountains above the river. At or near the mouth of the *arroya* which empties into the San Jose just below the present town, they found a small Indian village. The Indians had some goats confined in a nearby stone corral; wishing to purchase some, the visitors went to the corral, and found it made of quartz, in which, upon examination, much free gold was to be seen. This was on or near the vein known ever since as the Mina Grande. They immediately began work and it was found to be very rich, but has never been worked below 100 ft. in depth, although it is well worthy of further exploration.

There were several other veins discovered in the near vicinity, which yielded surface pockets of rich ore. The district is much faulted and in the early days this was not understood, consequently when a fault was met work was stopped. Most of these early discoveries have only been worked to slight depth; they are owned by individuals who continue to pay the taxes, but do no work. With intelligent development no doubt some of them will prove good mines. Many of the best mining men left for California overland during the '49 to '52 gold excitement. After this, until the Diaz régime, there was not much encouragement to work the mines on account of the numerous revolutions, as both parties held up and robbed everyone who had anything; but Porfirio Diaz stopped that and made the country safe.

In 1893 Francisco Peraza found rich ore on his Jesus

Maria claim, which he had been working in a desultory manner for several years. About this time, H. H. Hughes was in charge of the Trigo silver mine, near Yeadras on the State line of Sinaloa and Chihuahua, some 50 to 60 miles east of San Jose, and, hearing of this rich find, sent for samples of the ore. The Trigo mine at that time was apparently worked out, after twenty years of continuous development, never having paid a dividend. The management was anxious to find a good mine, and finally made a deal with Peraza for the Jesus Maria for $75,000; a liberal cash payment was made, the remainder on easy terms. Mr. Hughes immediately took charge and moved some of the machinery from the Trigo mine; W. C. Wilkins was made mine superintendent. By 1895 they had a 60-ton milling plant, offices, machine-shop, laboratory, and other buildings. The mill-heads for three years averaged $65 per ton. The bullion is 700 to 750 fine. Later, E. A. H. Tays was superintendent, with Mr. Mills, of the San Fernando, Durango, mine, as manager of the property, which was known as The Anglo-Mexican company.

After having paid five millions in dividends, and worked over the tailing dump of 30,000 to 40,000 tons, said to have run $25 to $30 per ton, the company sold the property to Peraza (the former owner), and Antonio and Miguel Tarriba, for ₱27,500, in May 1902; the management believing (as one of them told me a few months later) that the mine was completely worked out, and not worth a jack-knife; also, that the vein faulted so badly it cost more than it was worth to find new orebodies. I have been reliably informed that, during the first six months after the sale to Peraza and associates, they took out $64,000 net.

During 1905 Norman T. Tracy, who was then manager for the owners, surveyed and advised a long cross-cut (500 metres) to cut the vein at a new point on a lower level. Mr. Tays, later, being called as consulting engineer, also advised it, and the vein was intersected in good ore, which was persistent. The present owners have taken out about $3,000,000 worth of ore and now have one to two years' reserve. For the past three years M. A. Newman, formerly with George Tweedy at the old Bradbury Rosario or Tajo mine, near Mazatlan, has been manager, with an efficient force of Americans directing the various departments. Mr. Newman has overhauled the entire plant and changed the method of treatment. By putting in tube-mills and cyanide tanks with mechanical agitators he has increased the saving from around 65% to better than 90%. The question of putting in a hydro-electric power-plant on the Sinaloa river was seriously considered, but it was found that it would cost in the neighborhood of $300,000. As the interest on the investment there is 1% per month, and at present there is no demand for the excess power generated, it was considered best to transform the present steam-power plant to electric, using wood for fuel. This is now packed 10 to 12 miles at a cost of ₱10 per 2000 kilometres. It would appear that in the not far distant future it may be found advisable to move the steam-plant nearer the source of the fuel supply.

The cyanide tanks were placed in front of the two-story hacienda building, erected by the Anglo-Mexican company at a cost of ₱40,000, which is 500 ft. from the mill; this was necessary, as there was no other suitable site. Everything is run by electricity, the pumps, hoist, and the lights at the mine, and all the machinery at the mill, including a small ice-plant. An old tailing pile, about 50,000 tons, has an average gold content of $12. A new plant to treat this is now practically completed. They have to be raised 50 to 60 ft. and moved horizontally over 500 ft. by an endless belt, and are then treated by an additional steam-plant in tube-mills and cyanide tanks. The treatment is expected to net $500,000. The present management, in running the 400-ft. level, below the long cross-cut, on the vein, has extended this level out under the old Anglo-Mexican company's working, but 200 ft. deeper. The Anglo-Mexican company had no ore above, but below, persistent good ore. The present company, known as the Jesus Maria Anexas, has a large territory yet undeveloped; the deepest workings are only 700 to 800 ft., and it would appear that the property should have a long, profitable life before it. With the present capacity, it has an annual production of around three-quarters of a million, nearly two-thirds of which is profit.

The only other mine on which any work has been done in recent years, or ever extensive work, is known as the Rosario. This is less than 2 miles to the north and east of the Jesus Maria and is in the slates, shales, and limestone which extend down to within ½ to ¾ mile of the Jesus Maria, which is entirely in the andesite. In the early days of the district the Rosario was known as the Los Muertos, and a small surface pocket of rich ore was taken out. In 1893 W. C. Wilkins, Manuel Flores, and Mr. Parker located it, and in 1894 they sold the property to Antonio Echavarria for ₱5000. The vein, which was well defined on the surface, ran only $4 to $6 per ton. Don Antonio was an intelligent, practical miner, and much of the data herein was given to me by him. He ran a short cross-cut and intersected the old Los Muertos vein at about 100 ft. in depth, finding 7 ft. of bonanza ore. By June 1896, he had a complete 30-stamp mill all paid for, and for several years the annual production was better than one-half million. The tailing, which ran down the creek and was lost, assayed $12 to $20. They developed several veins by adits at good depth that gave very good ore. There are 8 to 10 other veins on the property as yet undeveloped that make equally as good a surface showing as the one developed. For several years the property has been in litigation, and for the past two years idle, but it is now generally understood that the former owners, which include Peraza and the Tarriba brothers, of the Jesus Maria company, have practically settled all litigation and in the near future will reopen the mine.

I believe if the district were in the United States, that within three years it would be producing from one-half to a million dollars per month. The present owners of the developed properties and many of the undeveloped ones are Mexicans; the two principal owners have been in Paris for the past two years, trying to spend their dividends from the Jesus Maria. There is no work whatever being done outside of the Jesus Maria mine. It is interesting to note there are working in the Jesus Maria mine three blind Mexican miners. Two lost their sight in a powder explosion; the other, a younger man, has learned by practice since he became blind to use the hammer and drill. They are led to the mine each morning and home each evening by a small boy, and the shift-boss takes them wherever he wants them to work, and points their holes for them. By taking a drill and placing their hands on either end of the drill, he gives them the place and direction of the holes; they put in a regular shift, accomplishing as much and receiving the same pay as other miners, working alone single-handed; their holes are loaded and fired by others. Formerly the company allowed them 25c. extra per day for the candles which they do not use, but this has lately been discontinued. They are as happy and contented as any of the other workmen.

During the late political disturbance, the *Insurrectos* held up the management for the bullion on hand and placed them in jail until they turned over $41,500; the mine was shut down, but after the railroad commenced operating again, so supplies could be obtained, it has been running continuously. The two generals in command of the *Insurrectos* that took the bullion, in June were placed in jail in Culiacan, by the orders of higher officers; one-half of the bullion was immediately returned, with a promise of returning the rest as soon as possible. San Jose is on the western edge of a gold district that extends east and north to Guadalupe y Calvo in Chihuahua, embracing all the southwestern portion of the Guadalupe y Calvo district, and extending into a portion of the Sinaloa and Mocorito districts in the State of Sinaloa. The Calabacillas mine, with a production of two and a half to three million, is in this area; also the La Cumbre de San Manuel mine, which has recently been sold to S. C. Dickinson, representing English capital, for $530,000. This gold district is one of the best in northern Mexico, but is little developed.

Tin Dredging in Alaska

By H. G. PEAKE

In 1900 and 1901 placer miners, who had traveled up the coast from Nome, started work on Buck creek in the Port Clarence mining district of Alaska. The gold was saved with difficulty, owing to the fact that it was heavily covered with some coating substance, making amalgamation impossible, and the riffles were rapidly filled up with an unknown heavy material, making the saving of gold still more difficult. The miners did not detect the true nature of this heavy substance until members of the U. S. Geological Survey came through the district and pronounced it cassiterite. On assaying, it was found to contain 68% tin. Several companies were subsequently formed for the exploitation of this deposit, and their failure has cast a certain amount of discredit on this field. In 1905 and 1906 the American Tin Mining Co. secured, by purchase and location, most of the claims on Buck creek; the remainder was secured later. Buck creek is fourteen miles inland from York, the nearest port, and extends from the junction of two smaller streams for a distance of about 3½ miles before emptying into Grouse creek, which empties in the Arctic Ocean. This company later took in an excavator of French design, which was set up and operated for five days, then abandoned, as it was found that it was unsuitable for the work. The crew were then put to work shoveling into sluice-boxes, and during the remainder of the season 37 tons of concentrate, which averaged 68% tin, was recovered. During the past five years this company, in performing its assessment work, has taken out enough tin each season to pay the expenses of sending up the crews, together with their wages, and all other cost of the work. The deposit on this creek has been examined by mining engineers, and was on one occasion surveyed and mapped and a thorough test made with a Keystone drill. This test showed a tin content high enough to warrant working the property, if a satisfactory method could be found.

On January 18, 1911, W. W. Johnson, of San Francisco, leased the property of the American Tin Mining Co. on a royalty basis; subsequently he organized the York Dredging Co. This company, after carefully looking into the matter, placed an order for a specially-designed dredge, suitable for operation in the shallow deposits and under the conditions in the district. The order for the dredge was placed with the Union Construction Co. on May 26, they agreeing to complete it in such time that a test run could be made this season. The machinery was shipped from San Francisco, on June 24, and at Seattle the lumber for the hull, which had previously been framed and fitted together ready for erection, was loaded on the same vessel. By special arrangement with the steamship company, this vessel made a trip to York, the nearest port. The roadstead at this port is very shallow, and the vessels are obliged to anchor some three or four miles from shore, where all freight is transferred to lighters, on which it is carried as near the shore as possible. From the lighters it is transferred to shore by wagons. From York to the site on Buck creek, where the dredge was to be built, it was necessary to make a wagon-road. This was done by cleaning out the bed of the Anikovik river where necessary, and by graveling about two miles over a low divide to the head of Grouse creek, the bed of which was also cleaned out. Work was started on the road June 15, and a camp was established at the dredge site at the same time. The vessel carrying the dredge machinery and lumber reached Nome on August 3. Here the construction crew, together with extra teams for hauling, were picked up and taken to York. Construction work was commenced on August 7 and the dredge was completed and ready for operation on September 6. Unfortunately, a severe storm washed out a portion of the dam below the dredge, and it was necessary to rebuild this before operations could be commenced.

This machine has 2½-cu. ft. open-connected buckets. The hull is 30 by 60 by 6½ ft., and 75,000 ft. of lumber was used in its construction. The dredge is provided with a revolving screen for washing the material. This has 3-in. perforations and the water-supply is furnished by a 10-in. centrifugal pump, designed to deliver 3000 gal. per minute against a head of 40 ft. The material passing through the perforations in the screen is delivered into either one of two sluices, which extend from a point at the centre of the dredge, 35 ft. beyond the stern. On account of the bulk of material to be recovered, provision was made so that one sluice could be cleaned up while the other was in use. The material passing through the end of the screen is delivered by means of a chute to a picking-belt, which delivers the rejections at a point about 10 ft. beyond the stern of the dredge. Occasionally cassiterite boulders weighing from 5 to 40 lb. are found. These are recovered on the picking belt by Eskimos. Between the two sluices and extending from their outer end to the upper, another conveyor was installed so that the concentrate could be shoveled from the sluice being cleaned up, directly upon it. This belt delivers its material into a hopper on the dredge, whence it is taken and sacked for shipment. The dredge is operated by means of gasoline or distillate engines, of which two are provided, one for driving the pump and one for the main drive, winch, screen, and conveyors.

The dredge started operation on September 10 and was run continuously until October 15. It has handled from 800 to 1000 cu. yd. per day and has recovered 2.85 short tons of concentrate for each operating day. This installation was considered by well informed men as more or less experimental, but all agreed that dredging was the best method for handling the deposit, and the results have proved conclusively that this was correct. So far as I am informed, this is the first placer-mining dredge for the recovery of placer tin that has been installed and successfully operated on the western hemisphere. Its work would seem to warrant further exploration of this field.

Phosphate Deposits

When the coal deposits of Pennsylvania, West Virginia, and other States of the Appalachian region were being formed, many millions of years ago, in the Carboniferous age, there were also being accumulated in the Rocky Mountain region enormous mineral deposits which are of a widely different character, but which may nevertheless play a part in the industrial development of the United States comparable even to that of coal. These are the phosphate deposits of Wyoming, Utah, Idaho, and Montana, which are now known to contain hundreds of millions of tons of phosphate rock, constituting a most important artificial fertilizer. Until recently it had been generally assumed that the phosphate deposits of South Carolina, Florida, and Tennessee afforded an 'inexhaustible' supply, but recent estimates by the U. S. Geological Survey show that at the present rate of increase in phosphate mining these deposits are likely to be exhausted within a generation.

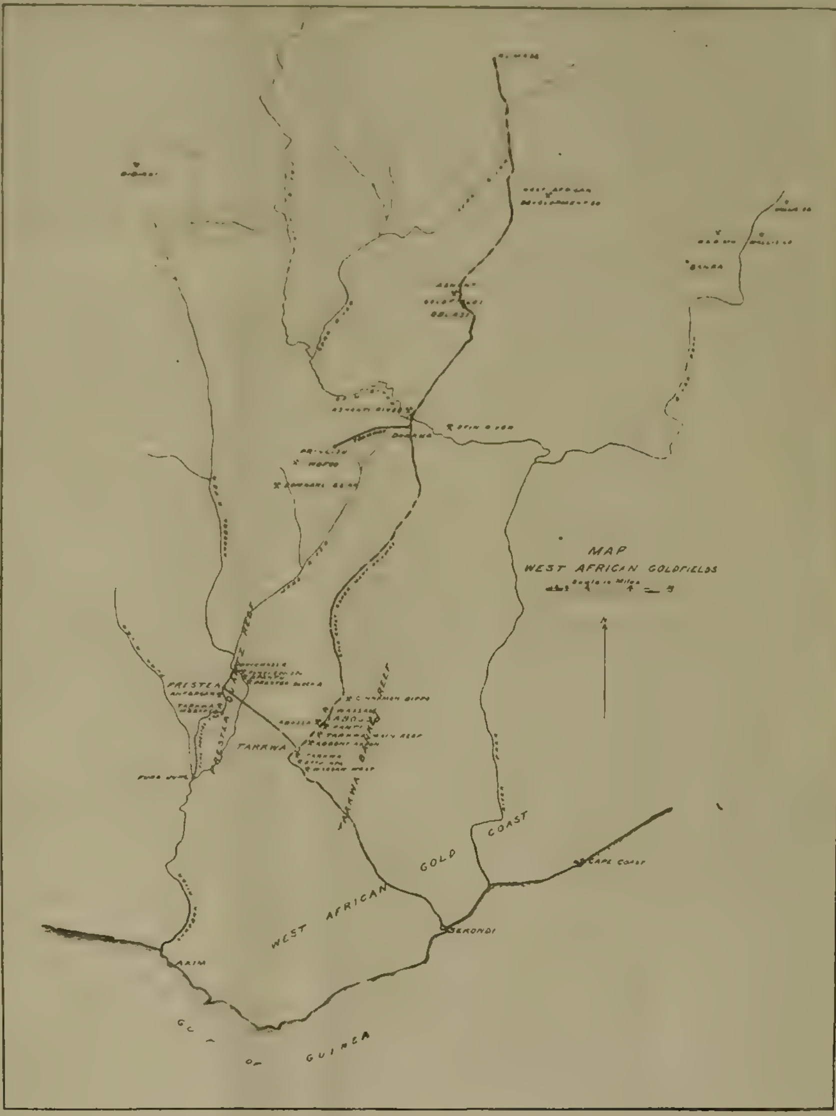
The discovery of the Western phosphate beds, therefore, constituted a most important find, and though the first reconnaissance of these deposits by the Geological Survey showed their considerable extent, the more detailed study and exploration, with additional discoveries made by the Survey during the last three years, have shown that the field is probably the greatest in the world. Recent geologic study of the phosphate-bearing strata indicate the probably still greater extension of the phosphate area. The northernmost portion of the beds first discovered was in Wyoming, but an outcrop of the same character and in the same geologic formation was found last year in Montana, some 160 miles farther north, so that Survey geologists believe that workable phosphate beds may be found in many other places. Phosphate rock usually sells in the markets upon a basis of about 60c. per unit per cent of available phosphoric acid, though high-grade phosphates from Eastern deposits bring as much as $4 to $5 per ton f.o.b. mine.

Gold Coast Mines, West Africa

*The Gold Coast is contained between 5 and 10 north latitude and 3° 7′ west to 1° 14′ east of Greenwich, including Ashanti and the Northern Territories. The population of the Colony and the Protectorate may be set down at 2¼ millions, but cannot be stated definitely, even when the census of 1911 is made known. The first records of gold from the Coast date back to about 450 years ago, when the Portuguese obtained, by trading, considerable quantities of gold from a port on the Gold Coast, which they named El Mina (signifying the mine). Subsequent trading stations were established by the Portuguese, Dutch, English, Germans, and Danish. The operations of these various companies were all confined to the coast, but considerable quantities of gold reached the hands of the traders, principally from the hinterland. In the year 1872 the whole of the rights to the territory now known as the Gold Coast was acquired by the British, and this fact led to the first Ashanti war. As the Ashantis had generally conducted their trade with the coast through the Dutch, they feared that the British would try to deprive them of their trade connection with the seaboard. The British operations of this war were intrusted to the command of Sir Garnet Wolseley, and were wholly successful, as were also the wars of 1896 and 1900, in spite of the dense jungle which intervened between Cape Coast Castle and Coomassie, a distance by road of 186 miles. Up to the time of the subjugation of the Ashantis by the British this powerful combination of tribes maintained a complete control by force of arms, of nearly the whole of the tribes of the Gold Coast Colony, between Ashanti and the sea, and all trade with the hinterland was only carried on by their permission.

The constant demand for gold by the many trading stations on the coast resulted in extensive washing operations being conducted by native tribes, who, being slaves, were compelled to obey the demands of their taskmasters, and pay a yearly tribute in gold. In the earlier days most gold was obtained by panning the gravel from the many streams, and by hand-crushing the outcrops of quartz reefs, but later the auriferous conglomerates, which are now known under the name of banket, were discovered by natives, who, in their search for gold, sunk numerous pits along the outcrop at close intervals. The work of sinking the pits and of mining the conglomerate was performed by men, but the ore, after being raised to the surface, was taken to the creeks, disintegrated between stones, and panned by the women. The natives had no idea of driving from one hole to another, and when they reached the conglomerate beds (always by circular shafts 20 to 24 in. diam., and sometimes 40 or 50 ft. deep) they would gouge the ore for a few inches all around the bottom, and then proceed to sink another shaft, so that in places the ground was literally honey-combed.

Pierre Bonnat had been taken captive by the Ashantis, and remained a prisoner with them for several years, during which time he often heard the natives speak of the valuable deposits at Taquah. On regaining his liberty, some time in the early seventies, he proceeded to the Wassau district, in which the Taquah belt is situated, and obtained from the local chiefs two concessions, one at Taquah, the other at Abosso, these being about six miles apart. When it is considered that the whole of the country is covered by a thick jungle which makes an examination of the surface a matter of the greatest difficulty, it is an extraordinary fact that the areas taken up by M. Bonnat are today the most valuable ones on this line of auriferous country. M. Bonnat after obtaining the concessions proceeded to France, and was successful in obtaining the flotation of his properties and securing the necessary capital to enable him to develop and exploit his concessions. In spite of the great difficulties of transport, the unhealthfulness of the country, the denseness of the jungle, and the heavy rains, for which the coast is noted, M. Bonnat succeeded in opening up the mines and equipping them with hoisting and treatment plants; but although the ore mined and treated was of fairly high grade, the cost of mining and treatment, owing to the



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*Abstract from *The Mining and Engineering Review.*

difficulties mentioned above, was so great that the company was compelled to cease operations. Some of the difficulties of transport will be understood when it is mentioned that, though river transport was utilized as much as possible, in many cases the machinery had to be transported on natives' heads over wretched jungle paths. Most of the machinery, therefore, had to be made in sections. In this respect the Bibiani mine has been laboring under a heavy burden through having the whole of the plant sectionalized so that it could be carried by natives from the railway station at Dunkwa to the mine, a distance of 70 miles.

The first noteworthy mining operations by British companies were carried out during the latter seventies, but, owing to the extremely insalubrious nature of the climate, these operations were limited. In 1900, however, quite a boom was created in West African mines, and many ventures, chiefly of a wild-cat nature, were floated on the London market for large sums. The collapse of the boom a year or two later left few mines in actual operation. Those on the Taquah belt which continued working are the Wassau gold mine, Abosso gold mine, Abbontiakoon and Taquah Exploration mines. On the quartz belt the only mines that were able to survive the slump were the Prestea Block A and Broomassie mines in the southern part, and Ashanti Gold Fields Corporation and Bibiani mines in the northern part of the colony. The result, however, of several years' working was the depletion of high-grade ore reserves and the gradual extinction of the capital of most of the various companies, owing to the extremely high costs of mining. All skilled labor required has to be imported at considerable expense and high wages, while the actual manual labor is entrusted to the natives. The London directors at their annual meeting of shareholders like to expatiate on the cheap (?) labor of the Gold Coast, but many years of experience has fully established the fact that native labor, though nominally cheap, is really most expensive, even when properly supervised, but it is an unfortunate fact that supervision on the West Coast has generally been of a most perfunctory character. Things continued in this state until the year 1908, when several mining engineers from Western Australia, who were placed in charge of some of the mines, became convinced of the fact that mining and treatment by careful management could be carried out at a cost that would leave a fair margin for the shareholder. Representations being made in the proper quarter resulted in large sums being invested in the industry, principally by the big South African companies, notably the Consolidated Gold Fields of South Africa, and the infusion of this new blood resulted in the boomlet of 1909.

Gold is generally obtained on the coast from two parallel auriferous belts, the principal one being the Taquah banket belt, on which workings are at present being carried out over a length of 20 miles from Eduapriem on the southwest to Chida in the northeast. To the north of Chida there is a break of a few miles, in which very little banket has as yet been discovered; beyond this large deposits of banket (said to be of a profitable nature) have been opened up by the Wallis Syndicate, Ambroso Syndicate, and other prospectors for a distance of several miles along the outcrop. The quartz belt lies 15 miles west of the Taquah banket, and extends parallel in a southwesterly and northwesterly direction. Gold in this latter belt is mostly contained in quartz reefs, in a fissure of the graphitic schists, which are mostly found associated with auriferous quartz reefs. These may be said to extend from the seaboard near Axim far into Ashanti. If one were to judge by the magnificent reports gathered by the many eminent (?) engineers, which have been put in the papers during the last two years, the Gold Coast must be a happy hunting ground for those in search of the precious metal: but the fact remains that, though a considerable number of mines offer a fair opportunity for the profitable employment of capital, the greater portion of the reefs, whether banket or quartz, are not by any means of a profitable character, so far as they have been proved by workings along the outcrop. As a matter of fact, the known profitable areas do not comprise one-sixth of the line of reef, on what is known as the banket belt; while on the Prestea quartz range the lengths of outcrop that offer inducements to prospecting companies are comprised between Anfargah on the southwest and Broomassie on the northeast, a distance of probably five miles, though prospecting and mine development are being carried out for about another twelve miles northeast of Broomassie, and five or six miles southwest of Anfargah. In Ashanti mining operations have mostly been confined to the quartz belt, which is believed by some authorities (on rather slender evidence) to be a continuation of the Prestea goldfield. During the early part of the present century an immense amount of speculation took place in Ashanti, but, owing to inadequate returns, the field was gradually limited to work on the Ashanti Gold Fields Corporation, Akrokerri, and the small property known as the Ashanti Quartzite. In the year 1909, however, owing to the depletion of its ore reserves and to the fact that development work failed to disclose any further bodies of ore, the Akrokerri mine ceased operations and disposed of its machinery.

Progress in Zinc Smelting in 1910

By C. E. Siebenthal

*The expense of the manual labor necessary in retort zinc smelting and the losses incident to the lack of continuity in that process have stimulated metallurgists to invent mechanical charging devices and to design forms of furnace in which the smelting operation should be continuous.

The Saeger cleaning and charging machines, in use in the Silesian zinc works of Georg von Giesche's Heirs, consist of steel trucks operated by electricity upon tracks parallel to the face of the furnace. Mounted upon each truck in alignment with the sloping retorts are as many banks of screw conveyors as there are banks of retorts in the furnace, and from three to eight conveyors in each bank. After the condensers are removed, the cleaning machine withdraws the residues by inserting the screw conveyor into the retort; then follows the charging machine in which similar conveyors push the charge into the retort. The advantages of the machines are summed up as follows: Saving of half the labor charge; shortening of the injurious cooling-off period while cleaning and charging the furnaces, thereby increasing the time for distillation and consequently the yield; and lastly, more healthful conditions of work.

The Wettengel rotatable furnace is designed to save time and trouble in charging and cleaning the retorts. These are arranged in batteries in a revolving steel shell. They are turned upright beneath individual hoppers for charging, are revolved into horizontal position for distillation, and lastly are turned downward for discharging the residue. After re-charging they are turned to the horizontal, 180° from the position of first distillation. By thus alternating the top and the bottom of the retort its life is presumably doubled and the residue does not accumulate on one side. A small Wettengel furnace was in operation during 1910 at the works of the American Zinc, Lead & Smelting Co., at Caney, Kansas, but the tests are not yet concluded and results are not available.

The Hughes revolving furnace consists of a rotary retort held in place in a rotary shell or combustion chamber. A stack ore-hopper feeds continuously into the upper end of the gently sloping retort, which discharges both zinc vapor and residue into a stationary cylindrical condenser at the lower end. Both the size and the temperature of the condenser are controllable. The waste heat of condensation is carried through the hopper, preheating the charge, which arrives at the retort with a temperature of about 400°C. A retort 8 in. diam. and 7 ft. long is shown by experience to have a capacity of about 5 tons of roasted zinc concentrate in 24 hours. Savings are claimed in handling the ore, in more efficient use of the heat, and in initial cost of plant. A small Hughes retort was given a trial test at Butte, Mon-

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*From an advance chapter of the Mineral Resources of the United States for 1910.

tana, in 1909-10, and a full commercial size retort is now installed at the demonstrating plant of the Hughes West Continuous Zinc Distillation Co. at Southampton, a suburb of St. Louis, Missouri.

Several methods have been proposed recently for smelting lead-zinc concentrate in the ordinary zinc furnace, producing lead-free spelter and a lead-bearing residue suitable for lead smelting. One of these is the Hopkins process, which employs essentially a charcoal or carbon filter between the retort and the condenser. It is found in practice at Swansea that this process, working on Broken Hill zinc middling, gave spelter 99.6% pure, as compared with 96.5% pure with ordinary condensers, and at the same time gave a much better recovery of the zinc. The increased recovery is due to the higher temperatures possible with this method. When the endeavor is also to raise the percentage of recovery, another charcoal or carbon filter is placed in the outer end of the condensers. In a 19 weeks test at Swansea, the Hopkins condensers and ordinary condensers working on opposite sides of the same furnace upon the same ore and in all other respects under the same conditions, the Hopkins condenser averaged more than 7% greater recovery.

A process for smelting zinc-lead slime and fine concentrate patented by Sulman and Picard, has been recently described. The scheme was devised to treat the fine lead-zinc slime resulting from the flotation processes at Broken Hill, New South Wales. This material could not be smelted profitably in the ordinary way because the lead destroyed the retorts and because the resulting spelter was too leady to be salable. In the experimental test the material was first carefully roasted in a hand-roaster, then mixed and made into briquettes composed of roasted ore, 70%; bituminous coal, 25.5%; and pitch, 4.5%. The briquettes were of such a size that 14 of them, 2 deep, just filled the retort. After distillation the briquettes came out of the retort quite porous, but intact, and well suited for direct lead smelting. There was no tendency for the retorts to 'slag up' in the bottom because the briquettes came away clear and whole each time. The recovery of zinc, based on the whole run, was 70%, but at times it exceeded 85%. The conclusion is that above 80% recovery would be maintained in commercial operation, which is excellent practice for that class of ore. As results of this process, an otherwise unavailable product was rendered profitable, the spelter commanded a premium for purity, there was 33⅓% increase in the capacity of the retorts, and there was a considerable saving of time and waste in cleaning and re-charging the retorts.

The problem of the complex lead-zinc ores has also been attacked from the electrochemical side. A 200-ton plant is under construction at Georgetown, Colorado, by the Western Metals Co., which will employ the Malm process. In this process the sulphides are subjected to partial dry chlorination in a tube-mill, the chloridizing is completed by agitation in a vat with hydrochloric acid, and the metals, except zinc, are, by an emulsion of zinc oxide, precipitated in a form suitable, after filtering through asbestos filter-presses, for treatment by lead smelters. The zinc chloride solution remaining is evaporated, fused, and electrolyzed, metallic zinc being thus recovered and the chlorine regenerated. The present plant is being constructed in the light of experience gained at the experimental plant previously in operation at Elkhorn, Montana.

Possible Source of Potash

In a recent Geological Survey report on potash, written by W. C. Phalen, the hope is expressed that every salt producer in the United States will in the future, when boring or otherwise exploring for salt, be on the lookout for possible occurrences of potash compounds. At present the Geological Survey has a deep-drilling party at work in the arid West, where vast deposits of salt are known to exist, in an endeavor to find possible sources of potash and nitrate of soda—two of the three essential elements of 'complete fertilizer,' a recognized necessity for successful agriculture.

Cement Industry of the United States

Ten years ago the production of portland cement for the first time passed the 10,000,000 bbl. mark, showing an increase of 2600%, over the production of ten years previously. Even this production was small compared with that of the present day. In 1910, according to the report on cement by Ernest F. Burchard, of the United States Geological Survey, the production of portland cement reached the enormous total of 76,549,951 bbl., with a value of $68,205,800. This is equivalent to 12,986,152 long tons, valued at $5.25 per ton. It is an increase over the output for 1909 of 11,558,520 bbl., or nearly 18%, and an increase in value of $15,347,446, or more than 29%. This increase alone is greater than the total output of portland cement in 1900. In addition to portland cement there was also produced last year 1,139,239 bbl. of natural cement and 95,951 bbl. of puzzolan cement, a total of 77,785,141 barrels.

The price of portland cement in 1910 was as low as 73c. in some places, the average for the United States being 89.1c. per barrel. In 1890 the average price was over $2 per barrel, and as late as 1903 it was $1.24 per barrel. The following table shows the healthy growth of the American portland cement industry and also the decrease in prices:

	Barrels.	Average price per barrel.
1880	42,000	$3.00
1890	335,500	2.09
1895	990,324	1.60
1900	8,482,020	1.09
1905	35,246,812	0.94
1909	64,991,431	0.81
1910	76,549,951	0.89

Titration of Potassium Cyanide in the Presence of Potassium Ferrocyanide

By W. D. Treadwell

Liebig's method for the direct titration of KCN with $AgNO_3$ is not applicable in the presence of $K_4Fe(CN)_6$. If, however, 0.1 gm. KI is first added to the solution, which should be about $^1/_{10}$ normal and slightly alkaline, accurate results are obtained. The addition of NH_4OH, as recommended by Denigès and Sharwood, is not necessary. The disturbing influence of $Na_2S_2O_3$ may be overcome by increasing the amount of KI to 1 gm. I found a satisfactory explanation of the above facts in a study of the silver ion in the various solutions. This was detected from measurements of the electromotive force of a concentration cell consisting of $^1/_{10}$ normal $AgNO_3$ and the solution to be tested. In the titration of pure KCN solutions with $AgNO_3$, it was found that upon the addition of the drop before the appearance of a turbidity, there was a sudden decrease in the electromotive force from 0.724 to 0.523 v., due to an increase in silver ions. Similarly the influence of excess NH_3, of $Na_2S_2O_3$, and $K_4Fe(CN)_6$ was found to be due to the formation of complex ions, and the lowering of silver ions below the concentration for precipitation of AgCN. Addition of KI caused in each case a turbidity due to the lesser solubility of AgI.—*Zeitschrift für anorganische Chemie.*

The uncertainties and the lure of mining in the Tintic district have been well illustrated by the recent return of the Gemini to the dividend list. This company, a close corporation of only 5000 shares, was forced to stop mining in the lower levels about four years ago on account of water. Some rather unpromising portions of the upper levels were developed, with the result that entirely new orebodies were opened, and from these the company has posted a dividend of $30,000. The previous total was of $2,000,000. The company is now figuring on pumping the lower levels and resuming mining operations there.

Treatment for Electric Shock

By H. H. Clark

*When a man has received an electric shock that leaves him senseless, two things should be done as soon as possible: (1) Remove the victim from contact with the electric wire. (2) Revive him or 'bring him to' by getting him to breathe. While removing the victim from the electric circuit, be careful not to get a shock yourself. If there is a switch at hand, cut off the current at once, but if there will be any delay in cutting off the current, remove the body from the circuit by means of a piece of dry wood, used either to roll or push the body aside or to lift from the body whatever is carrying current to it. Tools with dry wooden handles, such as picks or axes, may be safely used for this purpose. The body of the victim can be safely grasped if your hands are protected by several thicknesses of dry cloth, or if you stand upon a piece of dry wood. When you can do nothing else, you may be able to short-circuit the wire with which the victim is in contact, and thus blow the circuit breaker or fuses which protect that part of the electric system. A short circuit may be made by placing an auger, or drill, or a piece of pipe so that it will connect the two sides of the electric circuit. For example, in case the victim is in contact with a trolley wire, the auger, drill, or pipe should be thrown across the trolley wire and track rail, so as to be in contact with both. In doing this, be sure that auger, drill, or pipe leaves your hand before it touches the current-carrying part of the circuit, as otherwise you will get a shock yourself.

When the victim has been removed from contact with the current, turn him on his back, loosen his clothing from around his neck, chest, and abdomen, and place a small log, a rolled-up coat, or something of similar size and shape under his shoulders in such a way as to throw his head back and his chest up. The next thing to do is to draw out the victim's tongue, which can best be done by grasping it with a piece of dry cloth. This act clears the windpipe, and unless it is done, the victim cannot be made to breathe. If the assistant is alone, he will have to keep the tongue in this position by tying it with a handkerchief or a bandage passed over the tongue and under the jaw. The tongue must be held in this position while giving artificial respiration.

There are several methods of giving artificial respiration, but the one most commonly used is the Sylvester method. Kneel behind the head of the victim, grasp his forearms just below the elbows and draw them slowly backward until they extend as far as possible over his head, and hold them there for about one second. Then slowly bring the elbows forward and downward. Next press the elbows firmly against the chest and hold them there for about one second, so as to drive out the air from the lungs. Do not perform these movements too rapidly; swinging the arms up and down is a waste of time. To complete one series of movements should take about four seconds. A very good way to time yourself is to count, very slowly, 'one, two, three, four,' while making the movements. Count 'one' as the victim's arms are being extended, count 'two' while they are held above his head, count 'three' while his arms are being returned to his side, and count 'four' while exerting pressure on his chest.

Usually a victim of electric shock can be made to breathe within an hour, and the artificial respiration should be continued at least that long, even if the victim does not show any signs of being 'brought to.' If other persons are at hand, have them assist by relieving you at short intervals. Also have them keep the victim warm by covering him with coats or blankets, if any may be at hand. After the victim begins to breathe, the assistants should rub his limbs briskly and toward the heart, keeping their hands under the covering while doing so. This will help to restore the circulation of the blood, which has been for a time suspended.

While arrangements are being made for removing the injured man to his home or to a hospital, treat any injuries that the victim has received. Treat electric burns exactly as ordinary burns. Before the arrival of a doctor it is proper to cover the burnt place with several thicknesses of picric-acid gauze. This gauze is now being used in nearly all mines and hospital emergency rooms. In case no picric-acid gauze is at hand the burns may be covered with clean gauze, preferably taken from sterile packages, and covered with vaseline, carbolized vaseline, olive oil, linseed oil, or what is known as carron oil, which is a mixture of linseed oil and limewater. Cover these dressings with plenty of cotton and protect this in turn from the outside air with oiled paper or anything that will keep out the air while the victim is being taken home or to a hospital. Bandage all dressings lightly so as to cause as little pressure as possible upon the injuries.

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*From Miners Circular 5, Bureau of Mines.

Mining Districts of Humboldt County, Nevada

The southern portion of Humboldt county, Nevada, is part of a metallogenetic province characterized chiefly by the prevalence of antimonial ores of silver with numerous and widely scattered deposits of stibnite and cinnabar. There are in addition some deposits of gold-silver, copper, and nickel-cobalt ores. Ore deposition probably began immediately after the intrusion of the Triassic and Jurassic sediments in late Mesozoic time by a magma of generally granodioritic composition, comparable with that which invaded the rocks of the Sierra Nevada at the same period, and continued into the Tertiary. The known Tertiary deposits are essentially gold-silver ores and copper ores, but it is possible that some of the other types are also Tertiary.—*F. L. Ransome, in Bulletin 414, of the U. S. Geol. Survey.*

Production of Tin in Bolivia

The official reports for the first quarter of 1911, according to the *Boletin Sociedad Nacional de Mineria*, give the tin exportation as 8819 tons of barrilla, or concentrate, containing 60 to 65% tin. This is 1269 tons less than the production for the corresponding period of 1910, the decrease being due to the destruction of the roads by floods. The production by districts was as follows:

	Tons.
Potosi	5344
Oruro	2938
La Paz	537
	8819

An old method of mine ventilation, the use of a heating stove to create a draught, is used extensively and effectively throughout Missouri. An ordinary wood or coal heater may be employed. It is stationed at the surface, near the mouth of the shaft. The pipe is run horizontally to a point directly above the shaft from which a vertical section can be extended to the bottom of the shaft. The lower portion need not be of metal piping, wooden boxing being effective, and in some instances even better than metal would be. The top extension of the pipe should be sufficiently high to create an excellent draught when a brisk fire is built. The suction effectively removes impure air from the mine workings. The plan is more satisfactory than the use of the canvas blow-pipe, another common method of ventilation found throughout the district.

Deep excavations in the Arbuckle mountain region of Oklahoma revealed an underground lake at a depth of 62 ft., the development being done on the land of Scott Braden, 6 miles southwest of Davis, Oklahoma. Pressure forced water, sand, gravel, and fossils high into the air. The development was being conducted in search of zinc ore, several fair finds having been made in the immediate vicinity.

Lead and Zinc Mining

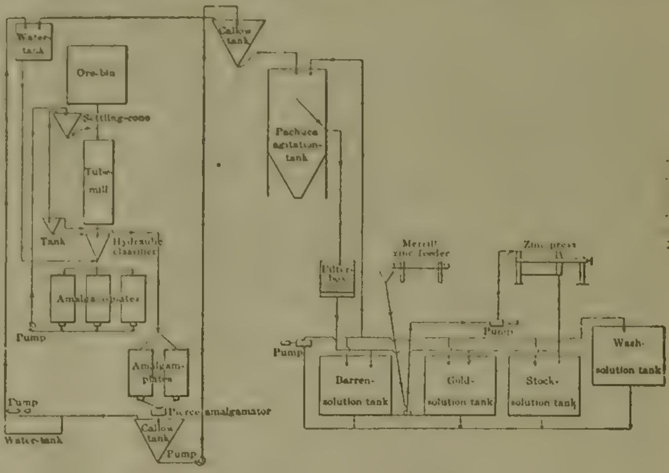
By B. S. Butler and J. P. Dunlop

*Mining and milling practice in the Joplin region is so well known through the numerous articles that have already appeared that but few words are necessary here. The type of mill erected in the southwest Missouri district is carefully chosen to fit the needs of the particular kind of orebody to be exploited, and, being based on the evolutionary experience of nearly forty years, is in general wisely selected. In early days of zinc mining in the district, when only the richest runs and pockets of the 'disseminated' deposits could be profitably worked and the life of the individual mine was necessarily short, a simple type of concentrating plant came into use. It was equipped with a rougher-jig and a cleaner jig, and had a capacity of 80 to 100 tons of crude ore per 10 hr. shift. When a deposit was worked out, the mill could be easily and cheaply moved to another deposit. When the increased price of concentrate made it possible to mine lower-grade ore and the life of the deposits was thereby lengthened, somewhat larger and more complete milling plants came into vogue. Sand-jigs and concentrating tables were added to the equipment, and the capacity was raised to 200 tons or more per shift. Such mills, developed by the necessities of local conditions, came to be characterized throughout the lead and zinc regions of the Central States as the 'Joplin type.'

The lead and zinc ores of the Central States, when marketed locally, are sold on a plan which differs somewhat from the methods in vogue in Western and other States where more complex ores prevail. The producer is paid by the ton of concentrate, all ore being sold in that form. The price is arranged on a sliding scale, the foundation of which is the price paid for ore of a certain standard, namely, the 'basis.' In each of the ores a 'basis' is arbitrarily taken which represents as nearly as may be the average metallic content of clean concentrate. In sphalerite or zincblende concentrate the basis is 60% (theoretical composition, 67%) of metallic zinc, by wet assay or analysis; in the oxidized zinc ores (the carbonate and the silicate), the basis is 40% (theoretical, 52 and 54%) metallic zinc; and in galena concentrate the basis is 80% (theoretical, 87%) metallic lead. The buyer will offer so much for 60% zinc ore which becomes the 'base price.' If the assay shows the concentrate to vary from the basis, $1 is added to the base price for each per cent of zinc above 60, and $1 subtracted for each per cent less than 60. Deduction is made for moisture, all concentrate being sold on dry, or net, weight. Penalties are exacted for the presence of undesirable elements, as iron, bitumen, barite, and fluorspar; $1 is deducted for each per cent of iron above 1%. The first ore sold from the new Miami district was penalized 2%, that is, $2 was arbitrarily deducted for the bitumen clinging to the concentrate. The blende concentrate from Miami averages about 50% zinc, and is penalized $10 per ton for falling 10% below the 'basis', as well as an additional penalty for the iron content. In practice, however, it has been found that these penalties are heavier than necessary, and the ore-buyers offset the excess by increasing the basis offer over the base price obtaining in the other parts of the Joplin region where the concentrate averages nearer 60%. Fluorspar occurs in the zinc concentrate of western Kentucky and southern Illinois, but neither fluorite nor barite is found in quantity in the ores in the Joplin or the upper Mississippi Valley districts. The practice of buying zincblende concentrate on an assay basis became general in 1899, though it began in a small way a few years earlier. Formerly the ore was bought on 'flat bid', that is to say, the buyer made a visual inspection and mentally estimated the metallic content very closely. Galena concentrate is generally bought on flat bid, though buying on assay is increasing. Ore which is sold in lump, such as hand picked galena, lead carbonate, and carbonate and silicate of zinc, is very generally sold on flat bid.

An Experimental Cyanide Plant

In designing a cyanide plant at the Alaska Treadwell mines, it was judged wisest to make exhaustive experiments before undertaking construction, as the capital thus expended would be repaid in the more effective working of the mill as finally constructed, and by the saving in the cost of the alterations usually necessary in a new plant. Preliminary tests were made, under the direction of W. P. Lass, in glass jars, and followed by tests upon 50-lb. lots by grinding in a small clean-up barrel filled with iron balls, the pulp being agitated in a 14 in. by 4-ft. Pachuca tank. Next a 4 by 12-ft. Abbé tube-mill was installed, the pulp passing over amalgamated plates to a Dorr classifier and Callow cones were used for dewatering the sand before cyaniding in a 10 by 22-ft. Pachuca tank, the classified solution going to a Merrill precipitation press. With this equipment 15-ton lots could be treated. The gold content was removed from the pulp by successive washes and treatment. The accompanying flow-sheet shows diagrammatically the method used for these experiments, with the exception that the filter-box shown was later superseded by a Kelly filter-press (type 1 B) of 50 tons daily capacity, which did away with the numerous washes and decantations previously required. With this equipment a complete series of tests was carried out, with the result that when the 100-ton plant was constructed it was operated from the start without any hitch.



FLOW-SHEET OF EXPERIMENTAL CYANIDE PLANT.

American manufacturers deserve a great deal of credit for their efforts in producing suitable permissible explosives to meet the economic conditions in the coal mines of this country. Many of the permitted explosives used in European countries would not be suitable for use in the bituminous coal mines of this country for the reason that they are much stronger and quicker in action. If such explosives were used in mines of this country according to our American practice, depending to a great measure on the execution of the explosive, they would fail in their purpose. For this reason the American manufacturers have found it necessary to reduce the strength and quickness of explosives for coal-mining purposes by adding inert materials or restraining substances. With explosives of this kind the average miner, after a short time, obtains successful and satisfactory results.

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*From an advance chapter, 'Mineral Resources of the U. S., 1910.'

Discussion

Readers of the Mining and Scientific Press are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Surface Indications of Ore-Shoots in Depth

The Editor:

Sir—After reading Mr. Cutler's article on pitch of ore-shoots in your issue of October 28, I am more than ever in love with the old rule: when you are in ore any change (of formation) is a bad sign, and when looking for ore any change is a good sign. Now in Mr. Cutler's second paragraph reading "When following an ore-shoot in a vein, a change in the vein or a disturbance is unfavorable * * *"; if we read "when looking for an ore-shoot in a vein * * *" then, by all means, what is needed is a gulch. Though I rather think that the prime cause of most gulches is that you cannot have two hills without one. In other words, if you look for the cause of the ridges, the gulches are a natural sequence.

I quote you from 'The Practical Handbook for Miners,' J. A. Miller, 1897, p. 95: "When a river forks at its head into two or more branches, it is strange to say, the source of the gold will nearly always be found in the right-hand branch geographically speaking * * * you are supposed to stand at the head of the river or stream, looking toward its mouth or outlet." Now this was evidently a rule in those days, whether it is now or not. Again, p. 103: "Observation shows that most mineralized mountain chains extend into a northeast and southwest direction—that is, roughly speaking—and that most metalliferous lodes run at right angles to the main axis of elevation of the ranges; it follows that lodes must have a more or less east and west strike."

Now, why should not ore-shoots have their little habits also? If it were possible to compare data from several camps, it would help settle the point whether ore-shoots in general favor a certain direction in their pitch.

It was not so long ago that a faulted vein meant digging in every direction; now there are rules for this, thanks to careful study and comparison. Of course, I don't say that Mr. Miller is infallible, as on p. 73 he tells us that "the almost microscopic infusoria * * * lay down beds of limestone and sandstone hundreds of feet in thickness." But this was before they found gold in the grindstone. Also, on p. 109, he says "pyrites or mica, which is the same thing"—which latter is rather a gem.

In these matters it is well to remember that fifteen years hence many of our present ideas will be laughed at. I can remember twenty years ago that an 'expert' would hardly look at a property in limestone. Granite and slate contacts were the fashion then. How long has it been since the tellurides were generally recognized—and are they really understood yet? Twenty-five years ago the Cornishmen used wolfram for ballast and wall building, and yesterday some zinc was overlooked. Tomorrow there may be a rule to find an ore-shoot in depth without following the ore *antigua* style. Before bidding good-bye to Mr. Miller, I quote a few sentences from his 'Mining Investor's Handbook', p. 192:

"The mining prospectus is got up for the purpose of selling the shares of its respective company and addresses itself especially to the unwary and gullible public. Nobody is responsible for the statements the prospectus contains. Nominally the directors are the responsible parties, but as it happens as often as not, the prospectus comes into existence long before the board of directors, and in not a few cases they themselves have been caught and deceived by their own prospectus. What is wanted is to make the prospectus innocuous. The prospectus should emanate from a practical mining engineer of good standing, who should be held responsible for every statement made in it. The prospectus should be signed by the compiler and also by a goldfields warden or magistrate residing in the neighbourhood of the mine, testifying to the respectability of the compiler and also as a guarantee of good faith that the ground proposed to be mined does really exist, and is the property of the company." Thus in 1897 and 1911, "which is the same thing."

SONORA.

Nacozari, November 3.

Mining Opportunities in the Orient

The Editor:

Sir—Having noticed frequent references to Oriental affairs in the *Mining and Scientific Press* recently, I would like to ask your opinion of the opportunities for mining now existing in Japan, Korea, and China, and I think many others among your readers would be similarly interested. Is the general impression that abandoned native mines in southeastern China offer a profitable field for exploitation by foreign companies a correct one? What effect will the revolution in China have upon mining development?

ENGINEER.

Salt Lake City, November 10.

[The mining laws of Japan, like those of the United States, are not framed to encourage mining exploitation by aliens, and there is little attraction for foreign mining investors. Korea, which now belongs to Japan, is governed by regulations which offer liberal terms to foreigners and foreign companies, though regarded as onerous by some who were accustomed to the provisions imposed by the former Korean régimé. The country offers a promising field for mining, as native workings are widespread. Frequent references to the companies now operating in Korea appear in our columns. China, generally speaking, offers little field for foreign exploitation, as the experience of the Government with foreign concessions has been so unsatisfactory that it is safe to say that no more will be granted, unless under extreme diplomatic pressure. A good deal of native capital is being invested in the development of coal mines, but we regard the coal supply at present available ample for present needs, though the demand is likely to grow rapidly. The demand for capital for industrial development is so great that mining, other than coal, is somewhat neglected by native investors. The general impression as to the mineral wealth of southwestern China is well founded, to a certain extent at least. The Burma Mines, Ltd., is successfully operating an abandoned native lead mine and slag-dump in the Shan States, a short distance west of the frontier. The Syndicat du Yunnan has a 60-year concession on 40,000 square miles in Yunnan, but though it has been in existence for ten years, little has been accomplished on account of local difficulties and the opposition of the people and officials of the province. It is to be feared that the revolution, if it should be successful, will hamper rather than encourage mining development. The underlying cause of the outbreak is popular opposition to the wholesale incurring of foreign loans for the development of railways and industry, and in any case the financial situation in China will be bad for some time. There will always be opportunities, of course, for individuals to enter the employ of the companies now in operation and to engage in work in various other ways, but in all cases the engineer should see that he is provided with a properly executed contract and funds for traveling expenses before venturing so far from headquarters. Generally speaking, living conditions are excellent in the Orient, and the climate is nowhere unhealthful when reasonable precautions are observed.—EDITOR.]

THE MESABI IRON RANGE in Minnesota produced in 1910, according to the United States Geological Survey, 53¾% of the entire iron ore production of the United States. The Lake Superior district, including Minnesota, Michigan, and Wisconsin, produced 81½% of our total iron ore production. Figures from other countries are not yet available for 1910, but this is probably a greater production than the entire year's output for any foreign country.

Concentrates

Most of these are in reply to questions received by mail Our readers are invited to ask questions and give information dealing with the practice of mining milling and smelting

TIN EXPORTS from Perak for August are given as 7642 piculs of block tin and 31,439 piculs of ore. A picul is approximately equivalent to 133 lb., and equals 100 kin.

ON melting copper, it is important that none of the copper project above the charcoal. Any copper not covered by charcoal will be oxidized or 'burnt,' and the casting will be weak and full of holes.

IN MINING and milling low-grade orebodies power becomes a large factor in the total cost. A former manager of a custom mill for complex lead, zinc, and iron ores at Leadville reported that power amounted to 25% of the total cost of operation of his mill.

MILLSITES having no connection or association with a lode claim, cannot be patented unless each millsite has a mill or other reduction works upon it. Plants of another nature, even though of service to a mill or mine, or other uses of the claim, will not satisfy the law.

ALLUVIAL deposits are sometimes worked upon a royalty basis; the amount of royalty paid depending upon the working conditions and cost and the richness of ground. In one case 10% of the gross proceeds was paid, but 20 to 25% of the net proceeds is the more usual arrangement.

HOT brass cylinder heads and jackets may be cleaned by using the following recipe. Sift coal ashes fine and mix with kerosene oil to a thick paste; add as much air-slaked lime as can be conveniently mixed with it. Apply this polish to the bright parts, rubbing hard; wipe off and polish with dry slaked lime.

IN melting brass or similar metal, too strong heat is detrimental. Portions of the metal exposed will be melted and oxidized before the rest is melted. The best practice is to have the metal melt as uniformly as possible, so that all portions become liquid at about the same time. This avoids overheating any portion.

MALDONITE is a well defined compound of gold and bismuth, and was first discovered in the quartz of the Nuggetty reef, Maldon, Victoria. It has a pinkish silver-white color when freshly broken, but tarnishes to a dull copper, and finally to black. Before the blowpipe it yields a bead of gold and the usual bismuth coat.

MAKING forgings and welds is aided by directing a jet of compressed air against the heated ends of the work. The air-blast will cause a display of fireworks and will considerably raise the temperature of the metal just prior to making the forging or weld. By this means it is possible to revive the heat in a piece that has become cooled. The air-jet will also blow off all dirt and scale. It will burn the metal faster, and it will increase the heat.

WATER may be appropriated in California by diverting it for some useful purpose, the appropriation being good from the time of diversion. A notice is placed at the point where the water is diverted, stating the amount of water taken, the purpose and place of use, and the means of diversion. This is duly recorded and the work of diversion must be begun within 60 days of the posting of the notice, and carried on with all due diligence to completion. The failure to make use of the water for a beneficial purpose for five years is held to constitute a forfeiture of the right.

FOR a water-supply system the quality of the water available determines its usefulness quite as much as the quantity. Some waters contain ingredients that make it impossible to use them for irrigation unless certain precautions are taken in applying them to the land and in draining them off. Certain ingredients in water make it unavailable or destructive if used in boilers, and the quality of water used in a manufacturing plant may largely determine the quality of the product of manufacture.

THE following substances are held to be locatable under the placer laws when found in placer form; when occurring as veins or lodes, even if primarily formed as placers, it appears that they should be located as lodes. The last three are the subjects of special placer acts.

Alum
Amber
Asphaltum
Borax
Building gravel (uncertain)
Building stone
Gas
Gold-bearing gravel
Guano
Gypsum
Iron beds
Kaolin or fire clay
Limestone
Marble
Mica
Phosphate (uncertain)
Salt beds and springs
Slate
Soda
Sulphur
Tailing and slag
Petroleum

DIATOMACEOUS EARTH is chiefly used for cleaning and polishing, either in the form of powder, or mixed with soap. It is an effective non-conductor of heat and has been used alone, or with various compounds, for coverings for boilers, steam pipes, and safes and in fireproof cements. Its great absorbent qualities fit it admirably for use in water filters and for dynamite. For the latter use it is mixed with wood pulp. It is used largely by paint manufacturers as a wood filler. Boiled with shellac it is made into records for talking machines. In Germany it has been used for the absorption of liquid manures so that they could be utilized as fertilizers, as a source of silica in making water glass, in the manufacture of cement, tile glazing, artificial stone, ultramarine and other pigments of aniline and alizarine colors, paper filling, sealing wax, fireworks, hard-rubber objects, matches, and papier-mâché, for solidifying bromine, and for many other purposes. The value runs from $6 to $9 per ton.

NITRATES can be tested qualitatively in the field, but there is no process known by which a prospector can make a test that is very reliable. There are, however, two methods which are pretty good indicators. One depends upon the fact that caustic soda or potash (NaOH or KOH) will act upon aluminum to produce hydrogen, and nascent hydrogen will act upon nitrates in such a way as to produce ammonia. The process, then, is for the prospector to furnish himself with a number of small aluminum cups, sticks of sodium or potassium hydroxide, and a small measuring cup, such as a cartridge filler, which would be the only outfit he would have to carry. He would then take specimens of the soil or mineral which he wished to examine, measure it in his cartridge filler, and put it in the aluminum cup with a certain amount of water, always the same, and then add his hydroxide. By the strength of the ammonia odor evolved he could judge about how much nitrate was present. In this or in other processes used, careful tests should be made before going into the field, in order to become acquainted with the reaction and with the amount of ammonia produced from given amounts of material. The best way to do this would probably be to take clean sand and add to it varying known percentages of saltpetre. After making such tests a number of times, a prospector would be able to judge roughly of the percentage of nitrates contained in samples of the same size in the field. This experiment is ordinarily made by using a glass vessel and strips of aluminum, but by using aluminum cups which would nest there would be less bulk to carry, and this would obviate the carrying of glass, always an undesirable object in outfits which must be packed from place to place.

Special Correspondence

LONDON

Differing Opinions as to Future of the Tanganyika Concessions.—Financial Crisis Impending in the Company.—Secrecy Hides Principals in Recent Tin 'Corner.'—Orsk Goldfields.

Interest is being shown in the copper enterprise belonging to the Tanganyika Concessions, situated in Katanga in the southern part of the Congo State and just over the border from Rhodesia. The chief mine is the Star of the Congo. For eight years or more this copper deposit has been before the British and Belgian publics, for the ownership and control is about equally distributed in the two countries. In a general way it may be said that the company arrangements in the two countries are such that Belgians control the financial side, and Robert Williams, the English head, is responsible for the administration and the mining and metallurgical operations. Various reports have been issued as to the extent and metallurgical value of the ore, which is almost entirely carbonate. Mr. Williams, who is neither a mining engineer nor a metallurgist, says there is enough ore to produce 100,000 tons or even 200,000 tons of copper per year for an unlimited number of years. Unfortunately, the opinions and views of experienced men capable of judging have never been sought, so in well informed circles there is an air of polite incredulity. One of the first requisites necessary for the exploitation of the deposits was railway communication. A year ago the Rhodesian Railway system was completed to Elizabethville over the Congo border and not far from the 'Star', and by this means access was given from Cape Town to Beira. A railway is also planned and is partly completed from Katanga to Lobito bay on the west coast of Africa. With the best of communications, however, the cost of sending coke from Europe is tremendous. At present no coking is done on Natal, Rand, or Wankies coal, and, indeed, the deposits nearest to the mine are not suitable for the manufacture of metallurgical coke. The smelter started operations this summer, and many rumors have been in circulation as to the difficulties experienced. It is beginning to be realized that a young and inexperienced metallurgist like Allan Gibb is the wrong man for the place. Mr. Williams, however, still sticks to his guns in a hopeless and despairing sort of way, and issues lamely optimistic circulars, giving all sorts of excuses for the absence of information, such as "badly mutilated cablegrams." Such information as is vouchsafed, unintentionally reveals the fact that the metallurgist is at his wits' end to get a good smelting mixture. The congeries of companies forming the Tanganyika group is approaching a serious financial crisis, for the available cash resources are nearly exhausted and the debenture interest is a long way in arrears. The quotation of the ordinary £1 shares is falling steadily, and is now £2 as compared with £7 eighteen months ago. I should not be surprised if the shareholders received an ugly blow even before this letter is in print; but in any case the crisis cannot be postponed later than Christmas.

During the last six or nine months there has been an artificially inflated price for tin, due entirely to the machinations of certain merchants who have been able to corner the visible supplies of such metal as is sold on the London Metal Exchange. I am sorry to say that I am not able to give your readers the names of these speculators, for the simple reason that members of the Metal Exchange do not give away the secrets of their trade to journalists or to the public. In this way they resemble the tin smelters, who are equally secretive. It is really good of the trade not to 'split' on each other, but I suppose there is such a thing as honor in other circles than the proverbial one. It is not generally known outside the metal trade that the only brands of tin sold on the Metal Exchange are those of high quality, such as are necessary in the manufacture of tin-plates. This tin comes from the Federated Malay States and the islands of Banca and Billiton in the Dutch East Indies, these two sources being classed as 'Straits Tin,' and from Queensland and Tasmania. The ores from which these brands of tin are produced are mostly concentrates from gravel, and are notably free from other metals. The assay of Banca, Billion, Penang, and Singapore tin is 99.9% or more; Mt. Bischoff tin from Tasmania assays 99.8%, and Queensland brands run 99.6 to over 99.9%. These are the only brands sold on the London Metal Exchange, and the product of the Cornish, Liverpool, and German smelters is disposed of in other ways, though as a rule through firms of brokers who are members of the Exchange. Tin produced by Cornwall, Liverpool, and German smelters comes from Cornish and Bolivian ores, chiefly. These ores are not gravels, but are found in veins, and usually are associated with many other minerals and metals such as lead, antimony, arsenopyrite, and wolfram. The metal runs 98¾ to 99.9%. In addition many other brands are on the market, especially in Bolivia and China, that run as low as 95% tin. The brands that are not sold on the Metal Exchange are used chiefly in the manufacture of brass and other alloys, a fact which explains the establishment at Liverpool of branches of the Williams-Harvey and Penpoll smelters, a course adopted because the brass market was in close proximity. Owing to the recent 'squeeze' in tin, the majority of the members of the London Metal Exchange have been in favor of widening the source of supply for their official transactions, so a 'Standard' contract has just been adopted that allows high-class refined metal above 99¾% to be dealt in on the Exchange at the official price, in addition to Straits and Australian tin. This rule will allow much of the English and German tin to come within the scope of the dealings of the Exchange, and the increased supply will tend to prevent 'corners'. In addition, any tin assaying from 99 to 99¾% may be dealt in on the Exchange at £7 per ton lower than the Standard, thus providing further resources in case of need, though, as a rule, the penalty of £7 will be too great to induce transactions through the official medium. There is a great deal of unnecessary mystery in connection with the new scheme, and many people think that the smelters, and the mines producing low-grade ore, will suffer. This is not the case, apparently, and the above statement ought to clear the air of many misconceptions.

The Kolchan dredge of the Orsk Goldfields started operations on October 21, and a three weeks' run is expected for this season. It is reported that the stacker-scow has cleaned up $122,000.

MEXICO

A. S. & R. Smelter at Chihuahua Resumes Operation.—Development at the Mololoa.—Semiannual Report of San Rafael y Anexas.—Exploration Company Ventures.—Proposed Line from Guadalajara to Mexico City.

The Chihuahua smelter of the American Smelting & Refining Co., closed several months ago as a result of labor trouble following the revolution, is again in operation and soon will be running at full capacity. The company has decided to add two furnaces at this plant, giving it a total capacity of 900 to 1000 tons per day. Work on the smelter additions is in progress. Operations likewise have been resumed at the Terrazas smelter of the Rio Tinto Copper Co., another Chihuahua plant that was closed several months ago as a result of disturbed conditions. Several hundred tons will be handled daily. In the State of Chihuahua the mining industry is rapidly regaining the ground lost during the revolution, and it is believed the coming year will witness great activity. It is said that the new State government in Chihuahua plans measures of benefit to the mining interests. Recently the Mexico Northwestern railway commenced operating trains on the 22-kilometre branch that gives the Cusihuiriachic silver district in Chihuahua transportation facilities, and that road has let a contract for the building of another branch, 47 kilometres long, from Pearson to Colonia Pacheco. This latter branch will benefit the Dos Cabezas and other important mines. Orders have been placed for additional machinery for the two big mills of the Parral district of Chihuahua, the Palmilla and Veta Colorada, and these plants will handle increased tonnages during the coming year.

The old Mololoa mine in the Hostotipaquillo district of the State of Jalisco, one of the famous antiguas of western Mexico, is again in bonanza ore, and present shipments of high-grade ore are netting the Mololoa Mining Co. from ₱2500 to ₱3000 daily. Power for increased development is to be supplied by the building of a branch transmission line from the El Favor station of the Chapala Hydro-Electric Co. A reduction plant to treat the milling ore existing in the old workings, and that being opened by new development, will be built during the coming year. Much rich ore is being found in stoping in the big El Favor mine in the Hostotipaquillo district. A recent shipment of 26 tons netted the company ₱11,400, or ₱440 per ton. The mill at El Favor is now operating steadily. The aerial tramway that will carry the ores of the Espada Mines Co. to the Virginia & Mexico mill, in the Hostotipaquillo district, will be completed about the middle of December. The reduction plant is under lease to the Espada company. The Chapala Hydro-Electric Co., which has experienced much trouble in operating its Hostotipaquillo and Etzatlan transmission lines during the past rainy season, will change its insulating system during the present dry season. The company is completing a new 12,000-hp. hydro-electric plant, planned to supply mining districts principally. The Almoloya M. Co., of Mexico City, which has been operating in the Ameca district of Jalisco for a few years, has bought the old Cerrito copper mine in that district for ₱50,000. The Magistral-Ameca Copper Co., of Los Angeles, which abandoned operations at the Magistral mines in the Ameca district some months ago on account of disturbed financial conditions, has resumed work on a double-compartment shaft that is expected to prove the property at depth.

A report covering the operations of the San Rafael y Anexas Mining Co., one of the most successful companies of the Pachuca district of Hidalgo, during the first six months of this year shows a gross production of ₱1,649,556, and a profit of ₱546,114. A total of 71,587 tons was mined, the mining cost amounting to ₱6.56, and the milling cost to ₱3.94 per ton. The average yield was 653 grams silver and 3.43 grams gold. The company disbursed in dividends in the six months ₱434,400. The company formed last year by well known Pachuca mining men to build a custom milling plant in the El Chico district of Hidalgo, and which stopped work because of the revolution, is getting ready to resume operations. The company has contracts with El Chico mines for sufficient ores to keep the proposed 100-ton mill operating at capacity. The Pachuca Light, Power & Railroad Co. is completing its Pachuca-Real del Monte electric line, and will have it in operation early in the coming year.

The Exploration Company of England & Mexico has surrendered a three-year option on the Cometa property, adjoining the mines of the El Oro Mining & Railway Co., in the El Oro district of the State of Mexico, which was arranged early in 1910. It was believed that the Cometa contained important extensions of El Oro veins, but evidently developments since the option was taken have not borne out this belief. El Oro Mining & Railway Co. is retreating tailing that accumulated in the early days of the company's milling, the supplies amounting to 450,000 tons. It is estimated that a profit of $700,000 will result. The annual report of El Oro Mining & Railway Co., covering the year ended June 30 last, shows a gross production of $2,389,349 from 360,294 tons of ore, and a profit of $984,333. The profit from the railroad was $103,120, making a total profit of $1,087,453. Working costs were reduced from $4.93 to $3.90 per ton. The dividends paid amounted to 15%. The company is controlled by the Exploration Co., Ltd., of London, of which the Exploration Co. of England & Mexico is a subsidiary.

Southern Pacific engineers from San Francisco have started from Guadalajara, the Jalisco capital, to survey a line from that city to Mexico City. A concession for this line was granted by the Diaz government. The West Coast extension of the Southern Pacific will be completed into Tepic, the capital of the territory of that name, in December. In closing the gap between Tepic and Guadalajara the Southern Pacific will have to cross the *barrancas* of the Sierra Madre, and it is estimated that this crossing will cost from ₱7,000,000 to ₱10,000,000.

JOHANNESBURG, TRANSVAAL

Welgedacht Exploration Co. Closes Down. Government to Reduce Tax on Diamond Mines. Schuller Mine in Difficulties.

Since my last letter was written drawing attention to the wholly inadequate steps taken at Welgedacht to sink through the dolomite formation, and the discredit likely to be caused thereby to that portion of the Far East Rand goldfield, the truth of my remarks has been exemplified in a striking manner during last week. The directors have discovered that the plant and equipment is such that, with safety, even such a small quantity of water as 60,000 gal. per hour cannot be dealt with, and have decided to close down. A new board of directors has, however, been appointed, but the circumstances surrounding the company are such that it is doubtful whether—at least for some time to come—shaft-sinking operations will be again resumed. According to the bore-hole results, this shaft was going down upon what appeared to be a most promising area of the Far East Rand Goldfield. This failure of the Welgedacht Exploration Co. to handle its property in a workmanlike manner, is sure to throw discredit upon a goldfield whose value and possibilities have just been materially benefited by the excellent returns secured at Brakpan.

PREMIER DIAMOND MINE.

Diamond mining in the Pretoria district still continues under a cloud, and were it not for the fact that the Premier mine is worked on an exceptionally large scale, profits under the circumstances would be out of the question. The 60% profit paid to the Government is an incubus the industry ought not to be expected to carry, and it is reported that some alteration in this respect is contemplated by the Government. The Premier mine is the only diamond mine of importance in the Transvaal, and when it was first opened the prospects were so dazzling that even a 60% share of the profits did not seem too much to pay to the Government. Since then, however, the yield has fallen with depth to such an extent that only by working on an unprecedented scale has the company been able to pay the tax, and any inconvenience caused by such a heavy tax on the industry has been thrown upon the shoulders of the shareholders. Why a diamond mine should be called upon to pay six times as much as a gold mine it is impossible to say, and an early readjustment of the burden will be welcomed by all concerned.

Some attention has lately been attracted by attempts to open up the old Schuller diamond property in the Pretoria district, but so far the work done has been, as regards capital, of such a hand-to-mouth character that it is extremely doubtful whether the efforts of the prospecting syndicate can be expected to meet with success. The diamond pipes are so small and yield such a poor grade stone that only by working on an extensive scale will operations be conducted at a profit, while it is doubtful whether the syndicate will ever be able to command the necessary capital to enable mining operations to be conducted on a sufficiently large scale to be profitable.

Despite the many disappointments and losses incurred by the working of the Montrose diamond mine since the present company resumed operations, despite the fact that diamond experts are agreed that the so-called mines are of a worthless character, additional capital is being expended on the property. Month in and month out, operations are being conducted at a loss, and were it not that the mine is controlled from London, where a market exists for the shares, most probably the mine would have been closed down months ago.

TORONTO, CANADA

Lake Navigation Closed.—Many Power-Plants Proposed.—Prospecting Results Encouraging.—Development in the District.

Lake navigation in the Porcupine district closed about November 1, owing to the formation of heavy ice around the shores. At the same time land transportation became difficult owing to the partial freezing over of the roads, the frost not being sufficiently severe to form good winter traveling. The roads, abounding in deep mud-holes, were made impassable for heavy traffic and a number of horses were killed in attempting to overcome the difficulties of moving freight. Building has practically come to an end for the season, a great deal of work having been accomplished during the last few weeks. At the new town of Timmins sixty buildings have gone up in two months. The district will be abundantly supplied with electric power if all the proposed enterprises are carried out. The Porcupine Power Co., with a plant at Sandy falls on the Mattagami river, which has a number of contracts with mines, will not have a monopoly of the field. S. W. Wallberg has 400 men at work constructing a dam at Waiwaietan falls on the Mattagami to supply power by a transmission line to South Porcupine, twenty miles distant. It is hoped to have the line finished by the end of the year. Surveys have also been made and a company organized by Daniel Clark of Cobalt with the object of constructing a third power-plant at High falls on the Frederickhouse river. At the Dome good progress is being made with the power-house and stamp-mill, and it is hoped to have the mill in running order March 1. Recent operations have consisted principally of surface prospecting and diamond-drilling, proving the existence of large quantities of good milling ore. The deepest hole sunk reached a depth of 750 ft., showing the persistence of the surface formation. For 1000 ft. across the property surface prospecting has discovered outcroppings of high-grade ore. The Golden Stairway vein continued down to 200 ft. The main shaft is now down to 180 ft., and it will be continued to 400 ft. before considerable exploration work will be undertaken. The management of the Rea mine has been undertaken by Bert Pourrier, who will also retain his position as manager of the Vipond. The vein has been reached by cross-cutting on the 300-ft. level, 35 ft. from the shaft, where it is found to have widened considerably and to contain sulphide, though but little visible gold. At the 200-ft. level driving shows that the vein runs between 2 and 6 ft. wide, with good free gold for about 300 ft., splitting up and disappearing at both ends of the drift. New finds of outcroppings have been made on the surface, and cross-cuts are being run to tap them underground. The main shaft of the Dome Extension is now down 170 ft., and at 200 ft. a cross-cut will be run to cut the Anchor vein. F. Augustus Heinze visited the West Dome about the end of October and announced that a mill would be erected in the spring. The main shaft is being cross-cut at 125 ft. to catch several veins which show on the surface. The Cartz vein on the adjoining property recently acquired by the West Dome is being worked. A shaft has been put down 20 ft., the ore showing free gold. At the Vipond the main shaft is down 200 ft., and cross-cutting has been begun in two directions. About 650 ft. of underground development has been accomplished at the 100-ft. level. The new 100-ton mill is expected to be ready for operation in February. The principal work now in progress at the Dobie is the sinking of No. 2 shaft, now down 75 ft., a short distance lower to find a large orebody discovered by diamond-drilling. At the Jupiter the vein of No. 1 shaft has been driven on at the 100-ft. level for 84 ft. and found to contain gold. A cross-cut from the shaft on No. 3 vein at the 100-ft. level shows the vein to be 21 ft. wide, yielding good ore. Work on the Porcupine United, which was suspended at the time of the fire, has been resumed, under the management of T. S. Jenkins. The Eldorado has found free gold in the shaft, now down 25 ft. A controlling interest in the North Dome has been secured by the Temiskaming Mining Co. of Cobalt. The Wright-Hargraves claims, four in number, situated southwest of Kirkland lake in the Swastika district, have been purchased by W. Young, of Haileybury, and associates for about $20,000. At the Swastika mine two cages in the new 3-compartment shaft are in operation, and good milling ore is being extracted from the vein, which is 10 ft. wide on the 200-ft. level.

The Amalgamated Asbestos Co., operating a number of asbestos properties in Quebec, is in difficulty and likely to make default in the payment of interest on its $8,000,000 bond issue due December 1, amounting to $200,000. The earnings of the company for the past six months do not equal this sum, notwithstanding every effort to cut down operating expenses. The company will probably pass to the possession of the bondholders, and its reorganization is looked for.

The Laurentian gold mine, in the Manitou Lake district of northwestern Ontario, which has experienced many vicissitudes in the course of the last few years, has been purchased by E. E. Hedges, of Boston, who purposes to continue development work through the winter and is arranging for additional machinery.

NEW YORK

Decreased Copper Surplus Surprises Public.—Foreign Manufacturers Experience Boom From Low-Price Copper.—Ray Con. Issues First Report.—General Market Notes.

The copper producers sprung something of a surprise upon the general public when the statement for October was put out. It has been generally and confidently predicted that there would be a material increase in the surplus, estimates running all the way from 6,000,000 to 15,000,000 lb. When it appeared therefore that the October demand had not only taken all of the month's output, but some 5,897,214 lb. in addition, it was felt that the copper situation was and is making some real progress toward the long wished for higher price levels. Output for the month was 118,255,442 lb., an increase of 2,666,492 as compared with September. Domestic consumption was 64,068,307 lb., an increase of 6,756,723 lb. over the September figures. Nevertheless it was the export demand that saved the day, consumers abroad taking 60,084,349, as against 50,824,011 lb. for September. It is one of the hardships of the present copper situation that the metal output is for the benefit of the consumer abroad. Neither the manufacturer at home nor the consumer of the manufactured product is getting any just proportion of the benefit derived from the flood of red metal that is turned out by the smelters. If such were the case the nation as a whole would not suffer so greatly. As matters now stand, the German manufacturer has the laugh on all the rest of the world. He is going at top speed with raw material cheaper than ever before, and not only cheap but plentiful, and with no reason to apprehend any immediate change in conditions. On the other hand, when the American manufacturer does come into the market he will be bidding against himself. For months he has been importuned to act as the savior of the metal market. In a way, the domestic buyer will evidently have to bear a double burden. There seems to be but one element that is not altogether for the better in the metal market. It is not known just how much or what proportion of the so-called export deliveries goes directly into consumption. The industrial expansion in Germany has been tremendous, and a reaction is to be expected and should be anticipated, rather than any further increase in demand. Germany has been for some months the chief foreign user, and it is hardly to be expected that the present demand can be kept up indefinitely. The copper surplus of 134,997,642, as compared with the record mark of 165,995,932 lb., does not apparently show such a decrease in accumulation as would warrant any great enthusiasm; however, the present accumulated supply of the world is 273,884,362 lb., which, compared with 401,249,967 lb. surplus as of July 1910, shows that in spite of the tremendous amount of copper which has been produced, consumption has made material inroads upon the world's visible supply. It is upon this feature rather than upon the situation at home that better times for copper must be predicted. At the recent meeting of the Copper Producers Association, John D. Ryan, president of the Amalgamated Copper Co., was elected a member of the executive committee to fill the vacancy caused by the recent resignation of Urban H. Broughton.

The first quarterly report of the Ray Consolidated has just been made public. Production up to October 1 was approximately 9,000,000 lb. of copper in concentrate. At present it is costing the Ray 1½c. per pound to ship its concentrate to El Paso, over what it will cost to ship to Hayden when the new smelter is completed. One-half of the Ray mill is completed and working, and the material for the remaining half is all on the ground. The ore at present being sent to the mill runs about 1.85%. When the mill is running at its full capacity of 8000 tons, the management expects to bring the average of the ore up to 2.17% and copper costs down to below 9 cents.

Horace J. Stevens evidently is inclined to side with J. Parke Channing, in the latter's position that the copper producer will eventually have very much the whip hand. Mr. Stevens, in a recent review of the Lake coppers, says: "For the immediate future, the supply of copper in sight is fully adequate and no unduly high prices need be anticipated; but the figures clearly foreshadow another boom period within the next two to four years, at which time the alarmists will be as badly scared, for fear that the copper supply is petering out as they are now for fear that the production is so much greater than consumption that nothing but permanent disaster is in sight."

That there are others whose faith is as great as that of Mr. Stevens in the future of copper, is shown by the mines which are being made in distant lands. The Alaska copper country has been very much discussed, in part, because some believed that the Guggenheim interests were securing some deposits that would give them permanent control of the market; in part, because some of the ground was made the basis for some very unsavory promotions. The Cerro de Pasco, controlled by James B. Haggin, J. P. Morgan, and the estates of H. McKay Twombly and D. O. Mills, it being rather a family affair, with all of the gentlemen mentioned under one roof in the Mills building in New York, has been much talked of, because it cost its owners some $20,000,000 to bring it to its present state of profitable production. The Braden, the property in Chile, South America, taken up some time ago by the Guggenheims, has just joined the ranks of the producers. The last mentioned mines, one in Chile and the other in Peru, are soon to have each a rival, in the Ferrobamba in Peru and the Chuquicamata in Chile. These properties have been taken in hand by Albert C. Burrage, the Boston copper magnate. Each is said to be an immense steam-shovel undertaking, with orebodies like that of the Chino, exposed so that work can be done with little or no stripping of overburden. Mr. Burrage is the Boston director of the Amalgamated Copper Co., but it is stated that the Amalgamated has no interest whatever in either venture, the interests which have been acquired having been taken over for Mr. Burrage.

Ray Central has been a market feature in the copper list, on the strength of the company's plans for a mill. The present plans include the construction of a plant to handle 1500 tons per day, which will be designed by H. Kenyon Burch, who designed the Montezuma mill at Nacozari and the Miami mill at Globe. Frank H. Probert is acting as consulting engineer. Greene Cananea is beginning to show the results of the rebuilding of its plant. The October production showed 4,058,000 lb. of copper, 127,568 oz. of silver, and 763 oz. of gold. The precious metal values at the Greene Cananea are increasing and are of much importance in maintaining a low copper cost. The mine is keeping within the 9c. cost reached some time ago. The management states that dividends could be resumed now, but distributions probably will be deferred until there is more incentive to production. Any fractional advance in copper means a great deal to a big producer such as Greene-Cananea, and stockholders can really afford to wait for an improved metal market.

Nevada Consolidated is making a unique record in that it is turning out copper at 6.84c. per pound from ore that averages 1.7% copper. The construction of the new smelter to be built at Jerome by W. A. Clark for his United Verde property will be in charge of J. B. McIntosh, who superintended the construction of the International Smelting & Refining plant at Tooele and the new works at the Garfield smelter. The new plant is to be an oil burner and will be situated about six miles from the mine, with which it will be connected by a new narrow-gauge railway line. The erection of the new plant to be built by the Granby on its Hidden Creek property will be in charge of Albert Trotter, who was formerly on the Guggenheim staff. Detailed plans are now in preparation, but actual construction work will not be commenced until in the spring. Expenditure is expected to be about $1,500,000, the plant to be of 2000-ton daily capacity.

SALT LAKE CITY, UTAH

Grand County Uranium.—Ore Deposits Arouse Interest Abroad.—Magna and Arthur Plants Increase Tonnage.—Transportation Contracts.

Developments in the uranium property owned by W. L. Fitzgerald and Louis Grundhand, of Salt Lake City, in Professor valley, Grand county, about 22 miles south of the Denver & Rio Grande railroad, indicate that ore may soon be mined here on a commercial scale. Assays show 3 to 28% uranium, with indications of pitchblende. One analysis said to be of an average sample, gave as follows: Uranium, 2.84%; tungsten or wolfram, 2.84%; molybdenum, 1.72%; thorium, trace; gold, trace; silver, 2 oz. per ton; copper 27%. Several samples have been sent to various scientific laboratories, including the Sloane laboratory at Yale, and a shipment of 100 tons is being forwarded to Paris in response to requests resulting from the analysis of smaller samples. The ore occurs in a red Jurassic sandstone, a light standstone, and in a porphyry intrusive. The higher grade ore is carnotite, chiefly, and the lower grade is largely composed of uraninite.

At the present time the Magna concentrating-plant is treating an average of 12,000 tons of ore per day, and the Arthur about 3000 tons. If this rate of production is continued, it will increase the tonnage for the last quarter of the year still further, to about 1,365,000 tons. The amount of actual copper produced will, of course, depend on the grade of the ore mined during the quarter.

The Utah Metal Mining Co., which is constructing a tunnel through the range at Bingham, connecting with the International Smelting & Refining Co.'s plant at Tooele, has made a contract with the Bingham-New Haven for the transportation of that company's ores through the tunnel. The company has built over a mile and a quarter of the tunnel and has less than a mile left to construct. Several other companies are planning to make contracts for deep mining and transportation through the tunnel.

Utah metal mines have paid to date $5,169,687 in dividends in 1911.

General Mining News

ALASKA

Copper River District

Reports from Cordova state that the production of the Circle City district this year will be between $350,000 and $400,000. Clarence Barry on Eagle creek, Jenson & Herrington, the Mastodon Hydraulic Co., and P. J. Anderson on Mastodon creek, and Berry & Lamb on Mammoth creek are working with full forces and are making big clean-ups.

Ketchikan

(Special Correspondence.)—A No. 9-A Cameron sinking pump is being erected at the Red Wing group, owned by the Prince of Wales Mines, Ltd., and shipping will be resumed in the near future at this property. The mine is equipped with a compressor, three machine-drills, and a 60-hp. boiler. The ore assays 7 to 22% copper and carries gold and silver worth $7 to $9.65 per ton. Ore will be shipped to the Tacoma smelter. Rich ore has been discovered recently. The mine has so far been operated by lessees, but Tola Wyman recently returned as superintendent, and the property from now on will be operated by the owners. It is situated south of the Sulzer group of mines, which are steady shippers.

Copper City, October 26.

Prince William Sound

By a curious coincidence, work started on the Cameron-Johnson properties and the death of Mr. Cameron occurred at the same time, October 29. A shipment of 1500 lb. of ore recently was brought to Valdez. Two tests were made. One sample assayed $343 per ton and a second $1226 per ton.

Drake & Westbrook will continue development throughout the winter. Near the Treasury Note is a good water-power site, suitable for prospecting machinery. Drake & Westbrook hope to ship at least 100 tons before snow disappears in the spring, state advices from Valdez.

ARIZONA

Pinal County

(Special Correspondence.)—The new mill and smelter town of Hayden, in the Gila valley, 21 miles from Ray, is the scene of great activity, there being 1500 men, mostly Mexicans, employed, 700 by the Ray Con. Copper Co. and 800 by the A. S. & R. Co. Four of the eight units of the concentrator are in operation, and equipment and machinery is being installed in the other four units. It is expected that the fifth unit will be running by December 1. While one unit has handled as much as 1350 tons of ore per day, the present average daily tonnage is 900 per unit, or a total of 3600 tons, with a daily production of 180 tons of concentrate, the ratio of concentration being 20 into 1. The concentrate is dried by vacuum-pumps to about 9% moisture and shipped to the El Paso works of the A. S. & R. Co. The recovery of the copper content of the ore is reported to be from 70 to 75%. Electric power is furnished by the power-house nearby, 400 kw. being required for each unit. Water is pumped from the bed of the Gila river a distance of three-quarters of a mile, and 5.6 tons is used per ton of ore. Railroad communication is established by a spur from the Phoenix & Eastern, a branch of the Southern Pacific. About 200 men are employed in the operation of the four units—Americans for foremen and skilled labor, the majority of the workmen being Mexicans. Including the men employed in construction and in the power-house and shops, the total force numbers 700 men. H. Clay, formerly mill superintendent at Cananea, is superintendent.

The fourth generator has been installed in the power-house and the equipment now consists of four Allis-Chalmers 1750-kw. alternating-current generators, each driven by an Allis-Chalmers 4-cylinder triple-expansion condensing engine. There are also two Allis-Chalmers 200-kw. direct-current generators driven by Nordberg tandem compound engines, a Nordberg high-duty 3-cylinder triple-expansion pump with capacity of 7000 gal. per minute against a 90-ft. head, and a Nordberg cross-compound blowing engine with capacity of 18,000 cu. ft. of free air per minute. The pumping-plant on the Gila river consists of three Aldrich quintuplex motor-driven pumps with total capacity of 10,000 gal. per minute.

The A. S. & R. Co. is employing 800 men and is using 425 head of mules and horses, and one steam-shovel on the excavation for the new smelter at Hayden. Their contract with the Ray Con. Copper Co. calls for the completion of the smelter and the beginning of the smelting of the Ray Con. concentrate by April 1, 1912.

Globe, November 8.

The Ray Con. Copper Co., in a report covering the period from the last of April to October 25, just issued, states that before the first of the year the gross output of 2,500,000 lb. of copper per month will be increased to almost, if not quite, 3,000,000 lb. per month. Up to October 1 the production of copper in concentrate has been at a rate of about 9,000,000 lb. per month. Since the April report 47,240 ft. of workings has been driven, and several drifts and adits have been enlarged for permanent working. The concentrator building, power-plant, shops, and all accessories at Hayden have been completed. The fifth unit of the plant, which is to be completed at an early date, will not be needed before the end of the year. The water-supply is said to be unlimited as far as present or possible requirements are concerned. In the future the company will issue quarterly reports.

Yuma County

At the Steece Copper M. Co.'s property, according to recent reports from Parker, the shaft at the 500-ft. level passed through about 80 ft. of ore which assayed on the average $20 per ton. The shaft is now 900 ft. deep. Cross-cuts will be run to determine the width of the ore-body. P. H. Newman is superintendent of the property.

CALIFORNIA

Calaveras County

(Special Correspondence.)—The shaft at the Lightner mine is down 525 ft., with cross-cuts extended from the 200, 300, 400, and 500-ft. levels. It is reported that six distinct shoots have been opened, and the 60-stamp mill is running in good ore. The company treats its concentrate at its own chlorination plant, the product being sent from mill to works by an electric aerial tramway. It is reported a mine telephone system is planned. At the Angels group the old 900-ft. Angels shaft is being sunk deeper. A pump has been installed. The Melones Mining Co. temporarily has suspended operations, pending repairs and improvements to the surface plant. A 1600-ft. ditch will be built to enlarge the water-supply system, and the mill will be overhauled. A 250-hp. electric hoist is being erected. This mine is one of the most economically operated on the Mother Lode. The ore is quarried, and reduced by a 100-stamp mill. The property is on the north side of the Stanislaus river.

Angels, November 10.

Eldorado County

Ore assaying $82 per ton has been discovered in the Lucky Baldwin mine, recently acquired by Los Angeles investors, and the working force is being increased.

San Francisco capitalists have acquired the Beebe mine, near Georgetown, and extensive development is planned.

Plumas County

Another copper discovery has been made near Portola by Jack Rankin, who made the first find. Rich peacock ore was found in the second discovery, which was made about three miles from the town of Portola. Rankin sold his third interest in the first discovery for $15,000, state recent press reports. While many prospectors have been attracted by the copper discoveries, few locations have been made, as the finds were on patented land.

Sacramento County

Dredge No. 8 of the Natomas Con. of California, which was burned October 20, is to be rebuilt at a cost of about $225,000, according to recent reports.

SHASTA COUNTY

(Special Correspondence.)—The Mammoth Copper Co. is driving a new adit which will be used as the main working level. It lies about 750 ft. southeasterly of the main adit and is about 2000 ft. long. It is 9 by 10 ft., and is planned to intersect the orebodies about 167 ft. below the present workings. At the 2400 ft. level, it is believed, a new vein will be tapped, while at the 3100 ft. level the main orebody should be reached. Driving is progressing at a rate of 14 ft. per day. Two machines are employed, and 25-ton cars will be employed to transport ore, the cars being operated by electric motors. The track is laid with 50-lb. T-rails with a 36-in. gauge. It is planned eventually to extend the adit 600 ft. farther to tap a virgin vein disclosed by the diamond-drills. It is rumored here that the Bully Hill Copper Co. is still experimenting in an endeavor to devise a smelting process which will overcome the fume annoyance. The company's plant at Delamar has been idle for 18 months owing to the action of the National Forest officials. The Mt. Shasta has completed a new station on the sixth level, and driving from this and the fifth level is under way. Twelve men are employed. H. A. Clark is manager. The Mt. Shasta lies eight miles west of Redding. During October the Delta Con. company shipped two cars of silicious quartz to the Mammoth smelter. S. D. Furber, assistant secretary, is directing operations. The Minne Shasta recently sent a car of fair-grade ore to the Mammoth smelter. The mine lies in the Middle Creek section. The Noble Electric Steel Co. is completing the new furnaces at the Heroult electric iron smelter. It is reported active production will commence shortly.

MAMMOTH SMELTER.

Kennett, November 11.

SIERRA COUNTY

Rich ore is reported to have been found recently in the Sixteen to One mine at Alleghany, according to recent newspaper despatches, but no definite information has been given out.

TEHAMA COUNTY

The Northern California Gold Mining Co. will soon have its suction dredge in operation, it is reported. The dredge will operate about ten miles from Red Bluff.

TUOLUMNE COUNTY

(Special Correspondence.)—Operation has been started at the Starr King mine. The new 5-stamp mill is working satisfactorily, and it is believed that sufficient ore can be extracted in development work to keep it working steadily. Where work is now being done the vein is large and of a fair-grade ore, with a streak of high-grade that should bring the results up to a satisfactory average.

The Iron Spring and Buster mines, situated in Hunter canyon and owned by Benjamin Darnert and D. J. Sutton, have been bonded to S. O. Prescott, who is also interested in other East Belt mining properties. A crew immediately will begin driving an adit 500 ft. Mr. Prescott is the owner of several quartz claims in the same district as the properties he has just bonded, and he will begin the development of these in the near future. A bar of gold weighing 70 oz. is the result of the first clean-up after a 30-day mill run at the Crystalline mine. A large quantity of sulphide also was saved. Repairs are being made to the plant at the Omega.

At the El Dorado mine, near here, a 4-ft. vein showing free gold has been uncovered in an old shaft north of the prospecting shaft lately sunk and in which a small vein of high-grade ore was found several days ago. The property is being developed by the owners, the Sivori brothers and Henry Rosasco.

Development may soon be resumed at the Miller mine, in which R. W. Canthers of Sacramento is interested. Good progress is being made in the Columbia basin project, the double-compartment shaft having reached a depth of nearly 150 ft. Thus far the flow of water has been easily handled with one small pump, but four 10-in. pumps are being installed in anticipation of a large volume of water when bedrock is reached. Some of the gravel strata already traversed are gold bearing. Though a station has been cut at the 100-ft. level, it is understood that no driving will be done before the bottom of the shaft is on bedrock.

Tuolumne, November 12.

Conlin brothers, operators at Rye Patch, Nevada, have secured a bond and lease on the Golden City quartz mine and have started operations.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence.)—Work has been resumed on the Everett property, situated on Republican mountain. Otto Shatz, of Denver, is operating the mine under bond and lease. The Terrible compressor-plant is furnishing air for the operation of machine-drills at the Seven-Thirty and Zero mines. Shipments of lead and zinc ore are to be started from the Key West mine on Leavenworth mountain. The orebody is from 7 to 14 in. wide. E. J. Butts is manager. Plans have been completed for the resumption of work on the St. Paul property. The adit will be driven 500 ft. to intersect the St. Paul vein. Mont Tong is manager. A 12-in. streak of quartz that assays $40 per ton in gold and silver is showing in the bottom of the 35-ft. shaft sunk on the Black Prince vein. F. Winters, Jr., is owner. Construction work on the new mill at the Conqueror mine on Covode mountain will be started this month. George Schneider is manager. Work has been resumed on the Old adit situated in Columbia mountain. The bore is now in 550 ft. and a vein should be cut in the next 20 ft. The Mineral Chief mill is now running on three 8-hr. shifts. An average of 60 tons per day is being treated. A. L. Stephens is manager of both mine and mill. Work will be resumed in a few days on the Central Colorado property on Leavenworth mountain. C. R. Iliff of Denver is owner. Occasional shipments are being made from the Amie mine, returns of $90 per ton in gold and silver being received in settlement. W. S. McGintie is manager.

Georgetown, November 11.

GILPIN COUNTY

A mass of pitchblende or uraninite, weighing 240 lb., it is reported, was recently taken from one of the uranium producers on Quartz hill in Gilpin county. This pitchblende surpasses in radioactivity the pitchblende produced in Austria, but has not yet been developed in large bodies. Small but rich pockets are occasionally found in the development of the other ores for which the mines are worked. Similar ore, it is reported, has been shipped in the past from the Jo Reynolds mine in Clear Creek county.

Shipments assaying $120 per ton are reported from the Corydon, a mine that has been idle most of the time for twenty years. The property is owned by Henry M. Teller and associates, of Denver. Shipments reported from the Pittsburg in Russell gulch returned $325 per ton for the first-class ore, and $225 per ton for the second class. The ore was taken from the 800-ft. level and preparations have been made to follow it to greater depths.

LAKE COUNTY

Arrangements have been made to take advantage of the proffered co-operation of the Central Colorado Power Co. in providing for the unwatering of the lower depths in the mines of Carbonate and Fryer hills. A company with a strong directorate will assume charge of the pumping operations. The $40,000 that this company will need for the purpose will be raised by the sale of securities. The power company will subscribe $15,000, to be paid in current at a rate that will make the pumping much less expensive than it would be if coal were used. Liberal subscriptions from the mine operators and other business men of Leadville are assured. The deepest mining now in progress on Fryer hill is not more than 500 ft. from the surface. By raising about 700 gal. per minute it is estimated that the water-level can be lowered to 700 ft., and large bodies of zinc carbonate made available for profitable production. By pumping 1200 gal. per minute on Carbonate hill the water can be lowered to 1300 ft. from the present depth of 1000 in the Wolf Tone. The ground to be unwatered contains deposits of complex sulphide ores from which a large production can be maintained.

Walter W. Davis, formerly of the Yak adit, has gone to Aspen to take charge of the Smuggler properties, which have been unwatered by pumping through the Free Coinage shaft.

OURAY COUNTY

To promote prospecting in the Ouray district the Telluride Power Co. has offered to supply power to prospectors at one-half rates for long-time mining contracts.

TELLER COUNTY (CRIPPLE CREEK)

Work will be resumed at the 1000-ft. level of the El Paso mine in the near future. Development was abandoned some time ago through the flooding of the mine. With the increased production made possible by this work, it is believed that the company may resume the quarterly payment of dividends. Sinking of the Nichols shaft is progressing well. It is planned to give this shaft an additional depth of 300 ft., which will permit the El Paso company to hoist ore from the deep levels of the Beacon hill Ajax property. John Nichols is superintendent for the company.

IDAHO

SHOSHONE COUNTY

William Beaudry, superintendent of the Stewart mine in the Coeur d'Alene district, has confirmed the report of the recent ore discovery, saying that the vein was found in the winze and that it may go farther than the winze. The miners are reported in ore at a depth of 185 ft. The opening of the new orebody will greatly increase the shipments of pure galena. The long adit is being driven at a rate of about 400 ft. per month, and unless more than usual difficulties are met with in crossing the Osburn fault, the orebody should be reached early next spring. The crew has been enlarged and three shifts have worked continually, with results which, it is said, have set a record in the Coeur d'Alene.

MONTANA

DAWSON COUNTY

J. W. Ridinger, of Coeur d'Alene, is quoted at Spokane as saying that Ridinger & Co. will erect a stamp-mill on their property on Cedar creek, for operation in July. Much development work has been done on the property and assays have been secured ranging from $30 to $500 per ton. The ore is refractory, carrying copper, silver, lead, and running high in gold. The company has five claims. A 50-ft. adit has been driven on one of the claims. The company plans to handle the free-miling ore at the property and to ship the concentrate to the smelter.

LINCOLN COUNTY

(Special Correspondence.)—The Dominion mine, situated at the head of Lyons creek, near the Lincoln-Sanders county line, has a vein of ore about 4 ft. wide, rich in gold, according to William Criderman, who recently visited the property. The vein has been opened up for a distance of 1400 ft., Mr. Criderman says, and a series of assays taken at different places along the vein for this distance gave returns ranging from $9 to $1700 per ton in gold. In specimens taken from the property the free gold is plainly visible. The mine is situated on the divide between the headwaters of Vermillion and Silver Butte Fisher creeks. It is being developed by a company organized at Hamilton, and supplies have been taken in to last throughout the winter. Mr. Criderman has a claim on a vein parallel to the Dominion upon which he intends to do some work at once. The first move will be the letting of a contract for an adit 150 ft. long, which will cross-cut the vein at a depth of 100 feet.

Libby, November 8.

SILVERBOW COUNTY

(Special Correspondence.)—A large number of stockholders of Butte Coalition in this city were in favor of the proposal which originated somewhere in the East of a dividend being declared from the treasury surplus, but the cool-headed ones are wondering how a dividend of $4 can be declared on 1,000,000 shares from a treasury surplus which is less than $4,000,000. It is feared that the story originated in the mind of some Boston broker who took this means to start a boom in the stock. If this were the object, to some extent it has been a success. However, if this dividend is paid, the holders of the stock cannot expect to receive more than $3.80 per share, as the treasury surplus amounts to $3,850,000. Since Butte Coalition sold its property to the Anaconda company it is nothing more than a holding company, but it holds a large amount of stock in the Anaconda Copper M. Co. and the International S. & R. Co. The income from stocks held is adding something over $50,000 per year to the treasury after all expenses and dividends are paid.

The men who a few months ago made such an effort to raise sufficient money to build an independent smelter have abandoned the effort, and those independent owners have found out that people are not going to put their money into any such enterprise when the smelter accommodation at present is much more than sufficient to handle all of the ore offered and thousands of tons besides.

Butte, November 13.

NEVADA

CLARK COUNTY

E. Carleson and Charles W. Lund will start development immediately on a lease they have secured on 400 ft. of the main Quartette vein, says a report from Searchlight. The lease includes the original Quartette shaft, sometimes known as the glory hole.

The Searchlight M. & M. property temporarily has been shut down. Additional pumping facilities will be provided, according to a statement of H. E. Carter, manager of the property. The mill may start, however, in a few days on a run of ore from the Wells lease on the Dabu claim.

C. J. Farr, Charles Fearney, and George Weeks have started development in the Leadville district, 25 miles south of Searchlight, and plan to ship to the smelter at Needles.

ESMERALDA COUNTY

High-grade ore is being sacked for shipment at three points on the claims of the C. O. D. Consolidated, state recent press reports. Ore assaying about $300 per ton is being mined in a drift from the old incline that connects the workings of the Gold Bar and Victor mines.

Development will be resumed in the near future on the Jackpot group, about four miles west of Goldfield, according to recent reports. A trust deed covering a bond of $200,000 from the Hall Jackpot M. Co. to the Merchants Bank & Trust Co. of Los Angeles has been filed.

The directors of the Montana-Tonopah company recently ratified the purchase of the Commonwealth mine, near Pearce, Arizona.

The shaft of the Florence mine is down 915 ft., and sinking is being continued in order that new ground at a greater depth may be developed.

HUMBOLDT COUNTY

E. W. Hawk has discovered ore assaying as high as $1500 per ton on the Delaware M. Co.'s property in the Seven

Troughs district, according to recent reports from that place.

Active development is to be rushed on the Seven Troughs Monarch M. Co.'s property, to cut the vein, according to a recent announcement by D. P. [illegible], manager for the company. The adit now is in 1400 ft., and it is believed the vein will be found within the next 100 feet.

W. C. Pitt has purchased a one-fourth interest in the Walker brothers' cinnabar property in American canyon, says a report from Lovelocks. The property is equipped with a Huntington mill, concentrating tables, and retorts.

LANDER COUNTY

The Gold Basin M. Co. recently made the first payment on a group of claims at Carroll, in the southwestern part of the county to Charles Carroll, J. L. Watt, William Watt, and Mrs. Isabel Watt. All remaining Watt and Carroll properties are to be offered for leasing.

LYON COUNTY

(Special Correspondence.)—Business from a mining standpoint is improving in this vicinity. Unusual activity is noticeable along the copper belt, caused by the work nearing completion on the smelter at Wabuska.

SEVEN TROUGHS IN 1908.

Many of the silicious gold prospects have from a few hundred pounds to several tons of a medium ore that will not stand shipment to San Francisco or Salt Lake City, which will pay a profit when the new smelter is blown in. The majority of these prospects are on small seams and veins, and will never be large producers. On account of their smallness it will not pay to follow them to any great depth.

Yerington, November 11.

NYE COUNTY

The Tonopah M. Co. last week shipped 3450 tons, the Belmont company 2650 tons, the Montana-Tonopah 1045 tons, the Tonopah Extension 987 tons, the West End 525 tons, and the Midway 50 tons, making the total production for the district 8707 tons, the estimated value being $217,675, states the *Tonopah Miner*.

STOREY COUNTY

Only a nominal production was made by the Comstock mines last week, partly through the fact that no stoping was done on the 2500-ft. level ore. The Ophir, however, approached its customary output with 282 tons, which averaged about $50 per ton, the total production from the mine being valued at $14,252. The Crown Point, owing to the repairing of the Yellow Jacket shaft, hoisted a comparatively small amount of ore. During the repairing of the 2000-ft. station of the Union shaft, the only mining done by the company was the sinking of the Union and Sierra Nevada winze. At the Mexican, work on the mill was continued, together with other construction work and underground development. Three cars of ore were shipped to the smelter. At the Union Consolidated a higher grade of ore was found on the 2500-ft. level. Fifty-five cars assaying on the average about $24 per ton, and 55 cars assaying on the average about $6 per ton were shipped. The usual repairs were made at the Consolidated Virginia, together with considerable development work. The southwest drift on the 2250-ft. level was driven 16 ft. through low-grade quartz from which 22 cars averaging a little over $10 per ton was saved.

WHITE PINE COUNTY

The Nevada Con. Copper Co. in the quarter ended September 30, according to the official report recently issued, produced 15,837,097 lb. of copper, about the same as the production for the preceding quarter. This fact is taken as an indication that the company is maintaining its production at a figure of about 64,000,000 lb. of copper per annum. For the second time, no mention of costs was made. Thompson, Towle & Co., figuring on 12¼c. copper, computes the cost at 6.84c. per pound. The latter company, commenting on the Nevada Con. report, remarks:

"It is worthy of note that during this quarter the grade of ore treated was 1.7%, copper, which is the average of Nevada Consolidated's reserve. It is not to be lost sight of, however, that operations are confined at present entirely to steam-shovel ores and no underground mining is now being done. The management of Nevada Consolidated feels confident that the cost over the life of the mine will not exceed 7c. per pound. This opinion, however, is not expressed by some engineers, who believe that a 7½c. figure will be nearer the true average."

NEW MEXICO

SOCORRO COUNTY

(Special Correspondence.)—The Ernestine M. Co., even while erecting the new batteries, necessitating the stopping of ten of the old stamps to permit the new mortar-block to set, made the greatest monthly production in its history in October. The new orebody opened below the main adit is over 20 ft. wide and assays $40 per ton. The last 10-day clean-up in October yielded 10,465 oz. of gold and silver bullion, and 5 tons of high-grade concentrate; 570 tons of ore was milled during the week, producing 50 sacks of concentrate in addition to the zinc-box precipitate. E. Craig, the president of the company, is inspecting the property and the new machinery. At the Deadwood mines the third level west has opened good ore. The mill continues its regular production of bullion and concentrate. Both the old Cooney mine and the Little Charlie, of the Mogollon Gold & Copper Co., are producing a good-grade ore. Smelter shipments are being made from the former, while 10 tons per day are being treated in the Deadwood mill from the latter. The new working shaft on the Pacific, of the Oaks Co., has been sunk 18 ft. in ore. Work continues on the main adit. A good orebody has been opened in the 80-ft. shaft of the Iron group.

Mogollon, November 10.

OREGON

JOSEPHINE COUNTY

Chicago investors have purchased the W. H. Barr placer property, consisting of 320 acres on Briggs creek, state recent reports from Grants Pass. A sawmill will be built and the placer equipment will be added to. Moore brothers leased the property last year, and applied for a renewal, but Mr. Barr decided to sell the property.

As soon as the Commercial club of Grants Pass will give him a site, A. J. McCorkle will erect a 200-ton sampling-mill at that place.

Two carloads of machinery for the mill of the Michigan mine have been delivered. The equipment delivered includes Monell concentrating tables and a Monell slimer, manufacturd in Colorado. A mill may be constructed at the Jewett mine, 7 miles southeast of Grants Pass. Development will be resumed in the near future at the Granite Hill mine.

UTAH

JUAB COUNTY

The South Iron Blossom company recently completed assessment work on the unpatented ground owned by the company in the south end of the Tintic district. The work in the main adit, where the assessment work was done, was encouraging, and as soon as possible in the new year the ground will be patented.

The electric pump at the Swansea, which was stopped by a breakdown, will be in operation in a few days. Work will be taken up on the 940-ft. level.

Negotiations are under way with Salt Lake City mining men for a lease on the Godiva mine.

Salt Lake County

The report of the Utah-Apex M. Co. for the year ended August 31, recently made public in the West, states that regular shipments have been made since April. The mill was put in operation in June and is running two shifts on second-class ore from the Parvenue orebody. Plans are made to mix with this ore from the Louisa adit. An arrangement has been made to load directly on the cars of the Bingham & Garfield railroad near, and on the same level as, the Parvenue adit. The ore-sales for six months amounted to $313,102. The mining costs were $191,802, leaving an operating profit of $121,300. Other expenses amounted to $33,622, leaving a net profit of $87,672.

The Utah-Apex commenced using the Bingham & Garfield railroad on November 10. In six months of mining the company shipped 38,000 tons of ore.

Tooele County

It is believed that two lead furnaces of the International S. & R. Co. at Tooele will be in commission by the first of the year. The foundation work for two of three furnaces has been finished and the work of erecting the furnaces will be started at once. Grading for the third furnace is under way. Over 90% of the structural steel for the storage and bedding bins has been received. The large flue dust chambers have been completed and the bag-house also has been erected. Work on the plant was started last June.

WASHINGTON

Ferry County

(Special Correspondence.)—The Ben Hur Leasing Co. has completed the cross-cut from the shaft to the vein and is timbering the station on the 400-ft. level of the Ben Hur mine. The Knob Hill company shipped four cars of ore from the Knob Hill mine for the week ended November 3. The Quilp is now well ventilated, a new blacksmith-shop has been built, and the old one has been converted into a drying-house. The ventilation affects the 600-ft. level of the Surprise mine, from which the No. 2 and 3 raises on ore afford an air-current through the stopes. A small portable engine has been erected on the main level for hoisting steel, timbers, and supplies.

Republic, November 3.

Robert A. Koontz, of Spokane, president of the San Poil Con. M. Co., announces that the directors have decided to equip the property at Republic with a mill of 125 tons capacity. S. L. Boyer, manager of the mine, reports that in the South San Poil stope, above the No. 2 level, the orebody is from 6 to 8 ft. wide. Samples of the working face show 2 ft. of ore assaying about $135, and 6 ft. assaying $31 per ton. It is from this stope that the company was shipping until compelled to suspend by the closing of the Granby smelter.

Spokane County

L. K. Armstrong, temporary secretary, has called a meeting for November 24 to organize the Spokane section of the American Institute of Mining Engineers. It is planned to give a dinner in the evening. This will be followed by a business meeting, at which papers will be read. Officers for the year will be elected and a formal organization effected. R. S. McCaffrey, of Moscow, Idaho, will be one of the principal speakers.

Stevens County

(Special Correspondence.)—The First Thought Extension mine, in Orient district, idle for several months, will be active about November 10.

The adit of the Blue Grass mine, driven a long distance in barren hard rock, is in 335 ft. and entering vein matter. The Scotia mine has been examined in the interest of New York capitalists.

Orient, November 4.

The Diamond R., Diamond R. No. 2, Bella May, and the Bluejacket claims, in the Metaline district, have been transferred by William Kroll of Spokane and his associates to the Falls City M. & M. Co., which has been incorporated with a capital stock of $2,000,000 for the development of these properties. The ore is silver-lead, with the lead predominating. A crew of men is doing development on the Diamond R. at the present time, and it is planned to do extensive work in the spring.

CANADA

Ontario

(Special Correspondence.)—After the first snow at the Porcupine district comes the warm Indian summer that is new to most of the mining operators there at present. South Porcupine has built up wonderfully since the fire, and the convenience of the electric light is appreciated again.

Work at the Dome mine and mill is progressing as rapidly as material arrives. Nearly all the concrete work is in place at the mill; remaining to be completed is the tube-mill floor, the reinforced precipitation-press floor, and a few column piers. Two Merrill precipitation presses and one Merrill clarifying press will be placed on the reinforced floor. The material for the tube-mills, the presses, and the batteries has arrived, and will be placed immediately. The motors are on the ground and will be placed next. Most of the mill and cyanide tanks have arrived and have been placed. The first carload of steel for the new mill-buildings is delivered. The brickwork for the camp buildings has been finished and that for the machine-shop and store-house is nearly done. The refinery will be started in a day or so. The steelwork is about half up on the power-house, four of the present six boilers are ready, although one is sufficient to run the 12-drill compressor. Underground work is being rushed.

Sanitary conditions at the Dome mines will be most modern in every detail. They are installing a septic tank for sewage disposal to eliminate typhoid fever and other ill effects from unsanitary methods.

The spur track from Porcupine has been an important aid to the rebuilding of the surface plant. The company stock-yards show well with lumber, coal, and brick. About 20 carloads of steel is yet to arrive.

South Porcupine, October 29.

MEXICO

Chihuahua

Goldman & Co., of Mexico City, have purchased the Esperanza property, in the Placer de Guadelupe district, from Julio Miller and Jesus Madrid for $40,000, states a recent report from Chihuahua.

Shipments are being made to the A. S. & R. Co.'s smelter at Chihuahua from the Buena Tiera, Santa Eulalia, which was purchased last year by the Exploration Company of London for $600,000. R. M. Ray is manager for the company.

A record for shaft-sinking in the Santa Eulalia district has been established by sinking the shaft of the Estella mine over 100 ft. in the last month. The shaft, which now is 185 ft. deep, is 6½ by 15 ft. W. T. Swoyer is manager of the property, which is owned by Bainbridge, Seymour & Co. of London. S. G. Burn was the contractor in charge of sinking the shaft.

Sonora

The Greene-Cananea smelter established another record for itself in its October production, 6,000,000 lb. of blister copper. A third of this was from concentrate shipped by the Miami company, the customs product bringing up the output to record size. The Greene-Cananea company, during the month, had a little labor trouble, and the Oversight mine was closed for seven days, although the curtailment is not apparent in the smelter's production.

At Agua Prieta the records show the October exports to the United States amount to ₱1,169,500, divided as follows: copper, ₱463,800; silver, ₱427,100; gold, ₱178,600. There were 244 cars, containing 9433 tons of ore. The El Tigre mine shipped 78 bars of bullion, weighing 6340 lb. and valued at ₱95,000.

Decisions Relating to Mining

Specially reported for the Mining and Scientific Press

Injury to Miner Safety Cages

The statute of Montana requires iron bonneted safety cages with doors, in mine shafts over 300 ft. deep, to be used in lowering and hoisting the miners. The provision that the doors must be closed "when lowering or hoisting the men," must apply to the singular number as well as the plural, and requires the closing of the doors during the hoisting or lowering of one or more miners. The statute was not complied with by closing the doors only when the shifts of men employed in the mine were being lowered and hoisted at the usual time of changing the miners. And where the statute provides that when the cage is used for sinking only, it need not be equipped with such doors, the term 'sinking' is not technical but means descending, going down, excavating downward without substantial deviation from a straight line, and does not include the cutting of stations so as to relieve the operators from providing doors to such cages during such operations. Evidence in the trial for an injury to a miner while in such cage, showing that he entered the cage from a station from one side and that his foot got off or over on that side where it was crushed, was sufficient to show that his foot extended out of the cage through an opening where there should have been a door, and made it clear that the absence of the door from the cage was the proximate cause of the injury.

Osterholm *v.* Boston & Montana Consolidated Copper & Silver Mining Co., (Montana) 107 Pacific, 499.

Injury to Miner—Negligence of 'Shift-Boss'

The statute of Montana makes a mining corporation liable for injuries to a miner if such injury is occasioned by the negligence of a superintendence of a superintendent, foreman, shift-boss, engineer, or crane-man. Under this statute the word 'shift-boss' is formed by uniting the words 'shift' and 'boss'. The word shift means a set of workmen working in turn with other sets, or the time during which a particular set of men worked; and the term 'boss' means a master workman or superintendent, a director or manager, or one who oversees and gives directions; and this compound word as used in the statute accordingly means a master workman who directs the work of a set of men engaged on a particular shift. And in an action by a miner for an injury alleged to have been caused by the negligence of the shift-boss, the plaintiff was entitled to the admission in evidence of a paragraph of the defendant's verified answer, which after denying that the miner was injured while engaged in his duties as defendant's servant, or that the person by whose negligence he was injured was a fellow servant of the defendant, in fact, or was acting as shift-boss for defendant, alleged that the miner was injured through the negligence of one of defendant's employees, who was then and there a fellow servant of such injured miner, as such allegation was proof that the miner was injured by the negligence of one of the defendant's employees. But where it was alleged that the injury to the miner was by the fall of certain timber from above, the question of negligence must be submitted to a jury where there is any evidence to support the theory that the timber was caused to fall by the negligence of another servant in charge of the shift at the time of the accident. Under this statute it is not essential to render the master liable that the negligence of the shift-boss should obtain by the performance of a non-delegable duty owing by the operator of the mine, but the statute was intended to create a liability for the negligence of such superior servant resulting in injuries to another servant, though the negligence was occasioned while such superior servant was performing ordinary labor, not superior in grade to that of the miner injured.

Johnson *v.* Butte & Superior Copper Co., (Montana) 108 Pacific, 1057.

Recent Publications

School of Mines and Metallurgy, University of Missouri, Bulletin. Pp. 39. Index. Rolla, Missouri, September 1911.

Zinc and Cadmium in 1910 Smelter Production. By C. E. Siebenthal. Advance chapter from 'Mineral Resources of the United States, 1910.' Pp. 51. Ill. Washington, 1911.

Geology and Mineral Resources of Part of the Alaska Peninsula. By Wallace W. Atwood. U. S. Geological Survey Bull. 467. Pp. 137. Ill., maps. Washington, 1911.

Surface Water Supply of the United States, 1909. Part XII. North Pacific Coast. By J. C. Stevens, E. C. La Rue, and F. F. Henshaw. Pp. 521. Ill, index. Washington, 1911.

The Tertiary Gravels of the Sierra Nevada of California. By Waldemar Lindgren. U. S. Geological Survey, Professional Paper 73. Pp. 226. Index, ill., maps. Washington, 1911.

Silver, Copper, Lead, and Zinc in the Central States in 1910. Mine Production. By B. S. Butler and J. P. Dunlop. Advance chapter from 'Mineral Resources of the United States, 1910.' Pp. 68. Washington, 1911.

Surface Water Supply of the United States, 1909. Part I. North Atlantic Coast. By H. K. Barrows, C. C. Covert, and R. H. Bolster. U. S. Geological Survey Water-Supply Paper 261. Pp. 309. Ill., index. Washington, 1911.

Book Reviews

Any of the books noticed in these columns are for sale by, or can be procured from, the Mining and Scientific Press.

The Theory and Practice of Technical Writing. By Samuel Chandler Earle. 301 pp., ill. The Macmillan Co., New York, 1911. For sale by the *Mining and Scientific Press.* Price, $1.25 net.

A more general realization of the actual importance of technical writing in the field of literature is exhibited by the numerous articles and volumes upon the topic that have appeared during recent years. The present volume is obviously intended for a textbook, and will be of service to the technical schools where the study of English is included in the curriculum in a belated endeavor to correct the deficiencies of matriculants. Teaching 'technical writing' rather than good English is as unsatisfactory as teaching 'practical' surveying without mathematics. But a half loaf is better than no bread. There is much in Mr. Earle's volume that will be of service to those who feel their literary deficiencies, though so detailed a discussion is likely to prove discouraging. And we cannot agree with Mr. Earle in his division of writing into literature and science; the purpose of the former being to please, and of the latter to instruct. No such line of division exists; the great novelists have instructed as well as pleased, and the great scientists have pleased as well as instructed. Technical writing should possess all the characteristics which Mr. Earle discusses at length in his pages, but it should also possess the merit of pleasing literary form, which is a potent aid in attracting and holding the attention of the reader. Spencer has defined good conduct as that which is well adapted to secure a worthy end. Similarly good writing may be defined as that which is well adapted to attain the desired end. The end may be a simple one, more often it is complex and the characteristics exhibited will be similarly complex. Good writing is an art, and like other arts, a foundation of natural aptitude must exist upon which training may be superimposed.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

C. W. MERRILL has gone East.

FRANCIS DRAKE has gone to New York.

HERBERT S. JOHNS, of Oroville, is in San Francisco.

C. G. ROTHSCHILD, of New York, has gone to London.

E. A. RITTER is in Utah investigating carnotite deposits.

DEAN E. MITCHELL is expected to arrive from England shortly.

KARL EILERS and D. J. ROBERTS visited Globe, Arizona, last week.

A. H. CARPENTER has returned to Denver from Wyoming and Nevada.

J. E. HALL, of Reno, Nevada, is staying at the St. Francis hotel, San Francisco.

J. H. WEDDLE was in San Francisco and has gone to Choluteca, Honduras.

A. J. HOSKIN, of Denver, is engineer for the Moore Mining Co., at Alma, Colorado.

A. C. PERKINS has been examining dredging ground in the Perm district in Russia.

H. W. TURNER is making a geological study of the Ufalei estate, near Ekaterinburg, Russia.

M. L. REQUA is in New York and is not expected to return until the end of the month.

GASTON CLAUS, of Paris, was in San Francisco recently and has gone to Folsom and Oroville.

F. G. COTTRELL has left for the East, where he will confer with the Director of the Bureau of Mines.

CHARLES W. BOISE is on his way from Hurley, New Mexico, to Kinchasa, Belgian Congo, West Africa.

E. D. MCDERMOTT has returned to London, having resigned his position at the Kyshtim mines in Russia.

KURT PIETRUSKY has returned from abroad, and will be in New York City, instead of Chicago, as formerly.

J. C. WILLIAMSON, of the Orsk Goldfields, Ltd., was in San Francisco recently, and has sailed for Yokohama.

ROBERT E. CRANSTON has recently returned from Oregon, where he made an examination of the Oriole mine near Grants Pass.

SAMUEL W. OSGOOD, of Osgood, Carter Co., Chicago, will be in Knoxville, Tennessee, district for some weeks, examining zinc properties.

HORACE V. WINCHELL recently made an examination of the Idaho-Maryland mines at Grass Valley, California; he expects to go to Idaho and Montana.

K. C. PARRISH will sail from New York on November 24, for Cartagena, Colombia, South America, and will probably not return until next summer.

LEIGHTON STEWART, of Summerside, P. E. I., Canada, will be in the future with the American Smelting & Refining Co., at Tiro General mine, Charcas, San Luis Potosí, Mexico.

AMBROSE MONELL, of the International Nickel Co., W. E. COREY, late president of the U. S. Steel Corporation, and E. C. CONVERSE, of the Bankers Trust Co. of New York, were at Porcupine last week.

J. O. ROYER and LEOPOLD GELUS, general manager and president, respectively, of the Quartz King mine, left Parker, Ariz., recently, for Los Angeles, together with F. G. STIERLIN, engineer for the Chamber of Mines, Marseille, France.

FREDERICK F. KETT has been appointed general manager for the Swedish Iron Mines & Furnaces, Ltd., with headquarters at Nora, Sweden. For several years Mr. Kett was in charge of the 100-stamp mill at the Melones mine in Calaveras county, California, and recently resigned from the position of mill superintendent for the Braden Copper Co., in Chile.

Market Reports

LOCAL METAL PRICES.

San Francisco November 16.

Antimony	11—11½c	Quicksilver (flask)	45.50
Electrolytic Copper	14—15½c	Tin	45—46½c
Pig Lead	4.50—5.45c	Spelter	7½—8½c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50—9.75; large $7.50—8.50

METAL PRICES.

(By wire from New York.)

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Nov. 9	12.38	4.24	6.25	56½
" 10	12.45	4.24	6.30	56¼
" 11	12.48	4.24	6.35	56¼
" 12	Sunday.	No market.		
" 13	12.50	4.24	6.35	56
" 14	12.50	4.24	6.35	56⅜
" 15	12.50	4.24	6.35	56½

ANGLO-AMERICAN SHARES.

(Cabled from London.)

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

	Nov. 9. £ s. d.	Nov. 16. £ s. d.
Camp Bird	1 11 6	1 11 6
El Oro	1 3 0	1 2 9
Esperanza	1 13 1½	1 12 9
Dolores	1 5 0	1 5 0
Oroville Dredging	0 5 0	0 5 10½
Mexico Mines	7 17 6	7 15 0
Tomboy	1 3 0	1 3 9

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing Prices. Nov. 16.		Closing Prices. Nov. 16.
Amalgamated Copper	$ 59	La Rose	$ 3⅞
A. S. & R. Co	70⅛	Mason Valley	8⅞
Braden Copper	5⅜	Miami Copper	20⅛
B. C. Copper Co	4	Mines Co. of America	4
Butte Coalition	17	Nevada Con	17
Chino	22⅞	Nevada Utah	⅜
Davis Daly	⅞	Nipissing	7¼
Doble	1¼	Ohio Copper	1⅜
Dolores	4	Ray Central	2
First National	1⅛	Ray Con	14
Foley O'Brien	¾	South Utah	⅝
Giroux	4⅝	Superior & Pittsburg	16
Goldfield Con	4½	Tenn. Copper	36¼
Greene-Cananea	7⅜	Trinity	3⅜
Guanajuato Con	⅛	Tuolumne Copper	3⅛
Hollinger	10⅝	United Copper	1⅛
Inspiration	8	Utah Copper	48⅝
Kerr Lake	3⅛	Yukon Gold	3¼

COPPER SHARES—BOSTON.

(By courtesy of J. C. Wilson, Mills Building.)

	Closing prices, Nov. 16.		Closing Prices Nov. 16.
Adventure	4	Mohawk	$ 41
Allouez	31⅛	North Butte	22⅛
Calumet & Arizona	51	Old Dominion	44
Calumet & Hecla	383	Osceola	90
Centennial	9¾	Parrot	9⅛
Copper Range	51¼	Shannon	8
Daly West	5¼	Superior & Boston	2¾
Franklin	7¼	Tamarack	24⅛
Granby	28	Trinity	3
Greene Cananea, ctf.	7⅜	Utah Con	15
Isle-Royale	16¼	Victoria	2⅛
La Salle	4½	Winona	4¾
Mass Copper	6¼	Wolverine	85

NEVADA STOCKS.

(By courtesy of San Francisco Stock Exchange.)

San Francisco, November 16.

Atlanta	$ .16	Mayflower	$ .03
Belcher	.65	Mexican	3.50
Belmont	8.20	Midway	.25
B. & B.	.14	Montana-Tonopah	.97
Booth	.07	Nevada Hills	2.70
Chollar	.08	Ophir	1.75
Combination Fraction	.08	Pittsburg Silver Peak	1.17
Con. Virgina	.72	Round Mountain	.58
Florence	.70	Sandstorm Kendall	.03
Goldfield Con.	4.47	Savage	.11
Gould & Curry	.10	Tonopah Extension	1.12
Jim Butler	.23	Tonopah of Nevada	6.75
Jumbo Extension	.21	Union	1.27
MacNamara	.26	West End	.80

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EDITORIAL

BOSTON news despatches relate that the Essex Hosiery Company has taken over the Brown Stocking Company. But what has happened to the blue stocking?

JAPANESE SULPHUR from Hokkaido will hereafter be admitted free of duty, as the Treasury Department has reversed its recent ruling that the process by which this sulphur is produced is a refining process, within the meaning of the act imposing a duty of $4 per ton on refined sulphur.

SUPREME COURT decisions, under a new ruling cutting down the time allowed for arguments, will be much expedited and the number of cases disposed of this year will greatly exceed last. When the sensible arrangement of preventing an appeal upon technicalities of procedure, where substantial justice has been done, is put in force even greater progress will be made.

ORE DEPOSITS are objects of unceasing study and the sources of perpetual interest. And when they are discussed by so clear a thinker and lucid a writer as Mr. James Furman Kemp the interest is doubly intensified. Mr. Kemp is so closely identified with the present-day recognition of the importance of the rôle which igneous rocks have played in the formation of veins that the interest of his exposition of contact deposits, given elsewhere in this issue, is outdone only by its importance.

CONDITIONS in Mexico are still unsettled, and the recent action of the United States Government in seizing the person of General Bernardino Reyes, as well as a quantity of arms and ammunition, has served to attract attention to the real situation. Continual agitation in Mexico can serve no good purpose and may wreak much harm. Until Francisco I. Madero has had opportunity to show his ability as president, outbreaks against the Government are childish folly. And if a change of leadership should later appear desirable, legitimate opportunities of making it will not be lacking.

AUTHENTIC news from China has been scanty recently, and the final outcome is as uncertain as ever. Yuan Shih-kai has finally accepted the premiership, announcing that there is no hope of establishing a republic so promptly and effectively as to forestall foreign intervention. This care to prevent giving any occasion for foreign interference has marked all the actions of both sides throughout the progress of the outbreak, but if unrest prevails too long in the Flowery Kingdom the resultant effect upon national finances that have for years been in a precarious condition is likely to prove serious.

LEGISLATION that is hasty is often correspondingly irrational. No better example of this could be desired than the employers liability law recently enacted by the legislature of California. Under its provisions the employer of a reckless chauffeur who demolishes himself and his employer's machine in a collision, would be liable for whatever sum a jury might be persuaded to fix as the value of his life. Any employer of a single servant is similarly liable for injuries not within his power to prevent. Legislation of this character undermines the foundations of government by eradicating popular respect for the law-making branch.

ENGINEERING courses at Columbia University are to be placed upon the plane of graduate work, requiring two years of college work as a prerequisite, following the recent recommendation of the president and faculty. Many engineering students have failed to derive from their technical courses the benefit they should, because of the immaturity of their minds, or lack of adequate preparation. Students who find it imperative to become salary earners as early as possible can always find schools to meet their need. Columbia University, which, it is interesting to note, has the largest number of students of any university, does well to set the highest standards for itself.

The Alaskan Situation Again

Too protracted discussion, colloquially designated as 'Fletcherizing the conversation,' is the mark of the bore, and, having stated our views regarding Alaska and its problems, we have refrained from tiresome iteration. The Chicago address of the Secretary of the Interior, Mr. Walter L. Fisher, has received such wide publicity, and so nearly coincides with our previously expressed views that we at first refrained from its publication. But since it has, in some quarters, appeared in garbled form, we present it this week, as nearly in full as consideration of space will permit. A feature of the address that calls for further comment is the suggestion that the railroad from Seward should be constructed to the coalfields, and that if private enterprise does not undertake it the Government should do so. Recognizing the strength of the sentiment against the Government operation of public utilities, Mr. Fisher further suggests that joint public and private ownership and operation may be found practicable. The uncertainty of early returns upon the investment is likely to deter private capital from engaging in such a joint enterprise, and it might be well for the Government interest in such an enterprise to guarantee to the private investors, for a term of years, a reasonably low rate of interest upon the capital invested. There is too much fuzzy thinking and useless discussion in regard to Alaska. What is needed is prompt results, not comminuted conversation. Private individuals have finite lives and desire to reap returns upon their investments in this generation, the Government is under no such necessity and can afford to operate a railroad at a loss for twenty years if the assured returns for a century justify such a course of action. There is too much of the philosophy of unreason in what is put forth in many quarters in regard to Government ownership and operation of public utilities and resources. The universal control and operation of mines and railways by the Government is unquestionably undesirable. But Government control and operation of a few mines and railroads in districts where conditions are favorable is unquestionably desirable, so that we may be able to discuss its advisability from the standpoint of accurate information, not that of blind prejudice. The advisability of the leasing policy scarcely seems to need discussion. During 1907 and 1908 Mr. A. C. Veatch was sent as a special commissioner to study the mining laws of the Australian States and New Zealand; his report to the Department of the Interior is perfectly accessible and ought to be enlightening to many minds now wrapped in the mists of preconception and prejudice. It is interesting to note in passing that coal mines are now in successful operation upon leased territory in the Mesa Verde National Forest. The really useful public servant should not be too jealous of instant and universal public approval. W. H. Seward was not afraid of the phrase 'Seward's folly,' and Mr. Fisher can afford to be fearless in the performance of public duty.

The Scope of the Bureau of Mines

It is proposed, at the forthcoming session of Congress, to amend the organic act creating the Bureau of Mines, and the local sections of the Mining and Metallurgical Society of America have been requested to make suggestions to the chairman of the House Committee on Mines and Mining. This is noteworthy in many ways. It is a recognition of the position and influence of the Society that is gratifying, and, following the recent pronouncement of the Council "We are unable to recommend, however, that any section shall have the right to make public its conclusions upon any matter under any circumstances," it constitutes an adequate refutation of the wisdom and advisability of any such policy. In this instance effective action precluded the possibility of securing the consideration of the Society as a whole, and this is likely to be the case in every subsequent instance. Finally, it is not too early to give the Bureau of Mines wider scope for its activities. Effective and useful as the work of the Bureau has been in fuel-testing, mine-rescue work, and the prevention of accidents in mines, it has, beyond its extension of mine-rescue work, been able to do but little as yet for the metal miner. Many professional men, especially the geologists, have deprecated the possible invasion by the Bureau of the field of the Geological Survey, with a possible useless duplication of labor. But the proper fields of work of the Bureau and the Survey are genetically distinct; the one is kinetic, the other potential, the Survey deals with deposits, the Bureau with their exploitation and use. The study of each involves the consideration of the other, but co-operation in important matters is possible and in small affairs unnecessary, just as an individual doses himself with quinine for a cold, but calls in a physician for serious ailments. In these days of 'trust-busting' it seems a bit inconsistent to eliminate all possibility of a little healthy competition between the Survey and the Bureau. But some suggestions for possible extensions of the work of the Bureau bear the stamp of futility, the most notable of these being the proposal that a testing laboratory for the gratuitous testing of ore and other products be established. Such a laboratory would be inundated with work, of which the larger part would be perfectly useless, and the remainder could be equally well performed under private auspices. Assay certificates from the Bureau of Mines would prove a godsend to the 'wild-cat' promotor, and, incidentally, many worthy citizens would find their livelihood interfered with. Analytical and testing work has, in most places, now been reduced to a base-level of cost. Prospectors of the right sort would be the first to resent an attempt to place them upon a charitable basis; the old timer always paid his own way, whether he was able to go far or not.

We would urge, in conclusion, the unwisdom of imposing unnecessary restrictions upon the work of the Bureau. In business it is clearly recognized that the best way to get action that is prompt, effective, and well directed, is to secure a man whose judgment, ability, integrity, and loyalty can be relied upon, and give him a free hand. Since we now have at the head of the Survey and the Bureau of Mines men of this character it cannot be doubted that the best policy to be pursued is one of freedom from hampering restrictions.

Characteristics of Chinese Labor

By Thomas T. Read

Much has been written regarding the characteristics of the Chinese, both by those who are amply qualified to express opinions of value and those who are not. It is not surprising, then, to find an extraordinary diversity of opinion upon Chinese topics, the opinions of qualified observers differing from each other almost as widely as from those of the casual tourist. There are many reasons for this state of affairs, the most potent being the striking topographic, climatic, and racial differences between different parts of China. It must be remembered that the centre of dispersion of the Chinese people is northwest of the area they now occupy, so that the southeastern border constitutes a true frontier. Along the frontier are found groups that differ markedly from the main mass of Chinese. The Cantonese, to mention but one of these, speak a language differing from that of four-fifths of the population of China to about the same degree that Dutch differs from English, while temperamentally they exhibit the same degree of contrast as between Italians and Germans. Since almost all the Chinese in the United States, excepting officials and students, are Cantonese, this must be kept in mind in attempting to generalize from the characteristics of Chinese laborers in the United States. This discussion pertains to the average Chinese, more especially in the north; essentially the same type of men as those imported into South Africa by the Transvaal Chamber of Mines. I will attempt to discuss their characters in logical order, beginning with physical characteristics that are least disputed. Easily the first of these is resistance to bad living conditions, acquired through centuries of existence under the strict application of the Darwinian principle of the survival of the fittest. Overcrowding, underfeeding, and generally unhygienic living conditions have no terrors for the Chinese workman, because he has always been accustomed to them. They are similarly resistant to the diseases common to China; smallpox is ubiquitous and is nowhere dreaded; the resistance to septic infection is very high, and Chinese patients often show marvelous recuperative power. In winter, when the temperature was below zero, my ricksha men have run with me until they were dripping with sweat, on stopping would bundle themselves in a few ragged pieces of clothing, and, contrary to all reasonable expectation, did not die of pneumonia, but seemed to flourish. It should be said, however, that there is a good deal of tuberculosis, to which the Chinese seem no more resistant than Europeans.

Endurance is a quality which cannot be estimated so exactly, because of its relativity. A well-fed man naturally has more endurance than one who is underfed, especially one who has habitually been underfed. Attention should be called here to the fallacious reasoning in the apocryphal story of the railroad contractor, who, wishing to hasten his work, conceived the scheme of taking away the rice from his coolies and feeding them upon beefsteak, with surprisingly gratifying results. Such a procedure is as irrational as the feeding of a cow upon bones in the hope of converting her into a watchdog. Men whose digestive systems are hereditarily adjusted to a vegetable diet cannot be instantaneously altered to a diet of animal food any more than a locomotive can be changed from coal to oil burning without a readjustment of its mechanism. Increased results from Chinese workmen are to be secured by providing them with sufficient quantities of well cooked food of the kind to which they are accustomed, and not by making radical changes according to preconceptions. There are many features of the Chinese social system that at first sight appear adventitious, but which, upon careful examination, are found to be essential. An egocentric attitude of mind is not conducive to obtaining insight into Oriental problems.

Strength is equally incapable of discussion upon an exact basis, both because of the absence of exact data and because individual Chinese vary greatly in this regard. The general, and probably correct, impression is that the average Chinese is smaller than the average American. As a matter of personal opinion, I believe that Chinese brought up under good living conditions would at least equal in strength Americans of equal weight, and would perhaps surpass them. It must be remembered that this discussion applies only to laboring men, the literary and merchant classes, both by training and natural inclination, avoid all forms of physical exercise and are notably deficient in strength and endurance.

Skill can be adequately discussed by prefacing my remarks by the observation that Chinese are singularly lacking in imagination, having a literalness of mind that frequently astonishes the foreigner. This, coupled with great manual dexterity, produces results that are in some cases astonishingly good and in others disappointing, according to the amount of influence which each of these factors has in the outcome.

The mental characteristics of the Chinese are even more remarkable than their physical attributes, but considerations of space prevent too prolix a discussion. Perhaps the most striking is their hereditary cheerfulness, amounting almost to a national optimism, which is perhaps exemplified in the expression for 'tomorrow', *ming-t'ien*, 'bright day.' This is coupled with patience, which is a characteristic of all Orientals. Most astonishing to the foreigner is a habit of mind that considers everything from a viewpoint different from his own. This, with Chinese self-sufficiency and European intolerance and impatience, is usually at the bottom of all friction between the two races. Out of the relations between the Greeks and Romans and their African slaves has been derived the Caucasian sentiment that all colored races are inferior. The Chinese, by centuries of contact with immediately adjacent inferior races, have developed a similar attitude of mind toward all foreigners, and were not prepared for the advent of the Caucasian. But mutual acquaintance leads to mutual respect.

Chinese workmen are teachable, providing they have no previous knowledge of the subject taught. They are lacking in initiative, and are not good leaders or 'bosses.' They do much better work under foreign than under native supervision. Some years since, H. C. Hoover expressed a somewhat unfavorable opinion of Chinese labor, but it must be remembered that the Chinese Engineering & Mining Company took over an organization which had been for some years under native control. Under such circumstances the work of alteration of methods would be much more difficult than the creation of an entirely new staff of employees. The Chinese tendency to stick to known methods is most exasperating to foreigners, as is their tendency to try to reduce everything, even an indefinite proposal, to a definite systematic basis. This latter has its advantages, but they are not to the fore in pioneering work. As regards mechanical ability, the British officials of the Imperial Railways of North China have expressed to me the opinion that the Chinese mechanics are at least equal in efficiency to the average British mechanic, and I have corroborated this from other sources and by personal observation. And I have never seen any workmen who excelled the Chinese in the making of molds for castings.

Training and supervision of native labor is all-important, but the remarks by Wickham Quinian in regard to the Filipino, given on another page, are of such universal applicability that a further discussion here is unnecessary. The 'proof of the pudding' is the labor cost per unit of output. Where able-bodied, industrious laborers can be obtained for an average daily wage of 8 cents, and skilled labor, such as locomotive engineers, receives as a maximum $45 per month, it would be natural to expect low labor costs per unit. This is evidenced by the fact that the Han-Yeh-P'ing Iron & Coal Co., mining about 1000 tons per day of iron ore from open-cuts, almost entirely by hand labor (see pp. 453-454, *Mining and Scientific Press*, October 7), is able to mine it at a total cost of about 30c. per ton, as compared to a stripping cost of approximately 34c. per cubic yard at such mines as the Nevada Consolidated and Utah Copper.

The Alaskan Situation

By Walter L. Fisher

*The injurious effects of the joint or common ownership of coalfields and railroads have already been seen, and the attempt to remedy by drastic legislation the evils which the withdrawal of the coalfields of Alaska should prevent from recurring there is now being made. * * * This does not mean that Alaskan coal should not be developed and developed at once. It means merely that it should be developed properly as well as promptly.

Alaskan coal is of great value, but its extent and character have been much exaggerated. * * * The better known of Alaskan fields is the Bering river field, which is near Controller bay, and in which the Cunningham claims were located. * * * The Matanuska field is larger and may prove to be the most important. Both of these fields contain anthracite and high-grade bituminous coals. The question is how they shall be opened so as to promote development and protect the public interests. * * * Alaskan coal can be opened so as to enable a larger or smaller number of individuals or groups of individuals to make money out of their development. * * *

I personally visited the Bering field and examined some of its coal seams and coal mines. It is situated along the foot of the Chugach mountains, in the region a little south of Prince William Sound and some 1200 miles from Seattle. The field covers an area of fifty square miles or 32,000 acres, lying approximately twenty-five miles from the coast at Controller bay, with an immense glacier, known as the Bering glacier, on the east, from which the Bering river runs and empties into Controller bay. This field was discovered in 1896 and practically all of it appears to have been covered by claims entered under the law of 1904. The country is exceedingly rough and broken and the rocks are faulted and folded to an extraordinary degree, so that the larger portion of the coal beds in this field are crushed, leaving what otherwise would have been the highest grade of bituminous coal so that much of it cannot be mined as lump coal, but only in a finely crushed condition. There is, however, some coal in the field which doubtless can be mined as lump, but how much there is of this coal remains a question of considerable doubt. This doubt is further intensified by the fact that in the crushing process the coal seams have become pinched so that beds of considerable thickness at one point become thin or even pinched out within a short distance, making it difficult to determine what will be the condition of the beds at any given point beyond the explored area. * * * Aside from its crushed condition, much of the coal itself is of excellent quality, possessing high calorific power. The crushed condition does not interfere with its coking quality if otherwise good. Although it can be briquetted, or with the use of specially constructed furnaces it can be burned successfully in its present form, its physical condition will undoubtedly interfere with its immediate commercial value. * * *

As the Controller bay region is only twenty to thirty miles distant from the coalfields, there have naturally been numerous investigations to determine the possibility of constructing harbor facilities there. I am told that it was carefully investigated on behalf of the Copper River railroad by engineers of high standing and was discarded as impracticable. The attempt, however, was made under the advice of engineers of this road to construct a harbor at Katalla, which is outside of the range of islands to the westward of Controller bay, where there is deep water immediately off shore and where a pier or breakwater was constructed at considerable expense in the vain attempt to protect shipping from the force of the winds and waves of an open roadstead. A storm promptly demolished these works and led to their removal to Cordova.

Obviously, if modern dockage is provided at Cordova for copper ore and other heavy freight, it can be made to provide for coal with less additional expense than if separate facilities should be constructed on Controller bay. Nevertheless, several other railroad enterprises have been projected at Controller bay, but apparently all have become inactive except that in which R. S. Ryan and his associates are interested. It was the persistence of Mr. Ryan which led to elimination of the shore of Controller bay from the Chugach National Forest, and he has made three scrip entries on the shore, which are still pending before the Department of the Interior. Following the law, these entries each have a frontage of 160 rods, leaving 80-rod intervals between them, which the law provides shall be kept free from entry. On one of these 80-rod strips a railroad terminal has been located, but this entry appears to be without any warrant of law and is based wholly upon the theory that a railroad terminal location does not constitute an entry within meaning of the act. It seems to have been made merely to exclude others and upon the chance that the statute may be open to the construction mentioned. I do not believe that it is even intended to be seriously pushed. At all events, all the rest of the shore, except as stated, remains free from entry, thus disposing effectively of the claim that a railroad monopoly has acquired the frontage of Controller bay. Whatever may be the merits or demerits of this harbor, it has not passed out of the control of the Government. * * *

My visit to Alaska has led me to take a far greater interest in the future of the Matanuska coalfield, which is larger in extent, having an area of seventy-four square miles or 47,360 acres, better in coal, better in physical condition, and freer from the complications of private claims than is true at Bering river. Against these advantages must be set off its greater distance from the sea, but this very distance connects it more intimately with the real problem of Alaskan development—that of adequate transportation from tidewater to the Yukon. What Alaska needs more than all else is a trunk line railroad from the ocean to the great interior valleys of the Yukon and the Tanana, opening up the country so that its development may be possible.

The Matanuska coalfield lies north of Prince William Sound and from 150 to 200 miles from Seward, on Resurrection bay. It is known to contain extensive beds of coal of the same or slightly superior quality to that of Bering river, and in better physical condition both as to the coal itself and as to the obstacles to profitable mining. The country is not so broken, faults and pinching are less in evidence, and the crushing process appears to have gone on to a much less extent. A much smaller part of this field has been entered by private claimants, and most of these appear to be clearly illegal on account of dummy entries and other violations of the law, for which indictments are now pending. A railroad to develop this field and to open up the great interior valleys has been started from Seward, which has by far the best harbor and the best townsite in Alaska which I saw or of which I have been able to obtain any knowledge. The town of Seward lies at the head of Resurrection bay, which is a magnificent and extensive harbor, landlocked and free from ice, and already selected by the Government as a naval coaling station, and where the smelter operations may be one of the future industries.

The only criticism of the harbor of which I have heard is that the water is so deep that docks and fixed moorings will be necessary for perfect safety, but as this is also true of the harbor of Seattle, which has been regarded as one of the most magnificent in the world, it seems to be a fault which closely approaches a virtue. The railroad from Seward—the so-called Alaskan Central or Alaskan Northern—at present extends only seventy-odd miles to a point on Turnagin Arm, where it stopped for lack of funds and for various other reasons, among which the withdrawal of the coalfields from entry is particularly emphasized. * * * While a part of its construction does not seem wisely adapted to the transportation of coal or other heavy freight, I believe this road should be continued on to the coalfields and beyond them to the interior, and that if private interests do not care to undertake the task the Government should.

If a plan for construction at the joint risk and joint

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*An address delivered at the American Mining Congress, Chicago, October 27.

profit of the private investor and of the public along the lines of the Chicago Traction ordinances could be put into successful operation, this might reconcile the conflicting views of public policy as to the Government ownership of railroads, especially if the Government's share of any future profits should be commuted into an equivalent reduction of the rates or should be directly expended in furnishing to Alaska the other means of transportation of which it is and will continue to be so much in need. After such careful consideration, however, as I have been able to give to the matter, I believe that the uncertainty of immediate financial return will prevent the adoption of this plan and that the imperative need of immediate transportation development calls for the construction of at least one main trunk line from tidewater to the Yukon, which can better be constructed from Resurrection bay through the Matanuska coalfields than in any other way. * * *

The Matanuska coal should be brought to Seward for the use of our naval coaling station, and a mine for that purpose can well be opened by the Government on the Matanuska, where it can be made to serve as an example for private mining, where it can furnish information and serve as a check upon the profits of the lessees under Government leases. * * *

If we may assume that some of the coal claims which have been entered in Alaska, in either the Matanuska or the Bering fields have complied with the law and should be allowed, the suggestions I have made will enable us to compare in practical operation the development of coal under private ownership, under Government leasehold, and under the direct operation of the Government itself. We shall have an important railroad under private ownership, with governmental regulation, to compare with one under public ownership, and these two railroads will operate in separate fields where they will not directly conflict, but where each may serve as a check upon the other, and the advocates of both methods will doubtless come to appreciate more fully and more fairly both the difficulties and the advantages of the railroad as a governmental agent.

It remains only to consider more in detail the methods by which the coalfields should be opened. Those suggested have been the sale of lands in fee, their development under lease from the Government, and their operation by the Government itself. I believe that the time has passed when the Government should convey an unrestricted title to its coal lands. * * * But direct government operation, including the mining and selling of coal, involves such deep and far reaching changes, both of policy and of administration, that there is no present likelihood of its adoption. * * *

I believe the leasing system avoids the controversies and difficulties of both extremes of public and private ownership. It has been adopted with conspicuous success in the great mining communities of Australia and New Zealand. It is now the established law of the Yukon Territory lying in Canada just across the border line from Alaska. It is the system under which much of the privately owned coal land of the United States is in fact today being developed. Under it we can insert as matters of contract and as conditions to which the lessee voluntarily consents those regulations and requirements which promote the public interest, the enforcement of some of which by mandatory law might be unconstitutional. By making the terms of our leases liberal we can make them even more attractive to capital than if we adopt the policy of sale of the fee. * * *

In the southern Appalachian coalfields, just south of the Pocahontas region, it is estimated that 75% of the area is mined on a lease basis; in the Hocking Valley region of Ohio, 75%; in Iowa, more than 70%; in Arkansas, 60%; and in Oklahoma nearly all of the coal land is operated on a lease basis. In our principal coal mining States, the census figures for 1909 show that out of a total of 6,900,000 acres of coal lands under operation, more than 2,000,000 acres, or 30% of the whole, was in 1909 operated under a system of private leases. It is therefore substantially correct to say that, whether we like it or not, the choice is not as to whether we shall mine our coal on the leasehold system, but whether we shall mine it under leases from private owners or directly from the Government of the United States.

That the consumer has everything to gain under the governmental leasehold must be apparent, for the Government can make its royalties as little as it chooses and it has no invested capital and no unearned increment on which to pay returns. Opposition is to be expected only from those who wish to secure our coal lands for stock jobbing or speculative purposes. * * *

Expedients could be adopted in the effort to enforce development by requiring the purchaser to mine a certain amount of coal or to expend a certain amount of money in developing the land under pain of forfeiting his title to the Government, but this, after all, is only a crude and awkward device for securing what can be far more effectively secured by means of lease. * * *

In our own country, in the States of Wyoming and Colorado, when it was proposed that these States should lease their coal lands instead of selling them outright, it was argued that nobody would take out the leases. But experience has shown otherwise. In Colorado, in 1900, in addition to the large acreage of coal lands held in private ownership, nearly 6000 acres of State coal lands were operated under lease, and in 1910 nearly 20,000 acres of the State coal lands were being operated under such lease, with a royalty charge of 10c. per ton. In Wyoming today more than 3,000,000 acres of State lands of all kinds are being operated under 5700 leases. * * *

Some of the bills which have recently been introduced in Congress provide that the Interstate Commerce Commission shall regulate the prices at which the coal mined under these leases is sold not only by the miner, but by the middleman and the retailer to the consumer. Important as is the question of protecting the consumer, it seems unwise that price regulation by the Government should be insisted upon as a necessary feature of a coal leasing law for Alaska. Obviously such regulation must extend to the retailer if it is to do anything but enable the middlemen to make the profit denied to the miner. Regulation of this sort would be a new departure in either State or Federal administration. It raises fundamental questions of public policy about which differences exist that are as yet uncompromising. It would doubtless prevent any early action by Congress. Certainly if enacted in the form presented in these bills, * * * it would prove a serious, if not prohibitive, barrier to the development of a new country and a new and uncertain market.

The prime requisites of a leasing system are that only sufficient coal lands should be leased to meet the existing market and encourage its development; that the quantity leased to any one lessee should be limited to the amount that can be profitably mined as a unit and yet be large enough to attract investors; that the lessee shall pay his royalty as he mines his coal; that this shall annually amount to a fixed minimum which will make it unprofitable for him to hold the land without production; that he shall mine his coal without unnecessary waste and with due regard to the health and safety of his employees; that he shall not engage directly or indirectly in any combinations, agreements, or understandings to control the price of coal, and that the revenues derived by the Government shall not be used as a source of Federal revenue or as a substitute for taxation, but shall be devoted to the development of the State or Territory in which the coal is mined.

In his address, October 28, President W. H. Taft said:

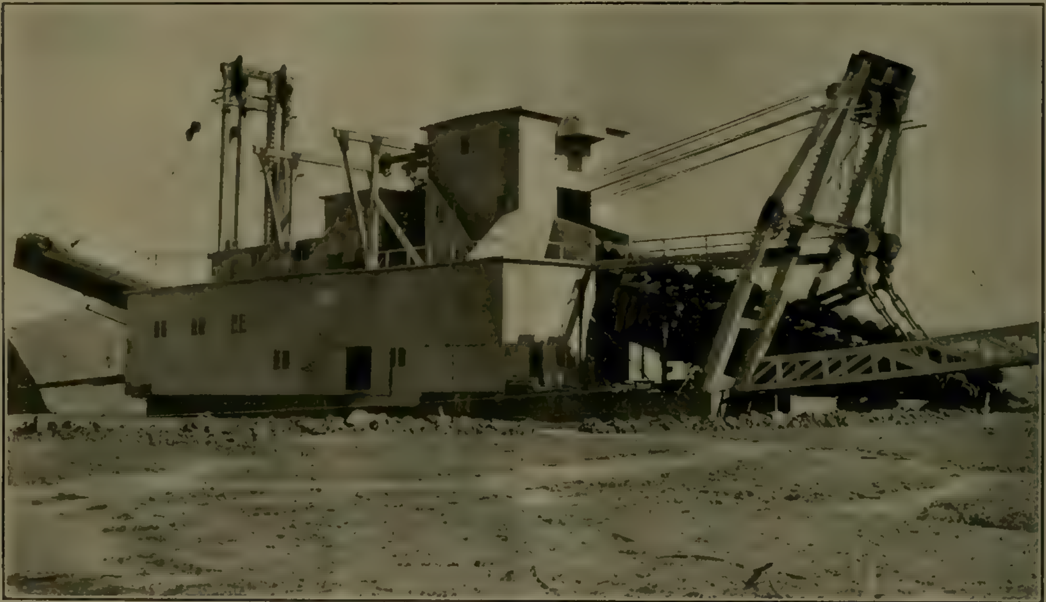
You heard last night a very interesting address from the Secretary of the Interior as to mining and the general subject of Alaska. I read the address last night, and I only want to say that I enjoyed the reading and approved it. He said in advance that he had published the address with my consent, after a general discussion with me, and now I want to make the confirmation complete. If the Secretary of the Interior will straighten out Alaskan matters and eliminate rodomontade and muckraking, and everything else that has interfered with the progress of Alaska, and put her on smooth seas and lead her on to only reasonable development, he will earn my undying gratitude, as well as my rejoicing as a citizen of the United States.

Dredging at Ruby, Montana

By Floyd Bushnell

One of the largest dredges in the world is being operated by the Conrey Placer Mining Co. at Ruby, Madison county, Montana, 80 miles southeast of Butte. This boat was built by the Marion Steam Shovel Co. at an approximate cost of $270,000. It is 150 ft. long and 60 ft. wide. The Conrey Placer Mining Co., which has its headquarters at Boston, was organized in 1898, when it took over the holdings of the German Bar Mining Co., formed two years previously.

The company controls about 1000 acres, and has an exceptionally good field for dredging. The distance to bedrock is from 12 to 60 ft. In places the gravel is cemented, making it difficult to dig. Occasionally boulders are dug up, but little delay is occasioned from this source. A monster boulder, five feet through, was lifted out of the pond by chaining it to the bucket ladder.



CONREY DREDGE No. 4, RUBY, MONTANA.

Until a few years ago steam was used exclusively as a motive power, but it was so expensive that it was decided to try electricity. Accordingly an electric line was built from the plant of the Madison River Power Co., a distance of 25 miles. An electric dredge, known as No. 3, was constructed, and it proved such a successful venture that it was planned to do away with steam as a motive power. Subsequent results have proved that a large saving has been effected by the use of electricity. Dredges No. 1, 2, and 3 are equipped with Westinghouse machinery, while No. 4 and the sub-station are supplied with General Electric machinery. At the present time the company is operating four electric boats, which move on an average 600,000 cu. yd. per month, but they could handle 20% more if pushed. It takes 300 hp. each to operate dredges No. 1, 2, and 3, and 1035 hp. for No. 4.

Dredges No. 1 and 2 are of the California type, with belt-conveyor stacker, the machinery being quite different from that of No. 3. The new dredges are of the close-connected bucket type, and dump 16 buckets per minute. No. 1 has 7½-cu. ft. buckets, and those on No. 2 are 9 cu. ft. No. 1 dredge is 96 ft., and No. 2 is 106 ft. long. They have 44-ft. beam and 9-ft. hull each; they dig approximately 37 ft. below the surface. These two boats are floated in ponds 125 by 200 ft., while No. 3 requires a pond 200 by 210 ft. The cost of the first three dredges was about $384,000.

During the summer it was decided to remodel No. 3 dredge, so that its efficiency might be increased. The old ladder, which was 100 ft. long, has been replaced by one 15 ft. longer. It will now dig to a depth of 53 ft., 10 ft. deeper than the old one. To care for the extra weight of the ladder, two triangular pontoons have been constructed and will be placed under the front end of the boat at either side. The chain consists of 92 nine-cubic foot buckets. This is the first extensive repair work on the dredge during the past five years.

Dredge No. 4, the largest of its kind in the world, was put in operation the past summer. The actual time of construction was seven months, practically no work being done during the winter months. The company experienced much difficulty in transferring the machinery of this mammoth dredge from the end of the railroad line at Alder to the operating ground at Ruby, a distance of two miles. A traction engine was used and some of the larger pieces were dragged much of the distance. The hull is 150 ft. long with a 50-ft. beam and a 5-ft. overhang; it is 13 ft. deep. There are 659,000 bd. ft. of lumber in hull and housing. The ladder is 116 ft. long and will dig 53 ft. deep; the upper tumbler is 31 ft. above water. The bucket-ladder consists of 80 close-connected buckets, each of which has a capacity of 16 cu. ft. The hoods and bottoms are cast in one piece.

The bucket pins are 7 in. diameter and each bucket weighs 4200 lb. The revolving screen is 50 ft. long and 9 ft. 9 in. diameter. The stacker is 130 ft. long, carrying a conveying belt 48 in. wide. The boat has two steel spuds 80 ft. long, weighing 45 tons each. To operate this boat requires a pond 250 by 300 ft. This dredge is equipped with Worthington centrifugal pumps as follows: One 16-in. low pressure, one 16-in. high pressure, one 6-in. bilge pump, and one 10-in. sand pump. The boat complete weighs 2200 tons. The rubber stacker-belt is enclosed in canvas housing, heated by means of steam-pipes, making it possible to run in winter, but in severe weather the dredge is shut down.

The company recently built a substantial sub-station, into which the power comes at 46,000 volts; it is transformed down to 2200 volts and taken to the dredges. There are automatic switches and meters for each dredge, so that it is possible to take care of each boat without interrupting the others. In this way it can be told how much power each boat is using. A private telephone system has been installed, connecting all the dredges and homes of the dredgemasters and chief employees. Since the electrification of the plant a considerable saving has been effected in labor. The steam dredges required 11 men each in 24 hours, while under the present system 7 men care for a dredge. Charles Kammerer has been manager for the Conrey Placer Mining Co. for the past 3½ years and has been in the employ of the company for the past 12 years.

The company has a complete retort and melting house, the walls, partitions, floor, and roof being entirely of cement and absolutely fireproof. The building is 24 by 36 ft., and contains a retort and melting room, a panning room, where the clean-up is handled and cleaned ready for retorting; a condensing room, where condenser pipes lead from the retort to carry off the fumes that might otherwise escape into the main building; and a concrete vault equipped with one of the latest improved doors and locks. In the retort-room are two Allis-Chalmers retort furnaces in which the amalgam from the dredges is retorted, and two melting furnaces in which the retort is melted and run into bars of bullion.

BUCKET LADDER, DREDGE No. 4.

The complete machine and blacksmith-shop is unusually well equipped. The shop is operated by a 50-hp. electric motor and employs eight mechanics. In this shop the company repairs and does all the finishing required on the dredges. In connection with the shop is a large storeroom, where are kept duplicate parts of all machinery used on the dredges, so that a breakdown can be quickly repaired. This machine-shop is a large factor in the successful operation of the dredges, which are run practically 90% of the time. All lost time is accounted for either in making repairs or in moving ahead. Eighty-five men are on the pay-roll of the company, and altogether several hundred persons are dependent upon the operation of the dredges for a livelihood. Ruby, a town of 250 persons, was built entirely as a result of the operations of this company.

The deposit now being worked contains 600 acres of proved dredging ground. Like many other alluvial deposits, it is generally fan-shaped, with apex at the mouth of the gulch. Its age (probably late Pleistocene), and the boulders and gold, in their subangularity and irregular bedding, denote a time of deposition much later than that of the California dredging fields. Other features indicate that it may be contemporaneous with those of Colorado. The surface has a slope to the west of about 1%, while the bedrock slopes slightly more to the west, thus as the work progresses in a westerly direction the depth increases until a maximum of 60 ft. is reached 2½ miles from the mouth of Alder gulch. The gravel, though not indurated in the ordinary sense, is tenacious and compact, due to the existence of clay distributed irregularly through it, particularly near bedrock. Here a greater amount of clay and a heavier pressure have combined to give a tenacity difficult to overcome; (1) in excavating with the buckets, (2) in discharging from the buckets, (3) in screening from the trommels, and (4) in sluicing.

The bedrock is an extremely tenacious clay, and varies in color from light cream to dark brown. It seems to owe its origin to deposition from slow moving or still water. It resembles the Oroville bottom, though it is more tenacious and sticky. It is generally smooth with but gentle undulations. There is no particular concentration of gold on or near it, nor does the gold penetrate into it. These features, together with the circumstance that when any considerable volume of it is excavated by a single bucket it must be pried or dug out (for it will not discharge), make it not only unnecessary but undesirable to more than skim it slightly. The gold averages from 800 to 840 fine. Its coarseness varies, about 40 to 60% passing 60 mesh and 15 to 38% passing 100 mesh. Much of the gold is subangular and coarse in comparison with that from the California dredging fields. It resembles the gold from Alder gulch, showing the same relation as is observed elsewhere between gold of debouchments and that of the creeks above them. I am indebted to officers of the Conrey Placer Mining Co. for information used in compiling this article, and take this occasion to thank them.

A large number of the shares of the Conrey company is owned by Harvard University; Gordon McKay, of New York, who was one of the principal shareholders, having recently bequeathed his holdings to that institution. For the past three years the company has used the bonus system in dealing with its employees. The first bonus amounted to $5000, the second $2500, and the third $3500. These amounts, divided among 65 men, are paid about Christmas time and are keenly appreciated by the employees.

Contact Deposits

By James F. Kemp

[*]In the truly remarkable progress which has been achieved in the study of ores during the past ten or fifteen years, the subject of 'contact deposits' has played a prominent part. Though long unappreciated at their true significance and regarded as merely subjects for interesting petrographic investigation, they are now recognized as one of the most important sources of copper and iron. The Southwest and Mexico possess wellnigh innumerable occurrences, and they do not fail in the Northwest, in British Columbia, and along the coastal districts of Alaska. Outside of North America they are not lacking, and it is always to be remembered that to the keen observational and interpretative powers of the Norwegian geologists is due practically their first recognition.[1] In the presentation of this subject, it will be my endeavor to first sketch briefly the types of contact zones which were early established by the petrographers, and then to summarize the theoretical views which were reached concerning them. The development of further views from later observations may next be outlined, leading naturally to the combination of petrography and economic geology in the latest investigations. There are some very interesting lines of attack which this particular problem has opened—lines which are fraught with much significance in relation to the large subject of the magmatic waters, and their influence.

By contact metamorphism is generally understood the processes of change which are set in action by an intrusive mass of molten rock and which work out their effects upon its walls. Recrystallization is started and new combinations of minerals form new and characteristic rocks. The effects are at a maximum next the intrusive, and die away in concentric zones or aureoles or halos as the observer goes outward. The intrusive mass itself does not escape, but almost always shows along its borders the compact textures due to quick chill.

The extent or frequency of the metamorphism varies with different kinds of intrusives. It would obviously be more frequently seen and more extensively developed with magmas rich in dissolved vapors. The crystallization of these molten masses to the several anhydrous silicates, which make up the final rock, drives out the dissolved vapors as magmatic waters and provides thus a powerful agent of alteration along the borders. Acidic magmas or those high in silica are the rocks generally believed to be most richly provided with these so-called mineralizers and as a matter of observation they are the ones around which are found the largest zones. Basic rocks are less likely to produce the changes, yet instances are known in which zones are associated with them. It is an interesting coincidence that cold, basic rocks have been found by Rollin Chamberlin to be the richest in gases.[2] Apparently the gases remain in the minerals of these rocks to a greater degree than in the acidic types. Again, large bodies of deep-seated rocks are more efficient agents than are small bodies, or than surface flows which only rest upon some underlying support and which soon lose their vapors into the atmosphere. On the whole, granites, with their close relatives, syenites, diorites, and the intermediate types, the monzonites and granodiorites, produce the largest zones.

Turning to the wall rocks, it is found that the zones are especially developed in two varieties of sediments: the richly aluminous, embracing the shales and slates; and the richly calcareous, the limestones. Sandstones are stubborn and unyielding subjects; while rocks already metamorphosed, such as gneisses and mica schists, have practically reached the limit of change. One therefore looks to the shales and slates on the one hand, and the limestones on the other, for the principal zones. The latter are more abundantly associated with ores than are the former.

The aluminous rocks develop a series of aluminous silicates of which andalusite, $Al_2O_3.SiO_2$, is most characteristic, so that the contact rock is often called an andalusite hornfels. Either with the eye alone or with the microscope the finger-like prisms of this mineral can be detected and often the white and black crosses of the variety chiastolite appear in the dark hornfels. The home of chiastolite is in these zones. Other rather less characteristic minerals are sillimanite, $Al_2O_3.SiO_2$, staurolite, $(AlO)_4(AlOH)Fe(SiO_4)_2$, biotite, amphiboles of several varieties, and quartz. The zonal rock is often dense, black, and flintlike, suggestive of its name, hornfels or hornstone. Sometimes, at a distance from the intrusive in the outer zones, are found the rude beginnings of crystals of andalusite or staurolite or even only the segregation of pigments in spots, which have received the name of spotted schists or the local German terms of *fruchtschiefer* and *garbenschiefer*, names scarcely capable of significant rendering into English. In North America the best known zone of this type is at Mt. Willard in the White mountains. It was described in 1881 by George W. Hawes and will continue to furnish instructive exhibits to others while geology endures.[3] The zones are not lacking in the West, however, and of them more is certain to be heard from time to time. They do not fail in Europe, in the old mining districts of the Hartz and the Erzgebirge, but are seldom, if ever, productive of useful minerals.

The limestone zones are of greater interest. They yield a larger variety of minerals than do the aluminous rocks, and aside from their connection with ores, they are on the whole the most prolific of all mineral localities. The commonest minerals characteristic of them are lime-silicates of one sort or another, but these simple compounds can be varied by additions of other bases until a long series of minerals results. The most characteristic of all is garnet, once thought to be exclusively the variety grossularite, $3CaO.Al_2O_3.3SiO_2$, but now known to be more largely andradite, $3CaO.Fe_2O_3.3SiO_2$. With this in almost as great amount is diopside, $CaO.SiO_2.MgO.SiO_2$, while in less abundance or frequency we find wollastonite, $CaO.SiO_2$, epidote, $2CaO.AlO.OH.Al_2O_3.3SiO_2$, vesuvianite, $5CaO.MgO.Al_2O_3.AlO.OH.5SiO_2$, scapolite, $3CaO.2Al_2O_3.6SiO_2$ (variable), quartz, SiO_2, magnetite, Fe_3O_4, specular hematite, Fe_2O_3, and many more of lesser importance. As a group they are often distinctively called 'the lime-silicates.' The rocks range from coarsely crystalline to very dense, fine-grained varieties, whose minerals can only be determined by the microscope.

The so-called garnet zones may be developed in strata next to intrusives, or they may spread outward along favorable beds for moderate distances,[4] or they may be developed around masses of limestone which become torn off from the walls by the advancing tide of molten rock and which may be then corroded and worked over into the new minerals. Such blocks may be later cast out from the crater of a volcano and, as at Vesuvius, furnish a long list of minerals. If the included blocks are very large (some even attain the size of small hills) they may be surrounded by large enough zones to yield orebodies.

The commonest ore which is found associated with contact zones on limestone yields iron. The iron minerals magnetite and hematite seldom fail in any zone, but they are often in masses of commercial size and purity. Practically all the iron ores of the Cordilleran region, except those at Hartville, Wyoming, are of this character. The best known are in the Iron Springs district of southwestern Utah, recently described by Leith and Harder,[5] but there are many more in the desert regions of southern California. The iron ores seem to have been brought from the eruptive rock during its cooling stages by magmatic waters and to have replaced the bordering limestone. They may also have been deposited in veins in crevices in the eruptive itself where they look like black dikes and by some observers are regarded as such.[6] Even if a deposit of any other metal had never been seen in the contact zones, the development of these iron ores would have shown this particular one to be a prolific emission from the cooling magmas.

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[*] From 'Types of Ore Deposits,' by H. F. Bain, E. R. Buckley, S. F. Emmons, W. H. Emmons, F. H. Hatch, O. H. Hershey, J. D. Irving, J. F. Kemp, A. C. Lane, C. K. Leith, R. A. F. Penrose, Jr., T. A. Rickard, and C. H. Smyth, Jr. Published by the *Mining and Scientific Press*. Ready about December 15.

[1] This, and succeeding numbers, refer to citations given in the original text.

Next after iron ores are those of copper. They are, as first precipitated, chiefly chalcopyrite or bornite in association with still larger amounts of pyrite. Alteration and secondary enrichment yield the usual train of higher sulphides and of oxidized products, but chalcopyrite and bornite seem to be the first members in the series. They and their attendant pyrite may fill crevices in the older iron ores, and may be mingled with the garnets and other silicates, but all three sulphides seem to follow the silicates and iron oxides in periods of deposition. The copper ores of first deposition are usually lean and of low grade. Secondary enrichment is needed in many cases to bring this first product up to a minable richness. Chrysocolla is, on the whole, the commonest product, but oxides and carbonates also appear, especially if there is calcite in the immediate vicinity. Instances are known, although not so common, in which the original sulphides are rich enough to smelt in the crude state. Copper ores from garnet zones are not well adapted to concentration. The high specific gravity of the gangue militates against a satisfactory separation. In the crude state, moreover, and unrelieved by secondary enrichment, these ores are usually too silicious for self-fluxing smelting, and when the copper is present as chrysocolla there is much danger of loss in the slag. The low tenor in copper makes the addition of barren material undesirable if it can be avoided. On the other hand, injurious ingredients are rare. Arsenic and antimony are unusual. A favorable feature is the characteristic but small percentage of gold, with which may occur 1 to 2 oz. of silver. The ores are irregular and fortuitous in their distribution in the zones. They may come in without warning, and they fade out in the same way.

There are one or two variations from the type of copper ores as just described. Whereas the usual experience is to find the copper disseminated in the zones of silicates, or in the associated bodies of magnetite, or in large individual masses of sulphides, at the mines of the Mazapil Copper Co., Aranzazu near Concepcion del Oro, Zacatecas, it favors large veins of coarse calcite that cut across the garnet zone outwardly from the intrusive into the limestone.[7] At the Cumberland-Ely mines in the Robinson district of Nevada, the lime silicates, while not entirely lacking, are much less abundant than in the cases cited. The zone is largely rusty chalcedonic and opaline silica within which, and well below the present surface, a great orebody has been discovered. This rusty silicious rock admirably illustrates those outcrops described in the West as 'blowouts.' In this instance silica seems to have replaced the limestone rather than to have combined with the lime.[8] The copper mines at Bisbee, Arizona, have also presented a case of contact zones that differs from the usual. Next the intrusive rock and over a width of about 200 ft. there has been developed a zone consisting of quartz and calcite, while outside of this and ranging over a width of approximately 1000 ft. the limestone is in large degree changed to a finely crystalline mass consisting of tremolite, pyroxene, garnet, vesuvianite, quartz, chlorite, and a few minor minerals. In this zone are situated the larger number of the orebodies, but some occur still farther out in the almost unaltered limestone. F. L. Ransome, who has described the area, is inclined to attribute an importance influence in the ore formation to one or two great faults which cross the contact zones. The metamorphic changes seem less thorough in the Bisbee case than in many others, more calcite remaining in the end-product.[9] In the Velardeña district of Durango, Mexico, J. E. Spurr and G. H. Garrey have worked out an unusually complicated case in which in addition to the zones from limestone, a diorite has also developed along the borders into an aggregate of garnet and pyroxene. The common experience is to find the effects upon the eruptive itself limited to fine crystallization from chill.

A different type of orebody from all of these is supplied by the copper deposit at White Knob, Idaho. The garnet zones here appear as pipes or trunks within the mass of the eruptive, although not far from the contact. Ten different pipes outcrop, but they come together within 700 ft., so that at the bottom levels there are but three or four surviving. The gangue of the ores is garnet, diopside, and calcite, as is usual, and in this case it appears as if calcareous hot waters had risen from below through the still heated eruptive and had produced the silicates.[10]

Iron and copper ores are, however, not the only ones found along the zones. Lead and zinc minerals were early noted in the Kristiania region and more rarely those carrying bismuth, antimony, and arsenic.[11] In Washington Camp, Arizona, copper has thus far been chiefly sought, but W. O. Crosby states that zincblende is more abundant[12] and galena is also well represented. In fact the complicated mixture of these several varieties has been one of the difficulties in the utilization of the ores of this particular locality. Zincblende is a rather common associate of copper ores in the zones. The mineralogy of the famous and unique orebody at Franklin Furnace, New Jersey, is much more closely akin to the contact zones than to any other known type, although it seems not to be in immediate association with a possible eruptive that could have produced it in this way. Gold associated with wollastonite has been recorded from the Santa Fe mine, Chiapas, Mexico.[13] It also occurs in the same relation, as I have observed, at the Cane Spring mine, in western Utah. Even platinum has been detected by L. Hundeshagen, with the same mineral in a contact zone, in Sumatra.[14] W. H. Weed has emphasized the sylvanite with less abundant native gold at Bannack, Montana.[15] The same observer found bismuth telluride (tetradymite) with bismuth sulphide (bismuthinite) at the Dolcoath mine in the Elkhorn district, Montana,[16] and also gold-bearing arsenopyrite at the Nickel Plate mine on the Similkameen river, British Columbia.[17]

It is evident from this review that the contact zones present a fairly wide range of metals, nevertheless it is true that copper has been the one of leading value hitherto. Iron, although somewhat utilized, remains chiefly for the future. Lead and zinc are known, but are not yet obtained in quantity from well established types. Gold has been found in several cases by itself, while it and a little silver are rather common associates of copper. Platinum has one recorded instance.

The contact zones, as stated at the outset, furnish particularly significant objects of study. The older idea of the formation of the silicates involved the re-crystallization of material in the orignal limestones without the addition of anything new. It was believed that where the zones are now found there was once a silicious, aluminous stratum, whose silica, alumina, and lime combined to yield grossularite or epidote; whose silica and lime gave wollastonite, or with magnesia, diopside, or with this and alumina, vesuvianite. Carbonic acid and water were evicted. Where small percentages of iron oxides appear in the silicates they were referred to the limonite or siderite molecules originally in the limestone. If a great eruptive dike or other form of intrusive cut across a series of limestone beds, and developed in some places the silicates, and elsewhere merely marbles, the inference was naturally drawn that in the former case the limestone was earthy or impure and the latter but slightly contaminated.[18] In the interesting exposure at Washington Camp, Arizona, where there is some scattered chert in the limestone, rims of wollastonite were found by W. O. Crosby surrounding the still remaining inner masses of chert.[19]

Along these lines a very interesting and important study was carried out by Joseph W. Barrell[20] both for aluminous and calcareous zones. Assuming the raw materials to be in the limestones with which the metamorphosing agents must work, and that they were calcite, magnesite, kaolinite, and limonite, it was possible to calculate the amounts of these which would be needed for the production of grossularite, diopside, or other silicates, and the amount of carbonic acid and water which would be driven off. By dividing percentage compositions by specific gravities, ratios were obtained, proportionate to the volumes of the several minerals, before and after. The number of volumes lost in the change could be computed and it was found to be impressively large. Thus in the production of grossularite, from calcite, kaolinite, and quartz, the lost carbonic acid and water and the increased specific gravity of the garnet involved 46.9% of cavities in the new rock, unless compression were to diminish them. Diopside necessitated 42.4% and wollastonite 32.8%. In the aluminous rocks andalusite would leave 27%. In Barrell's view porous belts of rock were thus afforded in which circulating solutions might later deposit ores. The hypothesis may, however, be tested in several ways: (1) What was the composition of the original limestone and did it contain the necessary ingredients for grossularite and the other lime-silicates? (2) Is the garnet of the zones actually grossularite? (3) Do the zones show the cavities that these calculations call for? (4) Do the silicates first form, producing cavities which are later filled by the ores?

The composition of the original limestone can be determined at least approximately by samples taken from the same bed or stratum at a distance from the eruptive. This has been done at San Jose, Tamaulipas, Mexico,[21] and at Morenci, Arizona.[22] In the first case there was less than 1% ferric iron and alumina and only 4 to 5% silica. The samples were taken in the endeavor to get a fair indication of the general composition. It certainly would not seem possible to conclude that grossularite in wide zones could have resulted solely from a limestone of this composition. At Morenci, the Modoc limestone, which is the one chiefly converted into garnet, is shown by Lindgren's analyses to have less than 2% silica and less than 3% alumina and ferric oxide. George Smith in the Chillagoe district of Queensland records limestones of 1.25% silica and less, and of less than 1% alumina and iron oxides.[23] So far as these analyses are significant, it is again obviously unreasonable to expect zones of almost solid garnet, several hundred feet wide[24] to be formed by the re-crystallization of an original of anything like this composition.

Hydraulic limestones are indeed known and are extensively used for natural rock cement. They range from 25 to 37% silica, 7 to 17 alumina, and 1 to 5 ferric oxide, and so far as chemical composition is involved they might yield grossularite, diopside, and other silicates, but they are rather unusual rocks as limestones run, and their presence should be demonstrated in each particular case rather than assumed. The presumption and such evidence as is available in the way of analyses are against their presence.

In answer to the second query as to whether the garnet is really grossularite, the lime-alumina variety, there is even more significant evidence. In the San Jose case, the garnet proved on analysis to be over 60% andradite, the lime-iron variety. In the Morenci instance it proved to be almost pure andradite.[25] The garnet from Washington Camp has also been found on analysis to be predominantly andradite. While it is greatly to be desired that these analyses may be multiplied as time goes on, and that samples may come from many additional localities,[26] enough evidence is at hand to justify the conclusion that the unquestioned assumption of grossularite is unwarranted. Now, while it might be possible with apparent justice to reason about a supposed limestone high in alumina, it is a very different matter to assume one high in iron. Richly ferruginous limestones are almost unknown, and thus a strong presumption is raised against the re-crystallization of material solely derived from the limestone. In the White Knob case where the pipes of garnet rock were in the eruptive, two analyses showed respectively 69.26 and 47.82% grossularite, with 21.13 and 44.16 andradite. These results, while higher in the aluminous variety, were by no means lacking in the ferruginous, even when the wall-rock of the pipes ran 16 alumina and only 1.59% of both oxides of iron.

The third query as to whether as abundant cavities are found in the garnet zone as the calculations call for is to be answered by observation. The theoretical abundance could hardly be expected to be actually reached. No zone is pure garnet. Diopside, and epidote or other lime silicates whose production involves fewer cavities, are seldom if ever lacking. There is also more or less calcite, and there may be not inappreciable quantities of quartz. Yet after critical observation of several zones with this point in mind, I have felt that the cavities were not as abundant as would be rightly expected on the re-crystallization hypothesis, but that there are often belts several feet wide of very dense rock. Vugs and cavities do occur, but they are too few in numbers. If cases like the zone of the Cumberland-Ely mine in Nevada, be examined, zones are found that are so largely pure silica that the re-crystallization hypothesis can hardly apply. To a less but still appreciable degree it is difficult to use it for diopside, a mineral higher in silica than the garnets, or for wollastonite, which is likewise more silicious. From only a few per cent in silica, ten or less, can hardly be believed to have been produced a rock that is either almost pure silica or composed of silicates fairly high in this acid radical.

In several localities the succession of the minerals in the zones has been worked out both by means of microscopic slides and by study of the hand-specimens. In the San Jose case the order seemed to be the following, the only question being the time relations of the lime silicates and the magnetite: (1) diopside and garnet; (2) magnetite; (3) pyrite and chalcopyrite. At Morenci, Lindgren records the simultaneous crystallization of the lime-silicates and magnetite together with some of the sulphides, whereas other sulphides are clearly later and cut the earlier minerals in veinlets. At the White Horse Pass mines in the Yukon, O. Stutzer determined the following order: (1) pyroxene, and rarely magnetite; (2) magnetite; (3) garnet with a few metallic sulphides; (4) amphibole and the greater part of the sulphides; (5) calcite.[27] Stutzer cites in this same paper the observations of O. E. Leroy upon the deposits of Texada Island in which the pyroxene precedes the sulphides, but the relations of the latter to the garnet are not mentioned. In some detailed observations upon garnet zones at Velardeña, Mexico, J. E. Spurr and G. H. Garrey note a number of successions in all of which the formation of garnet or some other lime-silicate comes first and the entrance of the metallic minerals follows.

These cases fall in line well with Barrell's view that the metallic minerals might be deposited in a porous rock, made so by the re-crystallization of the limestone, but it is fair to say that they might also leave the eruptive at a somewhat later stage than the silica, iron, and alumina and continue the replacement of the limestone or might fill any cavities that had resulted when silica and its associates evicted carbon dioxide. Magnetite and hematite occur in such great bodies and are so clearly replacers of limestone that the introduction of iron oxide from the intrusive mass seems established beyond question.

Not every observer has been inclined to view the garnet zones as contact effects. Some have thought them intrusive masses themselves. George Smith, in describing the Chillagoe, Queensland, occurrence mentions garnet rock 200 ft. wide enclosed in granite, and regards this, as well as occurrences along the border of the granite and limestone, as intrusive in nature. Most geologists, however, favor the hypothesis of production of the garnet by contact metamorphism and would be inclined to interpret the mass wholly enclosed in granite as a great limestone fragment altered by the eruptive or as formed in some such pneumatolitic manner as is necessary to assume for the White Knob, Idaho, case. Not a few observers in the field have doubtless speculated on the possible absorption or in-fusion of limestone along the border of the intrusive rock, and have wondered if at the time of its entrance the intrusive mass were not sufficiently superheated to make this possible. There is, however, as a rule, a pretty sharp line of demarcation between eruptive and sediment, and there is also a gradual passage of garnet or other lime-silicate rock into limestone. Scattered garnets and pyroxenes gradually fade out into barren wall rock. Some rather well grounded objections to garnets from fusion have been found in artificial experiments. Thus if garnet of the grossularite type be artificially melted and the crucible allowed to cool slowly, not garnet, but a mass of anorthite, melilite, and pyroxene results. E. T. Allen and W. P. White have made some interesting demonstrations of the melting point and conditions of possible existence of wollastonite, one of the commonest contact minerals.[*] They find that at normal pressures wollastonite cannot exist above 1180° C. At higher temperatures pseudo-wollastonite results, a mineral of a different crystal system and one not known in nature. While it is possible that higher pressures may make differences, yet the fusing point of acidic eruptives is usually well above 1200° C. and the intrusive masses may have been much higher. Wollastonite does form at normal pressures as low as 860° C. There is some reason thus to think it not a product of crystallization from fusion, but the result of the still highly heated after-effects. The banded arrangement of the lime-silicates, moreover, the vugs with their coats of crystals, the veinlets of sulphides, of quartz and of calcite itself, all argue against fusion and in favor of pneumatolitic processes.

Thus it has come to pass that almost all the recent students of these contact phenomena have interpreted them as due to the emission of water-gas and other highly heated vapors, which, with continued fall in temperature, in time give rise to highly heated waters. Where to draw the line between the two physical forms is scarcely known. The further speculation seems justified, that if the issuing gases and waters do not encounter limestones or aluminous rocks and are not relieved of their dissolved elements near the intrusive mass, they may rise as hot-springs and with diminishing pressure and temperature fill veins in the upper rocks. The abundant silica of the contact zones and its predominant occurrence as a gangue in the fissure veins are two things that may be of complementary significance.

The German Potash Syndicate

By Talbot J. Albert

*The Potash Syndicate furnishes an excellent illustration of what constitutes a German syndicate and distinguishes it from an American trust. Only by the study of a concrete example can the difference be clearly understood. There are two significant and material distinctions. The first is that the Potash Syndicate and most of the other syndicates have, as such, no capital or shares of stock which are dealt in on the stock exchange, as is the case with an American trust. The second distinction is that a syndicate is a combination for a limited period of time, usually five years, while the life of a trust is indefinite.

The units composing the Potash Syndicate and most mining syndicates in Germany are companies of two kinds, namely: those whose capital is divided into shares called *kuxe;* and those whose shares are of the ordinary, joint-stock variety with limited liability. The shares of the joint-stock companies are non-assessable, but on the other hand *kuxe* are shares that are assessable at any time and are of unlimited liability. These *kuxe* and shares of the individual concerns are dealt in on the exchanges of the large cities of Germany.

Each company that is a member of a German syndicate has its representative on the board of management of the trust, and this board fixes the quota of production allowed each mine and generally administers the affairs of the entire combination under its constitution and by-laws *(statuten)*. The constitution and by-laws must be signed by each concern entering the syndicate and the provisions therein contained strictly observed under penalties enforceable in courts of law. The mutual obligations of the syndicate toward its constituent members and the duties of the members toward the syndicate are thus protected by law, making it a legal combination.

The weak point in this form of organization is the dissension that often arises as to the quotas allowed the different members. Each company wants as large an allotment as it can get and there is disappointment if it is not received. For this reason upon the expiration of the life of a syndicate there is always uncertainty as to whether it will be renewed, owing to the competition among the various constituent firms. The object of a syndicate is not monopoly, but the prevention of disastrous competition. It is an agreement among producers of an article to prevent overproduction, so that supply will conform to demand and reasonable profits may be obtained. There is no outcry in Germany against syndicates; they are generally looked upon as organizations advantageous to well-regulated trade.

The German Potash Syndicate, a combination of seventy-six companies, is now practically in complete control of the potash mining interests of Germany. The chief competing mines were Einigkeit and Sollstedt, in the Brunswick consular district, and Aschersleben, in the Magdeburg district. Some time ago Einigkeit, which is controlled by American capital and has been connected with the so-called South Trust in the United States, came to an understanding with and was admitted into the syndicate. Now an agreement has been reached between the Potash Syndicate and those interested in the Sollstedt mine, by which Sollstedt is allowed the free delivery of salts under the contracts with its American customers until the end of 1911. Out of the profits a payment will be made to the International Agricultural Corporation of New York, which owns the shares, or *kuxe*, of the Sollstedt mine, and the balance will be paid by the syndicate, which will co-operate with Sollstedt in settling lawsuits threatened or instituted against the mine. At the end of 1911 the sales of salts exceeding the quota allowed the mine will cease, and it will become a member of the syndicate. In carrying out the agreement between Sollstedt and the syndicate it is provided that the International Agricultural Corporation shall enjoy all the benefits granted to the other large American importers of potash under the agreement made at the Hamburg conference in May last. The entire American business of Sollstedt with the International Agricultural Corporation will become centralized in the syndicate.

The agreement between Aschersleben and the syndicate provides as basis for union that the mine shall receive $357,000 from its American customers ($178,500 from the so-called North Trust anad $178,500 from the International). In lieu of a preference quota Aschersleben demands from $142,800 to $190,400. The justice of this claim has not yet been admitted by the syndicate, but, with counter demands and offsets, it is being considered, and there seems little doubt but that a final agreement will be reached and the mine become a member of the syndicate. In consequence of the increase in the quota of the Volkenroda potash works and the allotment granted the Weitmannshall works, a new apportionment of the quotas of all the companies in the syndicate has been made, which went into effect October 1, 1911. The potash production of the syndicate is divided into 1000 parts. The largest share (25.14) is apportioned to Leopoldshall mine and the smallest (3.44) to the potash works at Halle. The allotments to the three mines that have hitherto been outside the syndicate and which made independent contracts for the delivery of salts to American customers, are: Aschersleben, 20.68; Sollstedt, 15.24; and Einigkeit, 14.54.

With the absorption of these three mines into the syndicate all competition ceases. As Germany is the only country in the world in which potash mines are being profitably worked, and as the mines are controlled by one combination and their production and sales of potash regulated by the special law recently passed by the Reichstag, the German Potash Syndicate may be fitly termed a legally reinforced trust. The unworked potash field in the Duchy of Brunswick, Province of Hanover, and elsewhere in Germany is immense, but under the law no new mine or combination of mines can become competitors of the syndicate.

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*Abstract from *Daily Consular and Trade Reports.*

The Seneca Mining District, California

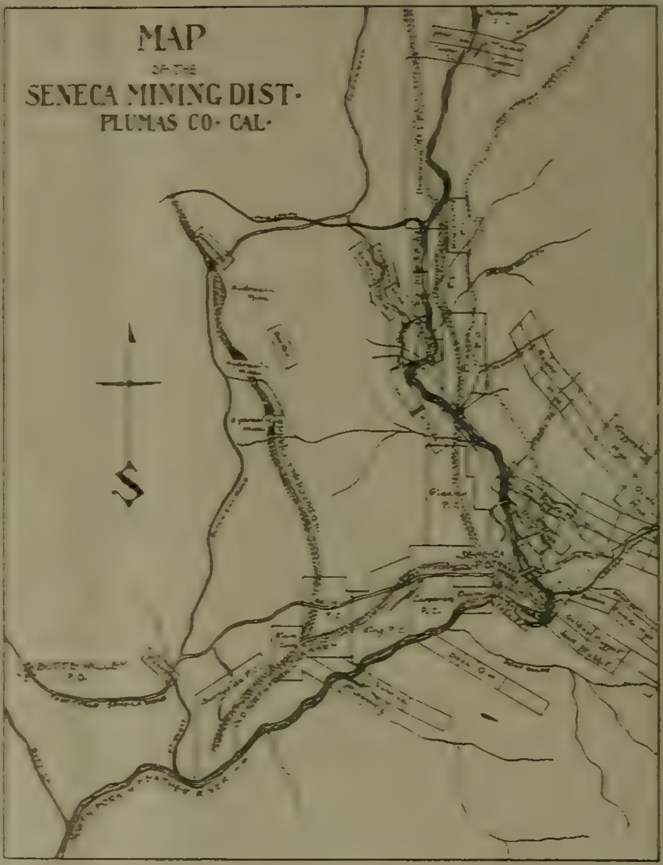
By F. L. Wilson

The Seneca mining district lies near Lassen Peak, in the northern part of Plumas county, and near the head of the north fork of the Feather river. The district extends from the mouth of Butt creek on the south to the dam-site of the Great Western Power Co. on the north, with an approximate area of 28 square miles. Seneca, the principal town, is reached by 45 miles of staging from Keddie, the nearest station on the Western Pacific railway. This distance will shortly be reduced to about 25 miles through the building of a new county road which branches from the old road near the town of Greenville and runs to the dam-site of the Great Western Power Co. and from there down the east side of the north fork to Seneca. The road between Greenville and the dam-site is nearing completion, and work may be started on the Seneca road.

The topography of the district is immature, as it is elsewhere in the uplifted portions of the Sierra Nevada. The north fork, cutting through the tilted sedimentary rocks and the successive lava flows, has a deep canyon. Between the Savercool and Dominion mines the walls are exceedingly steep. The river has a steep gradient, with an average drop of about 150 ft. to the mile. Terraces extend along the river, marking the course of the old channel, which was covered up by several successive flows of lava that extended nearly 20 miles down the river. The old channel of Dutch Hill is about 1000 ft. above the north fork and has been eroded, exposing gravel which has been hydraulicked to a considerable extent. Nearly a million dollars has been extracted from these hydraulic mines. The auriferous gravels are described by Diller as being of Neocene age, and the lava flow, that covered the channel before the region was uplifted, as basalt of the same age.

There are two old channels of the north fork, but the second one is not worked, although it contains gold, while the lower one has been worked for years. The river cuts it in two places and below these points there are rich placer workings. At the Dominion mine the top of the oldest channel is about 30 ft. above the river, and the other channel is about 200 ft. higher. The second channel is from 6 to 10 ft. thick, while the lower one is 15 to 40 ft. thick. Just above the Panama quartz claim the upper channel is about 40 ft. above the present one. The present river flows over a hard, compact slaty-schistose rock composed of greenish grains and called locally 'greenstone.' This belt is about 1200 ft. thick and has the usual strike of the district, N. 50° W. The old channel at the Dominion mine has cut through softer rock composed of slates and shales (see accompanying sketch), and at the Pliocene mine it crosses the greenstone and follows down the east side through the Glacier ground. The flows of lava extended down the north fork after the river had cut through the older lavas and auriferous slates, forming flats or terraces, and the gravel can be seen at numerous points along the terraces, just below the basalt. There is still a considerable portion of the channel that has not been prospected, and will in time be worked with profit.

Among the mines that have been worked are the Sunnyside, said to have produced $500,000; the Kelly, $8[illegible],000; the King, $40,000; the [illegible], $45,000; the Glacier, $30,000, and the Pliocene, about $25,000. At the Sunnyside mine, work is now being carried on in a new drift and gold is being washed out of the gravel of the old channel at a profit. Some work is being done on the Kelly mine and the Glacier mine. At the Dominion mine active prospecting is being carried on. A siphon has been installed to unwater a winze and found to work satisfactorily. Hungarian riffles are now in use, and other means of saving the fine gold and black sand will shortly be installed. Two samples of the black sand from this channel have assayed $850 and $1200 in gold, respectively. The gold examined under the microscope is metallic, adhering to particles of sand. The lava flows in the district are of different periods and range from andesite and pyroxene andesite to distinct basalts. Placers in the present channel of the north fork were at one time of great importance in the district, and some of them are still being worked. The Deane placer is profitable at the present time.

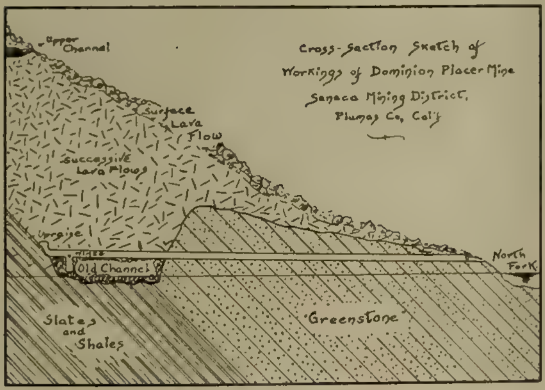


Next to the 'old channel' mining, quartz mining is playing an important part in the development of the district. Prospecting work is in progress at several of the quartz mines, particularly at the Del Monte, where another 100-ft. contract has recently been let. At the Dunn mine, the only profitable one so far in the district, a $6000 six-stamp mill is in active operation on the property. This mine and mill are owned and operated by the Seneca Mining & Milling Co. The discovery and development of this property is characteristic of the mines in this district. The White Lily (Dunn) quartz mine was discovered and located by the Dunn brothers in 1896. An arrastre was operated for one year, when a two-stamp mill, driven by a wooden overshot water-wheel, was installed and operated steadily for six years. In 1904 a 6-stamp mill was built and operated for 18 months, when it was destroyed by fire. In 1906 the present plant was built and has been in steady operation since. In 1907 the property was incorporated under the name of Seneca Mining & Milling Company.

The ore from the Dunn mine consists mostly of quartz, clay gouge matter, and some calcite, with fine flaky gold pyrite, and some galena. The ore assays 0.45 oz. in gold per ton, on the average. It is trammed from the mine in ¾-ton cars and dumped on 1½-in. grizzlies, the fine dropping into a 14 by 16-ft. bin, the oversize being shoveled into a 7 by 9-in. Blake crusher with discharge into the main bin. The fine ore is then fed by means of Challenge rotary feeders into the mortar boxes of the batteries. There are three of these batteries, of two 850-lb. stamps each, 100 drops per minute, and a drop of 6 in. The discharge of the pulp from the batteries is through 30-mesh angle punched metal screens to 40 by 90-in. plates. At present no attempt is made to save the tailing, but the management plans to install suitable concentrators soon. Arrangements have also been made for two additional batteries of five stamps each, and a hoisting and pumping plant for the mine, to be ready for operation about the first of the year. The mill is operated by water-power, the water being obtained from the north fork and brought to the mill through a flume 18 by 48 in. a distance of 1100 ft., and giving a vertical drop of 24 ft. The water from the flume passes through a 24-in. iron pipe into an 18-in. Leffel turbine, which generates about 20 hp., sufficient to operate the mill and other machinery. A 10-in. Victor turbine is used at night to run a 250-volt Westinghouse generator, which furnishes the mill and Seneca with 100 sixteen candle-power lamps. The output of the mill is 15 tons per shift of 24 hours. The company employs 8 men in the mine, and 4 in the mill.

SIX-STAMP MILL, SENECA M. & M. CO.

A RELIC OF FORMER DAYS.



CHANNEL AT THE DOMINION MINE.

On the Savercool claims prospecting adits were driven on the veins showing on the surface, and the ore from these was treated in a small quartz mill situated a short distance above the mouth of Ohio creek. Later a main adit was driven below these, and a larger mill erected. This mill was operated for a short time and then shut down due to the pinching out of the supposedly large pay streak. Later development on the property has failed to find the rich vein. The mill today is a total wreck. At the Horseshoe mine another stamp-mill was erected and operated for some time, but today stands idle, a monument to Seneca's lively early days.

Another item of economic importance to the district is the water development that is now in progress. The Great Western Power Co. has already developed the low water flow of Butt creek by means of a flume and pipe from a dam site near the Butt Valley power-house to the mouth of Butt creek. This gives a net head of 865 ft. The low water flow will generate, with the present machinery, 800 kilowatts. At a later date a high dam will be erected at the head of the flume and the plant built to produce a minimum of 6000 kw. continuous output. The storage in Butt valley will exceed 180,000 acre-feet. This storage is, however, small in comparison with that which will be obtained at Big Meadows upon the completion of the multiple-arch dam now in construction above the McMillan copper claim on the north fork. This storage will exceed 1,150,000 acre-feet. The dam will be founded on basaltic rock and will have a height above its base of approximately 144 ft. and a crest length of 660 ft. In the immediate future this dam will be used to store flood waters for liberation during the summer for the use of the company's plant at Big Bend. The company plans, in a few years, to divert the entire flow from the dam through a line of tunnels and then through a penstock to a power-house on the north fork near the mouth of Clear creek. The vertical drop will be approximately 1200 ft., and the plant when completed will generate 184,000 kilowatts.

New Zealand State Coal Mine

The general manager's annual report on the New Zealand State coal mines was issued at the end of August, and it is stated, in the Sydney *Daily Telegraph*, that the net profits of the enterprise for the twelve months are £1051, or a little less than 1d. per ton on the total output. The demand for the coal was undiminished, far exceeding the supply, which last year consisted of 260,803 tons, a decrease of 20,827 tons from the previous year's total. The Seddonville mine produced 51,550 tons of marketable coal, and the Point Elizabeth mine 209,253 tons. Considerable difficulty is found in disposing of the large quantity of small coal remaining from the lump supplied to the railways. The gross earnings last year amounted to £128,239, made up as follows: Point Elizabeth colliery, £88,764; Seddonville colliery, £18,624; briquette works, £2259; Wellington depot, £8415; Christchurch depot, £6404; Wanganui depot, £2119; Dunedin depot, £1652. The men in all branches are reported to have worked energetically and well.

Cyanidation in Colorado

By Marshall D. Draper

*The decadence of the mining industry in Colorado is attributable, in the opinion of some engineers, to the exhaustion of the more accessible and probably richer deposits of the first few hundred feet in depth. On the other hand, the large amount of development work necessary to extract those orebodies has, in numerous instances at least, also developed and exposed considerable bodies of lower-grade ore which, for various causes, are not now being treated. Cripple Creek, on account of the application of the cyanide process to the treatment of ore, has been more fortunate than some of the other districts, and although concentration plants have partly solved the problem of cheaper treatment in other districts, yet freight and smelting charges on concentrate cannot be avoided. It has been stated by San Juan producers that it is impossible to make small mines, of a production of ten to thirty tons per day, profitable on ore averaging less than $20 per ton. In considering this statement, a large number of conditions must be taken into account, such as the transportation cost to some treatment plant, treatment costs, the width of the vein, character of the ore—whether it contains other metals than gold and silver—mining costs, and it is impossible to say without detailed and definite data covering these points whether the statement is correct or only partly correct.

It is a well known fact, however, that ore of a grade that will not pay in the San Juan will pay in other Colorado districts, or in other States, this, of course, being due altogether to the difference either in the method or cost of treatment. Assuming that we have the ore ready for shipment, how is it that the shipper is unable to get any returns (I speak now of the San Juan shipper) on ore of a grade of about $10 per ton or possibly a higher grade? The answer is, that freight and treatment charges absorb practically all the returns from the ore. The establishment of some central custom-milling plant would create a market for such grade ores, and while it is not my opinion that the net result would be the immediate opening up of a number of mines, yet it would undoubtedly enable the small operator to exist and in the long run would greatly assist in the development of the mining industry in general. Given a possible production of about 100 tons per day, there are few mines which would not be justified in the erection of individual milling plants, but the difficulty with the small shipper is to prove his mine meanwhile. Such central plant could be arranged without difficulty for the treatment of lead and copper ores, where the concentrate containing these metals could at once be taken from the jigs or tables, the tailing from the milling operation being cyanided. The San Juan has been quoted as merely one of several districts in the State where such installation might be beneficial.

Together with several associates, I made a large number of cyanide experiments on the ores of Gilpin county, about two years ago, the various tests and experiments covering a period of about one year. It was found that there was no particular difficulty in the cyanidation of the ores, and crude concentrate containing 2% copper and only 10 to 12% silica could be cyanided direct without undue cyanide consumption and with a high extraction. As a matter of fact, the average extraction after the proper conditions were ascertained was found, on a series of sixteen parallel tests, to be 87%. Another point of considerable interest was that the average extraction of several Gilpin county custom-milling plants was found to be good, considerably better than has generally been supposed, and, in brief, probably in excess of 70%. Notwithstanding this fact, the shipper seldom receives a net profit of more than 50% of the gross value of the ore, and the difference has been found to be due to the freight and smelting charges on the concentrate.

There is no doubt whatever in my mind that the establishment of a central milling plant in Gilpin county with a treatment charge of about $2 per ton, would result in unparalleled activity in this pioneer gold district. This plant would use the ordinary present methods of amalgamation, followed by concentration, but would differ in further cyaniding not only the tailing but the concentrate as well.

The present situation, speaking of Gilpin county as a whole, is that the shipper is unable to work at a profit if the grade of the ore is under $6 per ton. In many cases this statement is equally true as to a head value of $7 per ton. A treatment charge of $2 per ton would insure a 300-ton cyanide plant a handsome profit, and the shipper would get some net returns from an ore running as low as $3 per ton, although this figure would not allow for any mining cost. The ores of Clear Creek county come under this head also, though not to so great an extent. As far as any lead content is concerned, it may be said, as before, that in the operation of a plant of this kind it would be a simple matter to divert the lead concentrate at any point and ship direct.

The cost at the New Portland plant at Victor is said to be something less than $1.25 per ton, and the cost at the Independence plant about $1.23. Average costs on Gilpin county ores may be estimated at about $1.08. It is probable that average costs on San Juan ores would be somewhat higher, as freight on supplies is higher and general costs are somewhat greater. It is safe to say, however, on the scale outlined, that the cost on approximately a 300-ton plant would be not to exceed $1.50 per ton, and when the plant was in good running order it is probable that this cost would be considerably reduced.

From the milling standpoint it must be admitted that there is much to be desired in the development of economical methods in Colorado. I believe that more could be accomplished toward rejuvenating the mining industry by the establishment of modern mills at central points than by any other means at present known. How this condition could best be attained is hard to say, and is a matter that is hardly within the scope of this article. It may be of interest in this connection to note that a prominent company took up the matter of the establishment of a custom plant in Gilpin county, their engineers looked into the matter and stated that they reported favorably on the feasibility of the plan. In the absence of some energetic promoter, the scheme was allowed to be supplanted by other matters of a more pressing nature and nothing was done. Engineers, in the very nature of things, are seldom good promoters, even if their inclinations are that way, and as the originators of this particular project were all engineers, the matter at present is as dormant as the mining industry in some sections of the State.

In my opinion, as previously stated, the most promising field is in San Juan county and in Gilpin county. It may be that Ouray or possibly Telluride would also offer inducements, though this could only be ascertained by careful investigation. Alma and Breckenridge might also be favorable fields. I hardly think that the silver losses in concentration in the case of the silver districts, such as Aspen or Creede, would be great enough to warrant such an installation. A smaller plant situated at some central point in Gunnison county might be a benefit. Such a plant in Clear Creek county would very likely prove of great benefit to operators. Cripple Creek has two individual installations embodying modern practice, but I am not aware that there is any custom plant embodying the latest practice, so that this might be a promising field for a 200 to 500-ton plant.

Shipping men in London are forming a steamship line to run from Sydney, New South Wales, to Valparaiso, Chile, with a view to utilizing the railway over the Andes between Chile and Argentina for a shorter route between Australia and England than is now possible. It is calculated that mails can be carried over this route in four days less than the time taken by way of San Francisco and New York. It is interesting to note that mails from Berlin to Peking sent over the Trans-siberian railway are delivered in thirteen to fourteen days from the time of mailing.

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*Abstract from the *Colorado School of Mines Magazine.*

The Outlook in Rhodesia

Johannesburg Correspondence

Accounts received from Rhodesia so far this year are not nearly so optimistic as was the case twelve months ago. Scarcity of employment and money are now spoken of, and a growing disinclination on the part of European shareholders to put up capital for mining ventures is noted. There has been a good deal of talk lately about the glowing prospects of the tin discoveries in Rhodesia, but Johannesburg, having transferred most of its talkers to Rhodesia, knows what reliance to place upon those who prefer talking to work, which unfortunately is the case with too many of those who have migrated from the Rand to Rhodesia. If talking does not make a mine, it will not be the fault of the would-be Australian tin experts with which the Transvaal has had so many sad experiences during the past ten years. Excellent museum specimens there will be no dearth of, as well as of talk and prospects, but this method of booming tin prospects inflicted such damage on tin mining in the Transvaal, about seven years ago, that the effects are still felt, and Rhodesian speculators would do well to take a lesson from Transvaal experience. Several of the best Australian and other tin talkers, who worked up the Sallies fiasco on the Rand, are now engaged doing the same in Rhodesia. Both tin and copper surface prospects here are decidedly delusive and deceiving, and until their existence in profitable quantities is proved by actual work, no amount of talk will turn a prospect into a mine.

PROSPECTING IN RHODESIA; TYPICAL VELDT.

Even when the gold possibilities of Rhodesia are considered impartially, one is struck by the plethora of prospects, and the dearth of established mines; for after fifteen years' work the dividend-paying company-owned mines can be counted on the fingers of one hand. Last year's gold output showed little better than others gone before, 40% coming from small producers, but this fixity of output is said to be due to more attention being paid to development. Despite this increased development, however, it is generally admitted that Rhodesian goldfields suffer more from a lack of development than anything else, and under ordinary circumstances this would be taken to indicate a lack of confidence. So far Rhodesia may be best described as a land of highly promising prospects, an Eldorado of the ancients, but unless the prospects are followed up by a bolder policy in the future than has been the case in the past, it will continue to be a country of prospects rather than of profitable mines. In a country like Rhodesia, where the ore often occurs in lenticular bodies as in Barberton, there is more speculative attraction and possibilities than on the Rand, and were the prospects followed up, every prize realized would entice the expenditure of more capital. Some of the properties are being worked with energy, but they are altogether out of proportion to the promising prospects; and for a good deal of the lack of capital, claim-holders are much to blame in asking for impossible terms. The general impression is that so long as Rhodesian properties are sought to be dealt with on unsuitable mining and financial conditions, so long will they probably continue to be in the hands of the small producer.

Australasia Mineral Production

The tables giving the mineral production of Queensland and the rest of the Commonwealth and New Zealand for last year, and for the ten years ended with 1910, disclose some features of interest. It is shown that the year's mineral output of the Commonwealth and New Zealand reached a total value of £28,036,864, which is £750,400 more than for the year 1909. New South Wales once more tops the list, with a value of £8,455,170, Western Australia being second with £7,056,450, New Zealand third with £3,791,133, and Queensland fourth with £3,710,222. It has to be noted that only in the case of New South Wales and Queensland are the returns for 1910, all the others being for 1909, but this fact probably does not alter the respective positions of the States. As a producer of gold, Western Australia continues to lead the other States and New Zealand by a long distance, Victoria coming second, New Zealand third, Queensland fourth, and New South Wales fifth. In silver production New South Wales again comes first, while New Zealand has displaced Queensland for second honor, the latter ranking third. Tasmania reports only the value of its silver-lead ores, and not of silver separately. In the output of copper Queensland continues to hold premier position, with a yield valued at £932,489, Tasmania again coming second with £608,038, and New South Wales third with £486,257. In tin, Tasmania is once more first, and Queensland second. New South Wales, of course, heads the list in coal production, second honor again being taken by New Zealand, with Queensland once more third. Looking at the figures relating to Queensland's output of minerals during the past ten years, it will be seen that, in spite of the large falling off in gold, the total annual mineral production increased during the decade from £3,124,574 to £3,710,222. In that period silver production expanded from £62,241 to £92,685 per annum; copper, £194,227 to £932,489; tin, from £93,723 to £243,271; coal, from £189,877 to £322,822; and other minerals from £32,742 to £244,000.—*Queensland Government Mining Journal.*

The Filipino as a Laborer

By Wickham Quinian

Will the Filipino work? Most assuredly. Is he a first-class laborer? To answer this question intelligently requires some explanation. I regard the great mass of the laboring element of the islands, from the standpoint of development, as children. They have never had an opportunity to develop qualities inherent in them, which go to make a first-class laborer. I say that these qualities are inherent in them, and I speak from ten years experience in handling native labor. The natives in the city of Manila who have had an opportunity to learn how to use their hands and heads are giving a good account of themselves. There has been a steady improvement in the quality of native labor since it was first used, ten years ago, until the present time. At no time have as satisfactory results been obtained from native labor as at present, and this may be unquestionably attributed to the fact that the natives who are now serving best on pile-drivers, derricks, in machine shops, and elsewhere, have been going to school, so to speak, for the past ten years. Therefore if you ask me: are Filipinos, speaking collectively, a first-class laboring element? my answer is emphatically, no. But, on the other hand, if you refer to that class of native labor which has been brought into contact since American occupation with Occidental methods and under American supervision, has been taught how to do things, then my answer is, most unequivocally, yes.

Every individual or corporation engaged in the development of any enterprise in these islands is necessarily dependent upon native labor to accomplish his or its task, and success or failure will depend largely upon the persons to whose task it fails to supervise the operation of the native labor. If by nature and temperament he is tactful, patient, in other words, a good schoolmaster, using the ruler when necessary, for he is dealing with children, he will succeed. You know, as someone has said, there are more balky drivers than balky horses.

The laborer in the provinces has not had the advantages of his city cousin. Nature has been lavish with these islands, and it is not to be expected that the provincial native who has an unlimited credit with Nature, a better bank than the Bank of England, should be looking for work when he has but to shake a few cocoanuts from the trees, levy an assessment on the banana trees in the hills back of his *casa*, or draw fish from the river to supply his needs. Why should he work? You or I under similar conditions would take life as easy as he does. But there are inherent in the provincial native the same qualities that have made the Manila native a first-class workman, and as time goes on the horizon of the provincial native will broaden, he too, coming in contact with Occidental methods and ideas, will develop a taste for the better things of life, for the gratification of which he will be glad to labor, as do the natives of Manila and other places in these islands who have had proper training.—*Far Eastern Review.*

The Platinum Market

St. Petersburg Correspondence

The rise of the platinum market at its chief centre, Ekaterinburg, in the Urals, has for some time been uninterrupted until the 83% metal reached the unprecedented price of 10* roubles 10 kopecks to 10 roubles 20 kopecks per zolotnik about a week ago. There had been for some days whispers of a weakening in the demand, but suddenly this, if it ever existed, was swept aside and it was creditably stated that although the official price was 10r. 20k. the buyers were willing to pay at the mines as much as 10r. 30k. per zolotnik.

But at last the weakness in demand has appeared and is having an effect on the market. The demand for platinum on the part of local speculators is what may be termed a stationary one, and it must be owned that the sellers are equally indifferent; and although the season for producing platinum will in a short time be closed by the frosts, as far as independent workers are concerned, which would result naturally in a reduced supply, there is all the same a tendency shown to lower prices. The latest official quotation on the Ekaterinburg metal exchange for 83% ore is 10r. 5k., or 5k. less than a week ago, while at the mines the price named is 10r. 20k., and a week previous to that it had been 10r. 30k. Confident authorities, however, on the spot contend that the reduction is not to be accounted for by the market having become overstocked with platinum; but rather because of the inability of foreign houses to invest in the metal as a result of the Turkish-Italian war, which has had the result, so they say, of reducing the share values of foreign-platinum concerns. That is why, says the report, the demand for platinum has somewhat decreased.

Cyaniding Tailing at Bodie

By An Occasional Correspondent

Wichman Bros., of Yerington, Nevada, are engaged in cyaniding some old tailing, sixteen miles below Bodie on Walker river. This tailing has been exposed for a number of years, having been carried down by floods from the Bodie mills.

The method followed is to plow the tailing for ½ to 1 ft. in depth, then disk and harrow, load into wagons, and haul to tanks. As much of roots, grass, and sticks were taken out as could be easily removed. A small amount of lime is added to counteract the acidity, and solution is run on and allowed to leach, no attempt at agitation being made. A saving of about 93% is claimed. The average content was about $3 per ton. A royalty of 50c. per ton is paid, or an average of about $900 per acre, and the operators report having made a little better than wages. The small profits are due to the shallowness of the deposit. This land before the removal of tailing would grow only a very poor quality of grass. Here is an instance of how the rancher 'gets back at' the miner, for if he collected damages from the mining company that allowed the tailing to run upon his land, then $900 per acre in royalties, and has his land in as good condition as before, he surely did not lose much. Of course, he did not necessarily collect damages.

From this point to Bodie cyaniding has been carried on over almost the entire river valley. Much of the tailing has been carried upon the land by irrigation.

Tuquerres, Colombia

By F. P. Gamba

This small town of 6000 inhabitants is one of the most important in the Department of Marino, being the centre for the neighboring mining districts. The construction of the town is very poor, but Tuquerres is improving greatly, principally by the rapid development of the mines. Situated at an altitude of 3000 metres (10,100 ft.), at the base of volcano Combal, it enjoys a very healthful climate, a little cold, but agreeable. The environment is the most picturesque that can be imagined, and the land is fertile.

The distance between Tuquerres and Barbacoas, the river port on the Patia river, is 31 leagues (93 mi.) which is covered in five days journey on muleback on one of the best roads in Colombia. It would be easy to transform this mule road into one for automobile freight, and doubtless it would be a first-rate business to get a concession for the construction of the automobile road between Barbacoas and Tuquerres.

The largest mining enterprise in the Department is the Gualcala Mines Co., near the city, owned by an American concern and managed by R. A. Linton. The very productive mines of La Concordia and El Socorro are also nearby, and most of the mines of the country are at no great distance. The trip from New York to this place can be made in twenty days. New York to Colon and Panama; Panama to Tumaco, Tumaco to Barbacoas by steamers on the river Patia, and Barbacoas to Tuquerres on muleback.

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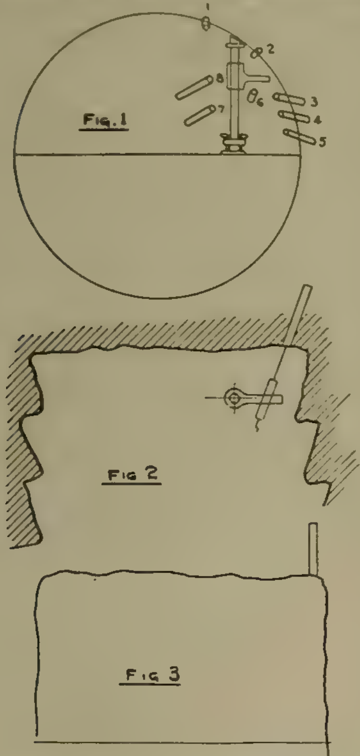
*1 rouble = 51.5c.; 1 kopeck = 0.01 rouble; 1 zolotnik = 4¼ gm.

Foreigners are well liked here, some Americans are doing well in business. John Bidlake, former United States Consul at Barranquilla, has rendered a positive service to the miners by opening a shop well provided with tools and dry goods. He is well esteemed here. Many businesses would be developed and pushed in this city. The population is white and Indian, very little mixed, the two races have kept themselves separate. The Indians are first rate workers and splendid miners when they are once taught. The wages vary as follows: peons, 20c., miners, 40c., and carpenters, 40c. The feeding costs 30c. per man. The local currency here is silver, at an exchange rate of 250 against gold.

Long Column Arms in Tunnels

In driving tunnel headings of oval or semicircular cross-section, ranging from 10 or 12 to 18 or 20 ft. wide on the floor, a customary method is to employ two columns, each carrying two drills. In order to complete the round and break the ground to the best advantage it is necessary either to move the columns or to set up a third column. A device for obviating this delay has been used recently with success in tunnels on the line of the New York City water-supply aqueduct. It consists merely of a column arm of unusual length, 30 or 36 in. This is set near the bottom of the column, and gives the drill a much wider range in placing the holes than the arm of ordinary length.



LONG COLUMN ARM IN TUNNEL-DRIVING.

With this long arm a tunnel wall or rib may be carried straight, instead of as a series of offsets, with the resulting roughness, which must be reduced by filling or trimming. In the sketch, Fig. 1, is shown a column with a short arm. It must be set far enough from the rib to permit the arm to swing between the rib and the column when the arm is placed for drilling the holes at the top of the tunnel.

Hole No. 1 is drilled with the arm on the left side of the column. The arm is then swung to the position shown in the cut, and holes No. 2, 6, 7, and 8 drilled. If this arm or a bottom arm of the same length is used for the lower rib holes, No. 3, 4, and 5 would be drilled as shown in Fig. 2, leaving an offset. The use of a long arm on this column allows holes No. 3, 4, and 5 to be drilled as shown in Fig. 3, and the difference in appearance of the rib when the two arms are used is shown by Fig. 2 and 3. These arms are, of course, made of extra strong material to withstand the strain placed on them when the drill is working at the outer end.—***Mine and Quarry.***

ALL INVESTIGATORS agree that the essential ingredients of portland cement are lime (CaO), silica (SiO_2), and alumina (Al_2O_3). The principal factor is the lime, and the more combined lime present in a cement the greater will be its strength. The lime limit is reached when there is more lime than will combine chemically with the silica and alumina. High lime cements usually set slowly but harden rapidly, and reach their maximum strength in a short time. When the raw materials are brought together in the kiln, some of the lime combines chemically with the silica, forming calcium silicate, and some of it combines with the alumina, forming calcium aluminate. These chemical combination must take place in definite proportions, a lack of combination making an unsound product, because of the free lime present. In slacking, lime expands, so that an excess of uncombined lime will cause the cement to expand, or 'blow', as it is technically termed, and crack. Next to the lime, the most important constituent is the silica. The true strength and hardening of a portland cement is due to calcium silicate. The silica should exist entirely in a combined state, and not as quartz sand, in which condition it does not combine with the lime, and is inert in the subsequent reactions. A portland cement, therefore, should tend toward a composition approximating the proportion: lime, 76.6%; silica, 26.4%, as lime and silica combine as tricalcic silicate ($3CaO,SiO_2$).—*Proc. Am. Soc. Civ. Eng.*

ALL THE FILAMENTS of water flowing side by side within a pipe must possess the same hydraulic energy. Energetic equilibrium within the pipe will always direct the flow of each particle in the direction of an equalization of energies, should any external influence upset the balance temporarily or locally. The filaments near the walls, however, are continually subject to such an external disturbing influence, in the form of the frictional resistance of the wall surfaces. Thereby they are constantly kept in a condition of deficit of velocity head. Thence a continuous fault in the energetic equilibrium results. As the sum of pressure head and velocity head for all filaments must be equal, those near the walls, possessing lesser velocity head, must possess greater pressure head. This, however, is hydrostatically impossible; yet, hydrostatically, it would have to occur, if the filaments were moving in straight parallel lines; therefore, the hydrostatic equilibrium becomes unstable, following the instability of the energetic equilibrium. The water, in order to regain its stability of equilibrium, is forced, by this unbalance of hydrostatic pressure, to abandon its original—or, at least, its hypothetical—straight-line parallelism, and to turn to the right or left in a helical path. Since the instability of equilibrium is indifferent as to right or left, in whichever direction it happens to be started it persists, because it finds therein stability of equilibrium.

IN Plumas county listings of quartz gold run from 627 to about 850 and the placer gold from 800 to 950. In Sierra county gold from quartz mines varies from 622 to 883; gold from the hydraulic mines at Port Wine (a Tertiary channel) is 948 in fineness. At Gibsonville similar deposits show a fineness of about 900. In Nevada county the quartz veins produce gold ranging from 645 to 890. The Tertiary gravels of the Harmony channel show the lowest grade of placer gold; it is 790 fine, but is derived from a small channel immediately crossing a number of rich veins so as to offer little chance of enrichment. In the main channel, at the Manzanita mine, at Nevada City, the fineness is 830. Gold from the deep channels of North Blomfield and Relief has a fineness of 906 and 935; at the Alpha hydraulic mine, 940 to 950; at American Hill and French Corral, all in main channels, 930 to 950.

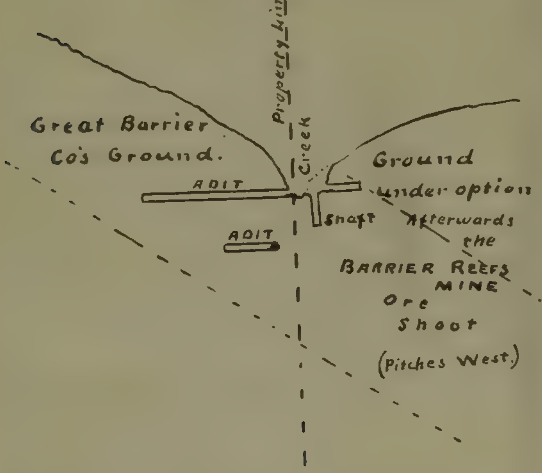
Discussion

Readers of the Mining and Scientific Press are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Surface Indications of Ore-Shoots in Depth

The Editor:

Sir—W. H. Storms' article and sketch which appeared in your issue of November 11, reminds me of a case in New Zealand, on which I had to advise, about fourteen years ago. A friend of mine had an option on some mining ground, and it was a matter of great importance to him as to whether or not the ore-shoot would cross the creek at depth. He had to make a quick decision, as a large cash payment was nearly due on his option. His end line was at the creek, and the Great Barrier company, on the east side of the creek, had nearly all of the ore-shoot at that time developed. That company had a 250-ft. adit driven east from the creek on the vein, and it was in good milling ore all the way. Sixty feet below this adit they had cross-cut the vein, by an adit, and they had driven a little way on the vein from the cross-cut. The ore there appeared to be as good or better than above. I was not privileged to sample the workings at that time. My client had only about forty feet of the ore-shoot on his ground, as it pinched out entirely at that distance from the creek. If the shoot pitched to the east, and did not cross the creek, the property he had under option would be almost valueless, as his small portion of the ore-shoot would soon be in the adjoining property.



The vein is an east and west fissure in andesite, and is from 2 to 3 ft. wide. The andesite then showing in the workings was yellowish-brown, soft, and much decomposed. The vein dipped to the south 60 to 70°. The ore had about an equal gold and silver content in a quartz gangue. The silver occurred as sulphides, black, ruby, and silver glance. Occasionally a little zincblende showed, and this always assayed high in gold. No free gold could be seen in any of the ore. My friend had sunk a 30-ft. inclined shaft, on the vein and near the creek. In the bottom of the shaft was about two feet of ore that assayed $100 per ton. This was the best ore showing on the vein in either property. He also had a short adit on the vein, just west of the collar of the shaft. This had been driven in beyond where the vein split up and the ore pinched out. These were all the workings on the vein. The surface was covered with soil, and the only vein outcrop was in the creek, where it showed like a band of tiling in a floor. No surface cuts had been made on either property to show the outcrop of the vein.

My friend was a mining man of wide experience. He contended that in nearly all of the ore-shoots that he had studied, in mines that he had managed and in others that he had visited, in looking down the vein on the dip the ore-shoot nearly always pitches to the left-hand side. If his 'rule' applied to the case then under consideration, the shoot would pitch to the east, and he would lose the money invested in the prospect, and any more that he might put in on further development and in other payments to the owners.

From my study of the ground, the indications to me were that the main centre of disturbance and hot spring action had been west of the creek; I reasoned that the fissure vein in that vicinity would likely be open longer for ore deposition, and the chances were that the shoot would dip toward the nearest big ancient hot spring. I advised my client that he had better than an even chance to get all of the ore-shoot at depth. He made his payment, formed a company, and went ahead with the development work. At 200 ft. below the collar of the shaft it was shown that all of the ore-shoot of the Great Barrier company had crossed the creek.

Albion S. Howe.

San Francisco, November 14.

Some Words and Their Uses

The Editor:

Sir—The need of such an editorial as that entitled 'Some Words and Their Uses,' in your issue of November 11, struck me forcibly, on thinking of the habit generally prevalent here of calling a heavy oil, one of *low* gravity, and conversely, a light oil, one of *high* gravity. This is exactly the opposite of the truth, and has its origin in the use of the Beaumé hydrometer, by which a heavy oil of, say, 0.986 specific gravity is called a 12° oil, and a light oil of 0.830 specific gravity is a 40° oil. In M. L. Requa's article (page 644, issue of November 18), 'Present Conditions in California Oilfields,' I find the phrase, "the oil is 23° or higher in gravity." This is ambiguous, although probably 'higher' is intended to mean 'lighter,' and illustrates the point I am trying to make.

All the newspapers here announce the sailing of vessels to the 'antipodes,' meaning New Zealand and Australia. The true antipodes of California is near South Africa, New Zealand being the antipodes of Great Britain only. The true meaning, those whose feet are opposite ours, is entirely forgotten.

R. B. Symington.

San Francisco, November 18.

Along Mexican Trails

The Editor:

Sir—The article with this title in your issue of November 4 contains so many mistakes, both in the spelling of the Spanish words used and in the information given, that I hasten to request the author to first learn the language before attempting to insert foreign words into an article for a technical publication, and also to give correct data at the same time. In case he should at some future date want to write another article containing these words, I here give them correctly: *arieros* should be *arrieros; maize* should be *maiz;* and *arroya* should be *arroyo.* The word *antigua,* when not meaning one of the ancients, is an adjective, and the sentence commencing "This *antigua* is the * * *" should be written, 'This *mina antigua* is the * * *' or 'These *labores antiguas* are the * * *'

Furthermore, the name of the British company working the Rosario mine at Guadalupe y Calvo is wrongly given. It should be The West Mexican Mines, Ltd. The information that a 200-ton plant is being erected is also incorrect. About eighteen months ago there was much talk of a 500-ton plant, but owing to the revolution this was not gone on with. At present the sand from the dump is treated by cyanidation.

Donald F. Foster.

Parral, November 14.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

RUST stains may be removed from wood by washing the disfigured parts with a solution of 2 oz. of oxalic acid to 1 pint of hot water.

BLACK DIAMONDS are harder than white ones. Their color varies from dark gray and brownish opaque to black. They are found only in Brazil.

TO toughen plaster casts immerse them in a hot solution of glue until well saturated. When treated in this manner a nail can be driven into them without cracking.

TO drive a nail under water take a piece of pipe long enough to reach the timber, drop in the nail point first, then follow with an iron rod a little longer than the pipe and hammer the top of the rod.

IN order to find the number of revolutions of a pulley, when the diameter and drive are given, multiply the diameter of the driver by the number of its revolutions, and divide the product by the diameter of the driven; the quotient will be the number of revolutions of the driven pulley.

TO prevent blow-holes in cast steel, add to fluid steel an alloy of aluminum with a metal of the alkali earth group, or with lithium. Aluminum alone does not act upon the nitrogen and hydrogen in the fluid metal. The metals of the alkaline earths and lithium possess that property, but they are too expensive for use alone. An alloy of aluminum and calcium gives the combined effect of both elements, so that carbon monoxide and also nitrogen and hydrogen can be removed.

A WHITE METAL that has small shrinkage and is good for pattern plates consists of lead 90% and antimony 10%. A harder metal with small shrinkage and good for pattern plates is zinc 66% and tin 34%. A convenient amalgam for stopping up holes that cannot be easily soldered is made from filings of this alloy and mercury, kneaded in the hand into stiff dough, squeezing out all the mercury possible. This amalgam should be pressed, when first made, into the cavity and allowed to harden. When hard it may be scraped or filed like the metal itself.

CARBORUNDUM is manufactured by fusing in the intense heat of the electric furnace a mixture of granulated coke, pure glass sand, and sawdust. The first two materials must be the purest obtainable. The coke is the carbonaceous residue from the distillation of petroleum; the sand used is the purest glass sand. The sawdust is added for the mechanical purpose of making the mixture porous, thus avoiding explosions of the carbon monoxide produced during the course of the reaction. The fundamental reaction takes place between the sand (silica) and the coke (carbon), resulting in the production of a carbide of silicon, or carborundum.

THE world's production of spelter in 1910 was the largest in history, exceeding that of the record output of 1909 by 35,104 short tons, or 4.1%. The major part of this increase was contributed by the United States, which exceeded its production of 1909 by 13,424 tons, or 5.2%. Good gains were also made by Belgium, France, Spain, and the Rhine district, and smaller gains by other countries, no country failing to show some increase. The output of the United States was 30.5% of the total production of the world. The next largest producers were Germany, with 27.33% of the world's production to her credit, and Belgium with 21.53 per cent.

ZINC imported into the United States as metal or in ore may be entered for immediate consumption, in which case the duty is paid and the zinc goes direct to the consumer; or it may be entered for warehouse, bond being given for double the amount of the estimated duty. From warehouse the zinc may be withdrawn for consumption by payment of duty, or it may be smelted in bond, finally being either withdrawn for consumption or exported from warehouse with cancellation of bond. The zinc imported for consumption may be actually used in the country or it may be manufactured and exported, in which case the manufacturer is entitled to the benefit of a drawback of 99% of the duties paid.

SELENIUM is a rare and little known element which is chiefly used in the manufacture of certain glasses, to which it gives a red color, and in coloring enameled ware red. It is used to overcome the natural green color of ordinary glass and also in making glass of a distinct red color, such as that used on railroads for signal lights. Selenium has the peculiar property of being a poor conductor of electricity in the dark and a fairly good conductor in the light, and a number of electrical inventions depend on this peculiarity. It has been used in experiments in telephoning along a ray of light, and for transmitting sounds and photographs from one place to another by means of a telephone or telegraph wire.

CADMIUM has been recovered in the United States since 1907 by the Grasseli Chemical Co., of Cleveland, Ohio. The metallurgical method employed has generally been assumed to be fractional distillation, but this is not confirmed by the company, which prefers not to communicate the process used. Among the possible sources of cadmium in a general chemical works would be the slime left in the production of zinc chloride from zinc scrap and skimmings, or from low-grade roasted zinc ores. As dilute hydrochloric acid dissolves zinc in preference to cadmium, the cadmium content of the zinc scrap and skimmings is left behind in the slime. From this slime the cadmium may be recovered by distillation, by electrolysis, or by purely chemical methods.

TIRE-CASING that is old and not in a condition to warrant repairing by a regular repair-man can be put in condition to yield several hundred miles of service. If it is blown out, carefully clean the inside of the cover with gasoline for about 5 in. each side of the hole; then cut a section about 10 in. long out of the best part of a cover that is in bad condition, cutting beads from it and trimming it with a sharp knife at the edges to a thin edge. Carefully clean the inside with gasoline, and when ready apply three coats of cement to the inside of the casing to be repaired, allowing each coat to dry well; also two coats on the outside of the repair piece, and apply together as you would patch an inner tube. Rivet the patch to the tire-casing by using small copper rivets or split rivets in a single row, about 1 in. from the head, placing the rivets about 1½ in. apart. After this is done canvas should be cemented to the inside casing, covering the entire patch, so as to make a smooth surface for the inner tube.

IN THE ordinary method of galvanizing, where the material to be coated is dipped into a bath of molten zinc, there is great loss of zinc in the form of semioxidized skimmings and of hard drosses, caused by the alloy formed by the zinc with the iron of the tank and of the article being galvanized. In the larger galvanizing plants there are furnaces to refine these skimmings and drosses and to recover the spelter. There are also many small plants and some large ones which make a practice of buying galvanizers' skimmings and drosses and of recovering the spelter. A considerable quantity of old metal in the form of various alloys of zinc with copper and other metals is also worked over and brought up to the desired composition by the addition of new metal. At almost every brass foundry and machine shop in the country it is the custom to remelt and use brass filings, grindings, and scrap copper and brass, and it is manifestly impracticable to attempt to take full account of such material. Some of the zinc smelters running on ore find it advantageous to work in a quantity of secondary material.

Special Correspondence

LONDON

Failure of the East Rand Proprietary Company Discussed.—Impoverishment of the Rand Mines in Depth.—Important Evidence.

A great deal has been said about the failure of the East Rand Proprietary to make good its promises of profit. This is one of the great consolidations on the Rand and is in the control of Sir George Farrar and his friends. Early this year Sir George publicly promised his shareholders a regular dividend at the rate of 40%. No doubt he believed it could be done, though he was not unaware of the fact that in many sections of the mine the content of gold was not so great as had been expected. When the mill failed to give the necessary yield, all sorts of devices were resorted to in order to bridge the difficulty for a time, as it was confidently hoped that the mine would eventually respond and that the deficiency would be only temporary. The cyanide plant was crowded beyond its capacity, which only made matters worse, for it caused some of the gold in solution to be re-precipitated and thus lost in the tailing. This incident was not altogether unfortunate for the directors, because it afforded them a scientific reason for the failure to maintain the yield and allowed them to blame the metallurgists for poor work resulting in loss of metal. Another piece of diplomacy for postponing the evil day was to clean-up after the end of the month and to credit the month's tonnage of ore with the extra gold extracted during the next month. There have been a number of articles in *The Mining Magazine* and also in other papers, giving out these explanations, but at the Club the general explanation is that "the gold never was there, anyhow."

The discussion is now accelerated, for the latest sensation in the market has been a confirmation of this cynically-expressed view, in the shape of the unearthing of the testimony given by Frederick Hellmann before the Mining Industry Commission held at Johannesburg in 1907. Mr. Hellmann was at that time consulting engineer to the Farrar group, and he is well known in America. The proceedings of the Commission were held privately, but the report was published officially. Nevertheless, Mr. Hellmann's views as to the future of the East Rand group of mines as affected by the general principle of impoverishment in depth was never made public property. This suppression of important opinions inconvenient to the interests of the magnates is only too characteristic of the state of things in Johannesburg, where nobody but the controllers ever has a chance of getting into print. Mr. Hellmann in his testimony asserted that the decrease in the gold content of the ore with depth was obvious in all the mines on the Rand with which he was acquainted. He was severely cross-examined, but was firm. His phrases were characteristic of a practical man, rather than the nicely balanced expressions of a scientific geologist, but they are none the less noteworthy. Wherever he had been in the deep levels he had invariably found the grade decrease with depth. After Mr. Hellmann left, Sir George Farrar and Mr. Lionel Phillips, excellent business men, but neither miners nor geologists, told shareholders in the East Rand Proprietary in 1910 that their Angelo Deep had added to the evidence that the Witwatersrand series were not decreasing in value with depth, and that there was no evidence whatever that the gold contents at the deepest levels were not fully as high as they were within 300 ft. of the surface. The publication of Mr. Hellmann's opinion will serve two purposes; one to prove that "the gold never was there," and second, to revive the discussion started by C. O. Schmitt a year ago with regard to the general question as to the persistence of the content of the Rand deposits with depth. We shall in all probability hear a good deal more of the subject in London before long, and the discussion bids fair to become more vigorous than ever, for the matter is of vital importance in the future of the Rand.

SILVERTON, COLORADO

October Flood Causes Many Shut-Downs.—Railroad Activity.—Coal Shortage.—Work at the Mines.—Outlook Gloomy.

The flood of October has resulted in a great many shut-downs, especially of smaller properties, and the handicap of all the larger mines. The local railroads have been repaired, with the exception of the Silverton, Gladstone & Northerly, which connects the town of Gladstone and the Gold King mine with Silverton. This road probably will not be repaired before spring. Otto Mears has a force of 300 men working from Silverton toward Tacoma, and a force of 50 men is working from Tacoma toward Silverton. At present the forces are about ten miles apart, but progress is very slow and a train can hardly reach Silverton before December 1. There has been no suffering here, but the coal supply is low, many families already burning wood. There is an ample supply of foodstuffs, as the merchants have been packing from Ouray to the Joker tunnel and bringing supplies from that point on the Silverton railroad.

The Columbus, at Animas Forks, closed down on October 31, and this part of the district is now entirely idle. The Sound Democrat, under bond and lease to Ross & Nickels, has suspended operations for the present, and the lessees are in the East to raise money for further development next year. Train service to Animas Forks has been discontinued and will not be resumed until June 1912.

A LANDSLIDE BLOCK, SAN JUAN DISTRICT.

The Sunnyside, at Eureka, is operating steadily and storing concentrate. Work has begun on a zinc plant for this property. The United States Zinc Co. is installing the plant, which is expected to raise the percentage of zinc above 40, the minimum for profitable shipment in the San Juan. The Silver Lake is now milling more than 60 tons per day and has increased the force at the mine. The Iowa Tiger Leasing Co. has canceled its lease on the Iowa and Tiger mines, and the Iowa company is in possession. The company's future plans have not been published, but it is probable that the mines will be leased to one of the numerous applicants. The Gold King, at Gladstone, is working a few men, but little will be done until spring, unless the railroad is repaired. The Hercules has a few men on development work on the lower levels. The Silver Ledge is idle except for a small crew pumping water. The mine was flooded in October to a point about 40 ft. above the 5th level, and but little progress has been made in clearing it during the past month. The water is now down near the 5th level. A new double-drum balanced hoist is being installed, and when in place will be operated by electricity, thus dispensing with the use of coal at this property except for heating purposes. A new flume has been built from United States creek to the mill, and an ample supply of water is assured. The Southern Exploration & Mining Co., a new incorporation, has leased the Congress mine and has taken over all the interest of Maris and Goudy, former lessees. The property will be developed during the winter and efforts made to open up the big shoot 100 ft below the present workings. If successful, the new company will be an important shipper in 1912. November has been a month of heavy snowfall and this coupled with the railroad blockade makes operations exceedingly difficult. No returns from ore shipments are available to help on current expenses, and the coal supply is very short. The recent severe storms make the restoration of communication with Durango a slow matter, and it will be difficult, and in many cases impossible, for properties away from the railroads to lay in their winter supplies. This means a great many shut-downs, and it can hardly be claimed, even by the most optimistic, that the outlook for 1912 is a very bright one.

JARBIDGE, NEVADA

Outlook Is Promising, but Production Is Slow. Additions Being Made to Two Mills. Many Properties Capable of Making District Good Producer.

While in general the outlook for this district is encouraging, production is slow. George Wingfield recently came here and bought a group of claims for a quarter of a million dollars; Patsy Clark visited the district and secured a controlling interest in another group for half a million dollars; half a dozen Spokane, Butte, and Seattle investors have followed their example and have taken up properties at prices ranging from $50,000 to $150,000; but with all these big deals there has been so little actual money exchanged that it has not been noticed in the town. When the value of the mines is recognized so that properties can be sold for cash, or bonded at a reasonable price so that the usual 10% would be paid down, the district may show more life. The mines are here, but the prices are prohibitive.

One thing which has caused distrust is the lack of bullion shipments from the two big mills, which have received much advertising and which were completed some time ago. While it was believed that they would produce thousands of dollars' worth of bullion per month, one so far has done nothing, and the other has not paid expenses. While in many other districts evidences are to be found of the failures of stock companies in the erection of mills before the mines were discovered, intended to promote the sale of stock, it has been left to Nevada, and to one of the most promising districts of the State, to see two large mills built near high-grade milling ore deposits, neither of which is able to handle the ore. This fact is not because of the defects of the process, but because the mills cannot crush the ore to a sufficient fineness and in quantity large enough to supply the rest of the equipment. New machinery is being added to both mills, and they may yet be able to treat ore assaying $18 to $30 per ton.

There is another mill in the district, a small, 3-stamp, double-discharge, prospecting mill, said to be the property of one of the stock companies organized to operate here, which is still lying in the bushes where it was dumped from the freight-wagon last spring, surrounded by two feet of water. This outfit was used in Boise as an exhibition and sampling mill and did good work. If it were erected and treated the ore from any one of the twenty mines here, the district would produce a creditable amount of bullion. There are eight or ten properties now sufficiently developed and with ore of such value that if they belonged to some old Mexican miner, or to an old prospector, they would be producing with primitive machinery built close to the mine, and there would be no anxiety to sell stock. Any of these properties could be producing from $25 to $100 per day.

The Jarbidge district is just two years old, and as yet it has not 'found itself'. The outside investing public apparently has forgotten its existence.

BUTTE, MONTANA

W. A. Clark Making Plans for New Concentrator. Butte-Alex. Scott 10% Commission Again in Court. Boston & Corbin to Erect 300-Ton Plant.

Since his arrival in this city, W. A. Clark has been in consultation with mining experts and architects in regard to the erection of his proposed zinc smelter and concentrator. He will first build a concentrator for the purpose of treating the ore from his Elm Orlu mine, which has been closed down since the destruction by fire of the concentrator of the Butte Reduction Works. He has brought here from Jerome, Arizona, Thomas Taylor, superintendent of his smelting department at that place, as well as Thomas Peacock, head of the mechanical department. A visit has been paid to the Washoe smelter at Anaconda and Mr. Clark says the reason he made the tour of the smelter with the heads of department from Jerome was for the purpose of getting some ideas which might be useful in a big smelter he was building at Jerome. He said that he proposed to fit it up with the most modern machinery for the treatment of ore from his United Verde company property. Mr. Clark will not leave the city until he has completed his plans for the erection of the new concentrator.

The question of a 10% commission for the sale of the Butte-Alex. Scott property has been three times before the courts of this city and apparently is yet unsettled, as once more the case is to be appealed. Duncan McCrimmon claims to have discovered the orebody in that mine and made the fact known to James A. Murray, the millionaire mining man. He says that Murray informed him that he would pay him 10% if the property proved of value to him. The sale was made, and Murray denies having ever made any such promise to McCrimmon. The latter brought suit to recover the 10% commission, amounting to $15,000. When the case was first tried McCrimmon secured a verdict for the full amount claimed, but a new trial was granted. On the second trial McCrimmon again won and the judge refused to grant another trial. An appeal was then carried to the supreme court, and the new trial was ordered. In the third trial the evidence was practically the same, but a verdict was returned in favor of Murray, the jury standing eight to four. Now notice has been given of another appeal.

The Boston & Corbin property is now receiving attention at the hands of the Boston directors who have been at the mine for several days. The men who came to this city and later proceeded to Corbin are N. L. Amster, F. L. Dabney, Alfred Codman, Charles H. Cole, D. A. Ellis, and J. W. O'Neill. Plans for extensive development are being made, and it is about decided that a 300-ton concentrator will be erected in the spring. A thorough examination of the mine shows that there is enough ore broken in stopes or blocked out to keep a mill of that capacity going for several years.

A. B. Wolvin, president of the Butte & Superior company, while in the city recently, informed a close friend that ever since the company had been using the Basin Reduction Works concentrator about 85% of the mineral content of the ore was recovered, and that it was hoped to attain later a recovery of 90%.

A report received by M. W. Bacon, manager of the Heinze western interests, states that a rich body of ore has been discovered in the Stewart mine. The vein was found in the winze, and it is believed that the orebody may extend farther than the winze.

Shaft-sinking in the Pilot Butte is making good headway, the depth now being a little over 800 ft. The cross-cutting from the Black Rock mine of the Butte & Superior company through to the Pilot ground has reached a point about directly under the Pilot shaft, and through permission of the Butte & Superior company the work is to be continued to a point where it is expected to find the Berlin claim vein of the North Butte company.

The work of cutting a station on the 1800-ft. level of the Tuolumne mine has been completed and sinking resumed to the 2000-ft. level.

NEW YORK

Upward Turn in Market.—Reports of Copper Exports by Metal Exchange and Producers' Association Differ.—Tennessee Copper Co. as Record 'Low-Cost Producer.'

The past two weeks have seen the markets in the East taken in hand by some of the strongest factors and given a sharp upward turn. There has been much talk of the light shed on the legal tangle in corporate affairs by the consent of the Federal court to accept the plan of reorganization offered by the American Tobacco Co. It remains to be seen whether the encouragement derived from this particular source is justified. There are some, of pessimistic turn, who refuse to believe that, with tariff agitation sure to be one of the principal factors in the coming presidential campaign, with a growing clamor for criminal prosecution of the offenders against the Sherman law, it is possible for any big bull market to be put into action and receive the necessary degree of public support. These have, to a certain extent, seen their position justified by a decline.

The market in copper shares has been in line with the rest of the list, and it is quite evident that everything that could be utilized to encourage the holders of copper shares has been made to do double duty. Not very long since, some of the copper authorities abroad were inclined to question the disposition of some of the metal which is disposed of by way of export from this side. There is a marked discrepancy between the October figures of the New York Metal Exchange and those of the Producers' Association. The Metal Exchange export figures are 40,808,000 lb., instead of 60,084,349 lb. as reported by the Association. Probably this is explained by the varying periods of time covered. The customhouse clearings and the Association figures rarely agree, because the accounts are not made up for identical periods of time. Still, the fact remains that there is some criticism of the monthly report of the Producers' Association, and evidently a strong impression that the best foot is put forward all of the time for the copper interests.

It is true that there has been a marked increase in the demand for copper at home during the past few weeks, but nearly all of the buying is known to have been for delivery during the current year; it is safe to assert, therefore, that, notwithstanding the fact that most of the mining companies are sold out for the present, still consumers show by their attitude that they are paying no attention to prophecies of higher prices for metal. With 500,000,000 lb. of added production waiting for a market to justify its being mined, the consumer can listen unmoved to any arguments based upon the world's consumption of copper and its proportionate relation to the world's known ore reserves.

The opinion or belief that not all of the copper sent abroad was being accounted for in the visible supply as given out every fortnight on the other side, has evidently caused some little uneasiness. Boston telegraphic despatches say that a careful inquiry has been made of all producers and shippers on this side, and it is said that all deny the existence of a quantity of copper held as 'invisible supply' upon the other side. A letter from Merton & Co., London, is also quoted as saying that there is no cause for apprehension; that any stocks held and not duly reported and accounted for are so small as to be wholly insignificant.

It seems strange to refer to the Tennessee Copper Co. as a low-cost copper producer, still crediting by-products as simply reducing copper costs, as is done in nearly all mines where there are appreciable precious-metal values, Tennessee is probably the lowest-cost producer in the country. As a matter of fact, however, the company is first a manufacturer of sulphuric acid, and produces about a million pounds of copper monthly as a by-product. This year's production of sulphuric acid will amount to about 200,000 tons, and the company has a contract for the sale of all of its acid production for the ten years next ensuing. As the only successful copper mine in the Appalachian range, Tennessee Copper stands in a class by itself.

North Butte has been attracting much attention in the market. It is quite evident that there has been some real liquidation in the stock, quotations having broken from $36.25 to $23 per share. There has been some talk of passing the next dividend, but it is stated upon apparently good authority that no such action is contemplated. At the present time North Butte's production is about 2,000,000 lb. monthly, but costs are about 10c. per pound, which is not enough of a showing to warrant any very high price for the stock. Obviously, the future of North Butte hangs upon present underground work, where it is not as yet known what will be found in the Edith May and Jessie veins, both of which are to be opened at lower levels, ranging from 2400 ft. in the former to 2800 ft. in the latter. Six to ten months will probably be required to complete the development, and meanwhile the shares will be sold.

The promoters of Porcupine properties have been hoping for a revival of activity upon the strength of some open trading in the shares of the Dome Mines, Ltd., on the New York Curb. A number of the larger people interested in the Dome have just returned from Porcupine, and a little market has been made, apparently upon the favorable impression they received. Quotations have been ranging around $40 per share. The Dome mill is to be running some time in January next and will begin operations on $6 ore.

SALT LAKE CITY, UTAH

Silver-Lead Producers Gain Confidence. — Park City Developments.—Slow Progress in Drainage Adit.—Railroad for Deep Creek District. — Bingham & Garfield Increases Capitalization.

The steadying in the price of lead and the stiffening of silver have had a similar effect on the confidence of the silver-lead producers, and recent news centres around this class of mine. In Park City the Daly-Judge is cutting loose by starting a second shift on its concentrator. The company has been working a single shift, but the volume of milling ore is such that the mill could be supplied at even a greater rate. The company has piled up a surplus of about $400,000 and is earning around $30,000 per month, without figuring in the increased output of concentrate. The Thompson-Quincy, one of the newer companies of Park City, is undertaking an extensive campaign of development, under the direction of John McSorley, who had much to do with opening up the orebodies of the Daly West and the Daly-Judge. The Thompson-Quincy has arrangements whereby it is working its property from the Daly West, and secures drainage and an ore outlet through the Ontario drainage adit. A MacQuisten tube-mill is being installed by A. J. Miller and E. J. Beggs at the plant of the Grasselli Chemical Co., for the purpose of experimenting with some of the Park City ores and tailings. The first work will be with tailing containing some lead, but principally zincblende. The zinc problem is an important one to Park City, as so many of the properties contain large quantities of zinc-lead ores of a grade requiring economical treatment and a close saving to make them profitable. The Snake Creek drainage adit, which is aimed primarily at the west end of the Park City district, is making slow progress at present on account of bad ground. The work of concreting about 300 ft. of the adit is in progress, and this is not made any easier by the fact that 2500 gal. of water per minute is being handled. Negotiations are still in progress for an extensive merger of Alta properties. For a long time it has been recognized that the water problem, and the securing of depth and economical extraction of ores could best be handled by the merging of several properties. Reports have been made on several of the mines by various engineers, and options on some of the most desirable properties have been secured. There have been numerous conferences, but no decisive action. For several decades the people who have been interested in the Deep Creek mining district in western Utah have been talking about what they would do if they had a railroad. Now they are having their hopes raised by the appearance of railroad surveyors between Ely and Deep Creek, and there is much speculation as to whether this means Western Pacific, Tonopah & Tidewater, Nevada Northern, or something else.

The Bingham & Garfield road has increased its capitalization from $1,000,000 to $2,500,000. This road has secured the ore business of the Utah Apex, which means added net revenue to both parties to the contract. The road comes within a few hundred feet of the Parvenue tunnel of the Utah Apex, which company will save 20 to 30c. per ton on hauling. The annual report of this company shows a mining profit for six months of $121,299.57, net profit, $87,671.37. The mill is now working three shifts, and there is a steady output of shipping ore.

JOHANNESBURG, TRANSVAAL

Similarity of Rand and European Coal Deposits.—Eckstein Group Engages Welsh Engineers in Place of Americans.—Mining Methods Discussed.

Ever since mining operations on the Rand assumed a large scale, a strong similarity has been recognized as existing between its gold-bearing beds and European coal seams. The local banket beds are of sedimentary origin, and undoubtedly the Rand goldfield has been thrown into its present shape exactly in the same manner as the European coal basins. Below the oxidized outcrop on the Rand the yield of the banket beds of course has declined, and one school of mining engineers urges that only by reducing working costs per ton milled, can the highest profit be obtained. Another school urges that the best profits can only be obtained by keeping the ore sent to the mill as high in value as the mine can be consistently made to produce.

The Eckstein group of mines, representing most of the best properties on the Rand, seem to be trying both methods. Some of those who control the destinies of their mines, appear to consider that working costs per ton can best be reduced to their lowest limit and profits thereby increased by copying coal-mining methods. On this account the services of colliery mining engineers from England and Wales have been secured to direct underground operations. As this group has almost exclusively employed American engineers in the past to control the technical working of their mines, this introduction has naturally caused somewhat of a flutter in the American dovecotes.

The lines upon which underground mining operations in the past have been conducted, have been based with the object of making the yield as close and correct a representation as possible of the average value of the payable ore reserves, with the result that the operations underground have been somewhat scattered, although the results obtained have been wonderfully uniform. To secure these results, some of the large mines find it necessary to draw their ore supplies from as many as twenty different levels. Not only so, but several mines find it necessary to reopen many of the old levels near the outcrop to remove the pillars left years ago for the support of the hanging wall, so as to sweeten the low-grade stretches of ore unexpectedly found in the lower levels of the mines. Of course, such a scattered system of mining means increased cost in many different ways over what would have been the case had coal-mining methods been followed, and the whole of the valuable ore completely worked out when mining operations were originally in full swing upon these particular levels.

There can be no doubt, however, but that concentration of underground mining operations must reduce the costs of supervision, handling, and tramming the ore, particularly if the levels are driven, and the work concentrated, on the lines of coal mining, so as to admit of mechanical haulage being introduced on the levels. Possibly in some cases the reduction may amount to 2 shillings per ton. Absolute concentration on coal-mining lines must, however, mean under existing Rand conditions a varying yield, and when the operations are mostly confined to the low-grade areas so frequently unexpectedly encountered on the Rand the profits also must decline. It of course has happened that in many cases underground mining operations on the Rand have been allowed to become scattered and expensive, without justification, a fault somewhat common with metalliferous mining all the world over. It is just possible, however, that if uniform results are to be obtained concentration may make their attainment impossible. At all events, only the individual surrounding conditions of a mine can decide to what extent the underground operations can with advantage be concentrated and low working costs sacrificed for higher or uniform results. At the Nourse Mines, where concentration is to be carried out under the control of a colliery engineer, apparently with the principal object of reducing costs, the results will naturally be watched with some degree of interest.

GLOBE, ARIZONA

Live Oak No. 2 Shaft Sunk 928 ft. in One Month.—Inspiration Experimental Mill Being Enlarged.—Fifth Unit of Miami Mill Nearly Ready.

At the Live Oak mine a station is being cut at a depth of 800 ft. in shaft No. 2, which recently was sunk to a depth of 928 ft. for developing the western end of the orebody. A world's record is said to have been made in this two-compartment shaft by Ross and McIvor, who sunk it 206 ft. in one month. The shaft was sunk on a churn-drill hole, which penetrated the orebody at a depth of 705 ft., and showed it to be 210 ft. thick at this point. The first 100 ft. assayed over 3% copper, and the average for the entire thickness of 210 ft. is about 2¾%, which is considerably higher than the average for the orebody given in the report of July 1, which was 2.25% for 12,000,000 tons. W. S. Osborne, one of the Ray Consolidated engineers, made an independent sampling of the shaft for Hayden, Stone & Co., and his results are reported to agree very closely with those obtained by the Live Oak engineers and with the results obtained by churn-drilling. While no figures have been given out, it is known that the ore reserve has been considerably increased since July 1. The cross-cut west from No. 1 shaft has reached the orebody, which is now being developed at that point by driving and raising. Four churn-drills are being used in exploring and developing the western end of the property.

The corps of mining and construction engineers assembled at the Inspiration now numbers 16, and all are busy on preliminary plans and surveys. The experimental mill is undergoing alteration and enlargement, and a small force of men is engaged in preliminary construction work at the dam-site at Wheatfields. Plans are being made for the mining of the ore and a 36-in. gauge track is being laid on the main adit level. The last official report showed a reserve of 30,000,000 tons of ore with an average assay of 1.95% copper. The New Keystone Copper Co. is operating one churn-drill on its property lying between the Live Oak and the Inspiration. The result of this exploratory work is not made public. There is no work being done underground. The June report gave 2,000,000 tons of ore averaging 2.25% copper.

The Miami Copper Co., with four of the six units of the mill in operation, is maintaining a daily tonnage of 2000 tons, the recovery of copper content of the ore being over 75%. The fifth unit is all equipped and ready to run with the exception of the line shafting for the rolls and Chilean mills. This has been delayed in shipment, and as soon as it arrives it will be placed and the unit started. The fine-grinding in this unit will be accomplished in three 6-ft. Evans-Waddell Chilean mills with rollers much heavier than those in the Trent Chilean mills, with which the first three units are equipped. There are two mills to the unit. The fourth unit is equipped with 8-ft. Hardinge pebble-mills instead of Chileans. The fine-crushing in all units is done with Burch rigid rolls. A considerable part of the ore is coming from the dump at No. 2 shaft, which is mined by a 'glory-hole'. The small steam-shovel used in excavating for the mill has been moved to the rim of the hole and dumps the ore into the crater and down a raise, to the tramming level. The third Nordberg 1200-kw. generator is being erected in the power-house under the supervision of Frank Zlatnik, power-house superintendent, who for many years was erecting engineer for the Nordberg company.

General Mining News

ALASKA

Juneau

The Skagway Mining Co., capitalized at $10,000, has been incorporated by L. S. Keller, D. L. Dickeson, E. J. Shaw, and W. W. Boughton. Its principal place of business is at Skagway.

Prince William Sound

The Mayfield Gold Mining Co. has been incorporated by M. M. Reese, F. C. Weber, and J. W. McMillan. The company is capitalized at $1,000,000, and has its principal place of business at Valdez.

The Valdez Gold Mining Co. has been incorporated by C. Crawford, A. E. Grigsby, M. Blum, H. B. Ingram, and E. Smith. The company has a capitalization of $10,000, the shares having a par value of $10. The principal place of business for the company is at Valdez.

Seward Peninsula

The Seward Peninsula Dredging Co. has been incorporated with a capitalization of $300,000, with the shares having a par value of $100. The principal place of business is at Nome. The incorporators are Jafet Lindeberg, L. Stevenson, C. C. Lomen, Carl J. Lomen, and E. J. Cole.

The steamship *Corwin* has arrived at Seattle with tin ore valued at $47,000 from the Buck creek diggings, near Cape York.

ARIZONA

Cochise County

The Montana-Tonopah M. Co. of Nevada has paid the first installment on the purchase of the Commonwealth mine, near Pearce.

The 100-ton concentrator of the Paradise M. & M. Co. at Paradise made its initial run November 8. There is much activity at present in the district.

Gila County

(Special Correspondence.)—The latest official figure of the tonnage developed by the Live Oak Development Co. is 19,000,000 tons of ore averaging 2.11% copper. Of this amount over 15,000,000 tons will average 2.25% copper. These figures are given by Charles Hayden, of Hayden, Stone & Co. which financed the last two stock issues of the Live Oak Development Co. and which probably will complete the financing of that company. After his visit to the mine recently, Mr. Hayden announced himself as satisfied with the development to date and said that the Live Oak Development Co. could have funds for future development and equipment. Shaft No. 2, near the western end of the property, passed through 210 ft. of ore averaging 2¾% copper. A station is being cut in the ore at a depth of 800 ft. and this end of the orebody will be further developed. Development is in progress at No. 1 shaft, and four churn-drills are in operation.

T. R. Drummond, manager of the Inspiration, states that he expects that a site will be selected for the new mill and that construction will begin soon. The alterations of the experimental mill have been completed and J. M. Callow and E. J. Harrison will arrrive in a few days to supervise the tests.

Churn-drill hole No. 1 of the Southwestern Miami Development Co. is now 1160 ft. deep and has been in chalcocite ore for the last 50 ft. F. W. Hoar, the manager, said last week that the westerly continuation of the Live Oak orebody into southwestern Miami ground has now been proved beyond question. A wire has been received from Thompson, Towle & Co. to the effect that the stock would be listed on the Boston Curb, November 20.

Globe, November 18, 1911.

The New State Copper M. & S. Co. has been incorporated by H. Sutton, J. P. McNeil, J. R. McDonough, Wade Sotel, and T. Kelly, of Globe, and W. W. Jones, of Miami. The company owns 33 claims, on which some work has been done, about seven miles south of Miami.

Development will be resumed at once on the Warrior properties by the Warrior Copper Co., as the Warrior Development Co. has formally turned over the property to the former company. The Development company had until December 13 to make the final payment on the property. It is announced that shipments to the El Paso smelter will be resumed about January 1.

Graham County

Some trade authorities believe that the Arizona Copper Co., Ltd., property is to be equipped with a modern reduction plant, owing to the reported favorable views in regard to the matter held by L. D. Ricketts, general manager for the Greene-Cananea company, whose recent trip West is thought to have been in the interest of the Arizona Copper Co. Mr. Ricketts recently sailed from New York for Scotland.

Pima County

The Arivaca Gold Mines Co. has been incorporated with a capitalization of $1,000,000, with its head office at Tucson. The incorporators are J. M. Ruthrauff, C. E. Woodell, F. G. Godfrey, all of Tucson.

The Campo Bonito M. Co. has been reorganized and is known now as the Cody-Dwyer Mining & Milling Co. The company has a capitalization of $5,000,000 and no stock is for sale, it is reported, as each man in the company is a millionaire. It owns the Southern Belle and the Campo Bonito properties, making a total of 40 claims. A 100-ton mill for the Southern Belle and new converters recently were ordered by telepgraph. Two 40-ton mills are already on the Campo Bonito property. W. F. Cody, famous as 'Buffalo Bill,' is president of the new company; D. B. Dwyer, secretary and treasurer; W. H. Getchell, consulting engineer. Its principal place of business is to be at Tucson.

Yavapai County

Machinery for a 250-ton reduction plant has been purchased for the Yarnell mine, in the Weaver district, by its new owners, a syndicate headed by W. E. Sharps, who financed the Ray Central company. The syndicate, composed of Philadelphians, has made an appropriation of $150,000, it is reported, half to be expended for equipment and half for mine development. W. R. Twitchell is manager of the property.

CALIFORNIA

The State Mining Bureau has issued a report stating that the mineral production of California during 1910 was $88,419,079, against $82,972,209 for 1909. Kern county leads the list with $19,614,014. Fresno county is second with $9,505,699.

Nevada County

James Roach and his son Thomas recently picked up a nugget valued at about $1700 on the William Tell claim, between the Comet and Conlin mines, state reports from Grass Valley. The nugget weighed a little over 143 oz. It is affirmed that a piece of quartz of the same size would weigh only 4 lb., leaving 97 oz. of gold.

Plumas County

The 5-stamp mill recently purchased for the Oro Fino quartz claims on Hopkins creek will be in operation late in December, says a report from Quincy. The claims are owned by the six Hewitt brothers. Henry Hewitt has charge of the erection of the mill, which was bought in San Francisco.

San Bernardino County

Many mining properties in the San Bernardino valley are planning to use electric equipment, states a report from Bakersfield, as the result of the construction of power lines by the Southern Sierras Power Co., the Phipps company recently incorporated.

(Special Correspondence.)—Extensive oil deposits are reported to have been discovered near Daggett. A. Falkoner, of Daggett, Marcus Bluth of Los Angeles, and J. H. Flinn, of Barstow, are planning development.

Daggett, November 19.

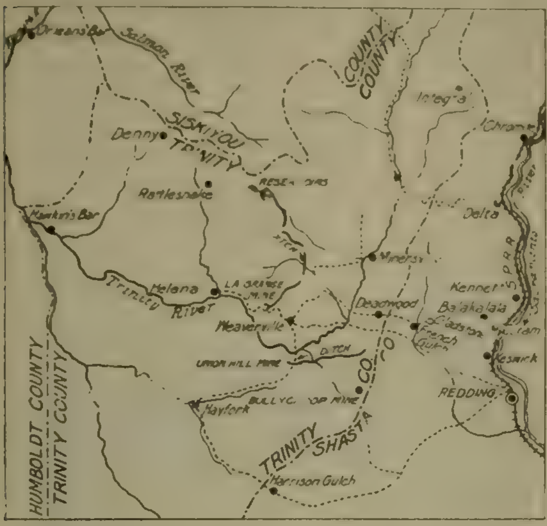
Sierra County

The Independence mine, on Wolf creek, about five miles from the Alleghany district, is now owned by the Independence Gold Mining Co. Fred A. Pearson is general manager for the company. Mr. Pearson and his associates had obtained a bond on the mine several years ago.

Fire last week destroyed the electric hoist and all other equipment, except the mill, transformer house, and superintendent's residence, of the Alaska mine, near Pike, causing a loss estimated at $7500. The company will rebuild at once. No lives were lost. J. Clippenstein, a pumpman, was in the mine when the fire broke out. Taking a safety razor from his pocket he shaved himself, and was found reading by one of the lights when his rescuers arrived. He said he knew "something was wrong," but could not find anything else to do.

Trinity County

The Trinity Con. Hydraulic M. Co., recently organized by W. A. Boland, has formally taken possession of the Hupp mine in Weaver basin. J. J. Murphy is to be superintendent of the property. The same company has several other properties in the Weaver basin, including the Headlight mine at Trinity Center. The price of the Hupp mine is reported to have been $100,000.



MAP OF TRINITY COUNTY.

Tulare County

The Himalaya mine of the White River district recently shipped chrysoprase valued at $7500 to New York jewelers. The consignment is said to contain the finest gems ever sent from the mine. The revival in popularity for these stones has brought about renewed activity in the mine, of which J. R. Merrill is superintendent.

Tuolumne County

(Special Correspondence.)—A temporary suspension of operations was caused at the Black Oak mine last week by a large inflow of water on the 1500-ft. level. The miners saved their lives by hastily retreating. The water, supposed to come from a subterranean reservoir, has about ceased flowing, and there will be no ill results other than the short interruption of work.

Repairs are being made to the machinery at the Bonanza mine at Sonora with a view to unwatering and working the property, in which Los Angeles investors are interested.

Development work soon will be in progress at the Carlotta-Pennsylvania. The improvements just completed consist of a new head-frame on a concrete foundation, a hoist-room and a change-room. A blacksmith-shop is being built and the construction of an elevated tramway to the mill will be commenced in a few days. A Leyner machine-drill and a new Matteson roller-bearing lever-dumping car have been added to the equipment. After sinking 200 ft. a cross-cut will be driven from the bottom, 400 ft. below the surface, to a point directly underneath the Pennsylvania shaft, which will then be connected by a raise. R. B. Whitman is superintendent of the property. The Sunnyside mill is now in operation. The Watt mine, near Soulsbyville, has been sold at sheriff's sale to satisfy a judgment against E. A. Hanke. The property was bid in by J. J. Rauer of San Francisco for $97.50.

Work has begun on the electric transmission line to supply power to the Slap Jack mine near Groveland, and a new head frame is being erected.

It is reported that operations will shortly be resumed at the Mitchell mine, situated in the western part of the county, ten miles from Keystone. The Clio mill will be in commission soon, the repair work being nearly done. Development is also in progress.

The vein at the Jim Lyons mine, near Confidence, is being opened by an adit, which is now in 80 ft. The vein is 4 ft. wide and free gold is easily visible in the rock. The erection of a mill is planned. The property was bonded several weeks ago to A. H. Russell, of San Francisco, for $75,000.

Tuolumne, November 18.

(Special Correspondence.) Development at the If I Can property is progressing favorably to make the same a good gold producing gravel mine. The boarding, bunk, and dwelling houses are in the course of construction, with an office building complete. A tubular mill has been installed as the means of breaking and crushing the cemented gravel. D. W. Kelly is manager.

Chinese Camp, November 18.

COLORADO

Clear Creek County

(Special Correspondence.)—The Humboldt mine on Ute creek has been taken over by N. L. Bernard, of Chicago, representing a syndicate of capitalists. A new adit is to be started to intersect the veins at a vertical depth of 1000 ft. The mill will be provided with three new tables, and a compressor plant is to be purchased. K. E. Seemann will serve as resident manager. The Victor mine on Virginia canyon has been taken over by the Pike L. Co. A plant of machinery will be purchased and the shaft will be sunk to a depth of 200 ft. From the present workings ore is being shipped that mills 2.50 oz. gold per ton. J. Woolcock has started shipments from the Cook vein of the Stanley mines that mills $35 per ton in gold and silver. Work is to be resumed on the Cumberland mine in Alice district by A. Holden. A 12-in. streak of ore that mills $120 per ton in gold and silver has been uncovered on the Oneida mine at Lamartine. A shipment of one carload of smelting ore is being made each day, that assays about $70 per ton. Shipments have been started from the King Bee property on Seaton mountain and returns of $40 per ton in gold and silver are reported. Edwards & Co. are operating under lease. The Puritan mine at Alice is showing large reserves and shipments are to be started. George Steuart is manager.

Idaho Springs, November 18.

In extending the adit of the Geneva mine on Alpine mountain, ore assaying as high as $15,000 per ton was found recently, state press reports. The mine is in the Georgetown district. It is owned by Mrs. William Aldred.

Fremont County

J. F. Shafroth, governor of Colorado, has appointed Mr. Dalrymple, State Mine Inspector, and John Wilson to investigate the grievances of the coal miners in regard to screening coal. The mines are largely those owned by the Colorado Fuel & Iron Co. A thorough investigation of the district is to be made.

Montezuma County

Under the new act allowing the Secretary of the Interior to permit development of natural resources in the National parks, the coal tracts in the Mesa Verde national park are supplying the town of Colfax with fuel, states a report by Mr. Wright, acting superintendent. During the year ended July 1, 226 tons of coal was produced. Mr. Wright advocates the relinquishing by the Government of territory surrounding Mesa Verde, as he believes the recent treaty with the Utes will bring under Federal jurisdiction more valuable property than that immediately surrounding the park, and the small ranger force makes it impossible to properly police the surrounding country. He suggested that Congress appropriate $41,615 for the maintenance and improvement of the park during the fiscal year ending June 30, 1913. The park office is at Mancos.

SUMMIT COUNTY

The magnetic separator of the Wellington M. Co. will be ready for operation late in December, according to recent reports from Breckenridge. The company has resumed sinking its main shaft with three shifts. The concentrator now is treating about 95 tons of ore per day.

The Reliance Gold Dredging Co.'s boat is to continue operations through the winter. The French Gold Dredging Co. soon will be working in the old channel, the scene of early-day placer mining. The Buffalo Gold Placer M. Co. has stopped operation for the winter. The Standard mine, on Gibson hill, is shipping about six cars of lead carbonate ore per month. To open the Oro vein a new shaft is being sunk on the Louis D. placer property in French gulch.

TELLER COUNTY (CRIPPLE CREEK)

The properties leased by the Western Investment Co. shipped in October 50 cars of ore. Of these, 15 cars were from the Ophir mine, and brought returns of about $40 per ton.

Milling-grade ore, in a 4-ft. vein, recently was found in the Jefferson mine, near Victor. The property is leased to W. R. Davenport.

An experimental mill for treating ore from the Christen adit is to be erected by the Signal King G. M. Co., which owns property on Signal hill, opposite the Moffat adit.

In another attempt to shut off the foul gases which have prevented the Moose mine from being operated, Peter Busch, superintendent for and a director of the company, has bulkheaded the shaft at the 600-ft. level, timbered the station with tight boards, lined it with heavy building paper to make it airproof, and laid a tight flooring. The Moose, under certain atmospheric conditions, could not be worked, although over $7000 has been spent in attempts to obtain adequate ventilation. It is operated by lessees.

Work on the Arapahoe claim of the Jerry Johnson M. Co. has been resumed at the 450-ft. level. The claim has been subleased to E. S. James. The Aetna G. M. Co., on Mt. Ervay, has resumed operations. Ore assaying as high as $27 per ton is reported mined. A rich discovery recently was made at the Jo Dandy, according to press erports.

The Mable M. estate, Beacon hill, in October shipped 44 cars of ore. The Stratton's Independence mine, which was filled with water in 1907, and which since has been idle, recently resumed work on the 1050-ft. level.

A heavy flow of water was found recently in driving the Roosevelt deep-drainage adit. T. R. Countryman, U. S. deputy mineral surveyor, made an official inspection for the Cripple Creek Drainage & Tunnel Co., and announced that the flow is 7900 gallons of water per minute. The increased flow has had a direct result on the mines on the district. At the Portland G. M. Co.'s property the water at the 1500-ft. level of the No. 2 shaft is now about 30 inches deep.

Ore assaying as high as 35 oz. gold per ton was discovered at a depth of 1335 ft. in the Roosevelt deep drainage adit, within the property of the El Paso Con. G. M. Co. The point where the ore was found corresponds to about the 2300-ft. level of the Bull hill mines.

IDAHO

BONNER COUNTY

(Special Correspondence.)—John M. Duthie, of Libby, and Arthur B. Corey, of Butte, mining engineers, with a force of men, have been testing in the past week the ground in the vicinity of Kootenai falls for placer gold. It is supposed that the test is being made in connection with the litigation over the power-site at the falls. The tributary land is claimed by the St. Paul, Minneapolis & Manitoba railroad and the Great Northern railroad under a land grant, but the Government is contesting this claim. Joseph A. Coram, of Boston, claims the land under placer locations and has announced his intention of erecting a $6,000,000 power-plant at the falls next year.

Libby, Mont., November 18.

CANYON COUNTY

A smelter is to be built at Nampa, by the Northwestern Smelting & Refining Co., incorporated for that purpose. The company has a capitalization of $10,000,000, under the laws of Idaho. A bond issue of $5,000,000 has been arranged, and the company is said to have a guaranteed tonnage of 2500 per day. The plant will cover 42 acres. The company has its own coalfields and iron and lime beds along a railroad now in operation. Charles H. Gage is general manager for the company.

IDAHO COUNTY

The Idaho-Comstock M. Co. this winter will continue the cross-cut adit, started last year and now in 500 ft., to a length of 1300 ft. The company has 14 claims. Thomas H. Minear is manager of the property.

The Elk City reduction plant made its first run November 1. There is a quantity of concentrate at the plant for treatment, but comparatively little ore has been brought. Mr. Tytler is manager of the plant. The plant is owned by the Elk City Reduction Company.

SHOSHONE COUNTY

The Lead-Silver M. Co. is employing a force of about 50 men and will sink the shaft 200 ft. deeper. Shipment of ore has been resumed.

A compressor will be erected at the Amazon Manhattan property as soon as the Washington Water Power Co.'s line reaches the property, which should be in the near future. The company also is planning to build a mill. The property recently was acquired by William T. Tracy, of Galesburg, Illinois. Mr. Tracy has just made an inspection of the mine, which is in the Sunset district.

A new compressor has been erected on the National M. Co.'s property, near Mullan, and a motor will be installed within a month. Two shifts are now driving the adit, which is in about 300 ft. Another 1200 ft. will have to be driven before the adit is under the orebody. The new adit is about 100 ft. below the old workings.

One of the most important discoveries made for months at the Stewart mine was made recently when exceptionally rich ore was found in a vein cut by the winze, according to reports from Wallace. The new adit is being driven at a rate of about 400 ft. per month.

MONTANA

LINCOLN COUNTY

(Special Correspondence.)—W. H. Graham, who recently bought the Wm. Criderman placer claims on Libby creek, states that he will have a fully equipped hydraulic plant in operation by the latter part of next April. Paul D. Pratt has already completed the survey work.

Libby, November 17.

NEVADA

CHURCHILL COUNTY

A preliminary estimate, recently issued, for October, the first full month of operation of the Nevada Hills Mining Co., shows that the company treated 2735 tons of ore, which milled $25.98 per ton, showing a recovery of over 91%. The net profit for the month was $41,062. The operating cost, exclusive of the cost of construction and the sinking of the Webber shaft, was $10.97 per ton.

CLARK COUNTY

Nels Nelson is about to start development work on his Graphic group of claims, adjoining the Red Cliff, three miles east of Searchlight. He has four tons of ore from the Louisa mine at the Cyrus Noble mill, the product of recent assessment work, from which he hopes to judge the value of the mine.

Carleson & Lund, lessees on the Quartette, have set up a windlass and are sinking on the vein. They have three tons of ore ready for the mill.

Esmeralda County

A deep working shaft and other development work will be started on the Silver Pick property early in January by the new owners, state advices from Goldfield. The property recently was secured by San Francisco investors headed by Herman Zadig. The deep shaft is planned for the Deserted claim, which adjoins the Pipe Dream fractional claim of the Silver Pick and the Mohawk claim of the Consolidated.

Rumors of the proposed merging of various properties are circulating. Among the companies mentioned for two or three mergers planned are the Lone Star, Blue Bull, Atlanta, Kewanas, Simmerone, Grandma, and Oro.

The Goldfield Merger Co. recently extended the time for exchanging stock on the St. Ives G. M. & M. Co. for stock in the Merger company to December 13.

Humboldt County

The Rye Patch M. & L. Co. has purchased a 10-stamp mill. C. A. Conlin, president of the company, recently stated that the company has 210,000 tons of ore on the dump of the old mine, which in a sample assay returned $8 per ton. It is believed that in the mine there is a large quantity of similar ore.

Lyon County

The stockholders of the Yerington Copper Co. have received notification that the controlling interests have organized the New Yerington Copper Co. with the same capitalization and that stock may be exchanged at the rate of one share in the new company for every two shares in the old company. By this arrangement the control of the new corporation will be retained in the treasury, and the stock will be used for development. Stock in the new company is assessable, but it is stated that it is hoped production will pay for development.

TONOPAH BELMONT SHAFT.

Nye County

The pool of stock of the Dexter White Caps M. Co. has been dissolved by unanimous consent of the directors, according to a recent statement issued by the company, and all who are entitled to stock may obtain it on and after November 30.

The Tonopah M. Co. in October produced bullion to the value of $220,450, according to a report just issued. The net profit for the month was $153,536. During the month 15,261 tons of ore was milled, the average recovery being $18.86 per ton. The bullion production amounted to 297,075 oz., valued at $220,450, and the concentrate to 87 tons, valued at $43,855.

The Tonopah Belmont Development Co. in October produced ore valued at $302,952. The net profit for the month was $163,799. The mill treated 7774 tons of ore, and 2550 tons was shipped to the smelter, making a total of 10,324 tons. The net profit shows an increase of $18,826 over that of September, and $10,193 over that for August.

The Montana-Tonopah M. Co. has declared a dividend of 6c. per share, payable December 20, to stockholders of record December 5. The company November 14 paid the first installment on the purchase of the Commonwealth mine near Pearce, Arizona.

The Tonopah district last week produced 8617 tons of ore, valued at about $215,425, the shipments being divided as follows: Tonopah M. Co., 3400 tons, Belmont G. M. Co., 2650 tons, Montana-Tonopah M. Co., 1030 tons, Tonopah Extension, 987 tons, West End, 500 tons, Midway, 50 tons.

A body of unusually valuable ore has been discovered in the North Star mine on the south cross-cut from the top of raise B.

Storey County

The only production reported by the Comstock mines last week was from the Ophir, which produced 406 tons of ore, assaying on the average $42.13 per ton, making the total production $17,105. Development work occupied the rest of the mines.

White Pine County

The Greek-American M. Co. is shipping ore from the Davis group at Aurum, state advices from Ely. The company is hauling the ore over a road which it built at a cost of about $4000 to Warm Springs, on the Nevada Northern, a distance of 14 miles. A vein recently found at the 110-ft. level has ore containing silver and lead and assaying between $5 and $10 in gold per ton.

Press reports state that a new vein carrying native copper in larger quantities than the original vein has been discovered by the Boston Ely company.

The Boston Nevada M. & M. Co. has started the construction of a mill near Osceola. The plans are in charge of C. L. Buckingham of Denver. The details of the structure have not been announced.

NEW MEXICO

Grant County

J. W. Kniffen has purchased a 50-ton cyanide plant for the Hinckley property at Steeple Rock. The mine has been operated for two years by the present owners, the American Exploration & Mining Co. The Last Chance mine, in the same district, recently erected oil-engines on its property.

Lincoln County

Bryan brothers have completed assessment work on the Cash Entry group. The work was done in the adit, in which the vein shows small, but consists of high-grade copper ore. John H. McCutcheon, owner and manager of several properties, is mining lead-silver ore which also carries some copper. C. M. Ryan and Tom DuBois are developing a promising prospect on the west side of the Gallinas mountains. The property has a lead sulphide ore which carries some silver and gold. The iron properties are seeing some activity.

OREGON

Baker County

For the first time in three years the aerial tramway at the North Pole mine is in operation, and the mill will be working in the near future. The force will be increased to about 60 men.

A rich vein, assaying as high as $100 per ton, has been found on Cabell mountain, Granite district, by F. E. Cabell, states a report from Sumpter.

Mining will be resumed, when the spring floods start, at the North Fork placer mine, in which C. D. Snyder & Sons, of Parma, Idaho, has just secured a two-thirds interest. The mine is nine miles from Granite.

Development of the Gold Bug property, on Rabbit creek, has been postponed, states R. B. Wallace, of Marshallton, Iowa, who recently inspected the mine. Only assessment work will be done for the present.

Josephine County

A. J. McCorkle and associates have taken a bond on the Gold Drift quartz mine, owned by W. T. Turnham and S. C. Stone, state recent reports from Grants Pass. The price of the mine is said to be $10,000.

UTAH

Juab County

The Eagle & Blue Bell mine, in the Tintic district, is shipping at the rate of four cars of ore per week, state recent reports, most of the ore coming from the 1300-ft. level. Imer Pett is manager of the property.

Ore assaying 178.8 oz. silver and 8.7% copper per ton was discovered in a cross-cut on the 280-ft. level of the United Tintic. The ore is from the Aspinwall vein. The United Tintic is a consolidation of the Bullock, Tintic, Empire, and Tintic Combination companies.

Recent developments in the Iron Blossom mine indicate that the 600-ft. level will rival the 500-ft. level, state reports from Eureka. While the ore so far mined assays about 10% copper, it is believed that an average assay of the face of ore showing today would return about 20% copper. Prospecting was recently carried on at the 1900-ft. level, but there will be no development at that depth until more machinery is installed, as the equipment is taxed by the present production.

The Gold Chain and Grand Central mines last week shipped 14 cars of ore. The Mammoth last week shipped 8 cars of ore, state reports. The electric pump at the Swansea, which was stopped for repairs, is now working. The other mines are active.

SALT LAKE COUNTY

Ernest R. Wooley, of Salt Lake City, former president of the Nevada Utah M. Co. is under indictment, charged with the larceny of over $14,000 of the company's funds. The complainant is the corporation itself. The complaint contains the allegation that as president he bought properties adjoining the Manhattan group in behalf of the company and that he represented that the properties cost him $15,000 when he paid only $300 for them. He is alleged to have received $15,000 from the company.

SUMMIT COUNTY

The Thor M. Co. has ordered 16 claims surveyed for patent and has let a contract for driving the lower adit an additional 150 ft. The property joins the Daly-Judge.

WASHINGTON

STEVENS COUNTY

The Tungsten Con. Co. of Loon Lake is reported to have uncovered a series of veins containing high-grade tungsten ore. A 60-ton mill is under construction, and it is believed that 4 tons of concentrate per day can be produced when the mill is finished. The mill will be equipped with electric furnaces. W. A. Brockway is manager for the company.

CANADA

BRITISH COLUMBIA

Development work at the Indian Mines has been suspended until supplies can be transported over the snow, says a report from Stewart. George Clothier is manager of the property. Harry Smith and E. Bunting have received another installment of $8500 in payment for the Hercules mine. Development work will be started in the near future. The adit of the Northern Terminus is now in about 45 ft. and the breast is in ore. There probably will be no cessation in development work. Work has closed for the season on the American creek property. Plans for a concentrator for the Ben Bolt mine are being considered by that company. Work is being done on all three levels of the mine. The adit at the Cascade Falls property is being driven to cut the vein at a depth of 80 ft. Frank Hume is superintendent of the mine.

MANITOBA

Quartz assaying as high as $122 in gold and 44c. in silver is reported to have been found recently along the east shore of Lake Winnipeg, thirty miles from Winnipeg, by E. A. [illegible]. The claim from which the samples were taken is known as the Gabrielle Mineral Claim. The proposed extension of the C. N. R. railroad will run through the mineral belt.

ONTARIO

The Temiskaming M. Co. of Cobalt has acquired a controlling interest in the North Dome Mines, Ltd. The price has not been announced.

The Rea mine, in the Porcupine district, has cut its No. 1 vein on the 300-ft. level, 75 ft. from the station. The vein at this point was about 25 ft. wide and carried some free gold.

The shipments of the Cobalt and Kerr Lake districts during the month of October amounted to 70 cars, or 2175 tons. The larger amount of ore shipped was high grade. The McKinley-Darragh was the leading shipper, with a total of 10 cars of high-grade ore.

The silver production for the Province of Ontario for the nine months ended September 30 amounts to 23,185,890 oz., valued at $11,593,286. This output makes a record for the camp. It is estimated that the production for the year will be about 3,000,000 oz. above that for last year, which is the present record for twelve months' output, 30,051,417 oz. of silver. Of the production for the nine months specified, all but 41 oz. came from the Cobalt, South Lorraine, and Gowganda districts.

The Crown Reserve M. Co. will pay a dividend of 2% and a bonus of 3%, amounting in all to $88,440. Similar dividends were paid November 15. The December dividend will be the twenty-second paid by the company and will bring the total dividend disbursements up to $3,626,061.

Press despatches state that the Seneca-Superior Silver Mines, Ltd., has acquired the three leases of the Kerry M. Co. on Peterson and Cart lakes. Development will be resumed in the near future on these properties, which cover about 30 acres. Two of the three leases are on property on Cart lake, adjoining the Gould property. The third is on property adjoining the Little Nipissing.

In the Swastika district visible gold has been found on a 20-ft. vein on claims adjoining the Reeves properties on the west. These claims are held by the Matabanick Gold Mining Syndicate. It is reported that this vein has been stripped for a distance of 500 feet.

YUKON

F. H. Kitto, inspector of Yukon surveys, has completed the survey work which he started last July in the Klondike watershed from Dawson to the mouth of Lee creek, including the north fork of the Klondike to the head of Benson creek. G. W. Tyrrell was his assistant.

MEXICO

CHIHUAHUA

The Chihuahua M. Co.'s property and the Potosi M. Co.'s property are being examined for London investors, state recent Mexican reports. L. Maurice Cockerell, of Chihuahua, is making the examination.

The smelter of the Corrigan-McKinney syndicate at Terrazas station was blown in on November 8.

The erection of a 10-stamp mill at the Capitanena property in the San Francisco del Oro district will be commenced shortly. The machinery for the mill has been ordered. A gas-producer power-plant is planned. D. H. Bradley, Jr., is manager of the property, which is said to be a bonanza.

Howard Sharp and J. S. Whitley have denounced 12 *pertenencias* in the Cusihuiriachic district, state recent reports from Chihuahua, and will call the property the Bella Vista. Jose B. Rascon has denounced 8 *pertenencias* in the Uruachic municipality, district of Rayon, under the name of Viente de Noviembre.

SONORA

At the Alacran shaft of the Mexican Metals Co. a find of fairly rich ore was made, according to an announcement made by August Fritsche. The Calumet & Sonora found valuable ore on the 60-ft. level of the Catalina No. 2 shaft. There now is a full breast of ore, although the orebody has been penetrated for 10 ft. The Cosac M. Co. has been organized by D. A. Richardson, of Douglas, Arizona, and his associates. The property is in the El Tigre district. E. B. Holt, of Magdalena, has organized the Arizona-Mexico Mines Co. to operate properties in Sonora. L. B. Garside of New York is associated with Mr. Richardson. It is reported the first development will be in the old Klondyke district. The Mesa-Rica company is about to increase the capacity of its mill, about 35 miles south of Moctezuma. A. C. Tanner is in charge of the work. The material has been delivered.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

Edwin E. Chase is at Parral.

Francis Drake is in New York.

H. W. Chadbourne is in New York.

F. L. Ransome is at Tombstone, Arizona.

D. H. Bradley, Jr., has returned to Parral.

E. J. Collins was in San Francisco recently.

C. E. Rodgers is at McKenzie, North Dakota.

George T. Coffey has returned from Dawson.

Milton M. Detch, of Goldfield, is at the St. Francis.

E. T. Corkill has returned to Toronto from Pittsburg.

L. D. Ricketts has sailed from New York for Scotland.

B. W. McLean, of Quincy, California, is in San Francisco.

G. H. Garrey has returned from Plumas county, California.

Hiram Hixon was in San Francisco, and has gone to Tacoma.

G. Blanchin was in San Francisco recently and has returned to Paris.

T. W. Fitzgerald, formerly of Guanajuato, Mexico, is at Sandon, British Columbia.

G. W. Egenhoff, manager of the Original mine, near El Portal, is in San Francisco.

Howard D. Smith has gone to San Joaquin valley, and will continue east to New York.

T. G. Brown is now with the Creston Colorado Company, at Torres, Sonora, Mexico.

A. C. Veatch is with the United States Geological Survey, at Washington, District of Columbia.

A. M. Yonge, of the Lightner Mining Co., has just returned from New York and Pittsburg.

Edward S. Wiard has removed his office from 417 Boston building to 422 Boston building, Denver.

W. B. Bretherton has accepted a position with the Dome Mines Co., Ltd. at Porcupine, Ontario.

H. S. Derby has quitted engineering practice and will practice as a consulting attorney at Sacramento.

W. H. Hutchings has accepted the position of general manager for the Ohio Mining Co., at Pearl, Idaho.

William H. Blatchley has left Tonopah, Nevada, for Mexico, where he will be traveling for some weeks.

C. H. Munro expects to leave Nikolaievsk in December and will return to San Francisco later in the winter.

Desaix B. Myers has been engaged in examination work in Calaveras county and has returned to Los Angeles.

Victor C. Alderson, president of the Colorado School of Mines, together with James T. Smith, visited Creede, Colorado, last week.

Charles S. Smith, of Boston, president of the Old Dominion Mining Co., is in Globe, Arizona, making an inspection of the property.

Edward M. McIlwain has resigned the presidency of the Universal Vanadium Co. to accept the presidency of the Lehigh Coke Company.

J. R. Edwards is now the head foreman at the concentrator of the Veta Colorada Mining & Smelter Co., at Parral, Chihuahua, Mexico.

John McSorley has been engaged as general superintendent for the Thompson-Quincy Consolidated company at its property in Summit county, Utah.

John D. Wanvig, Jr., late superintendent for the Superior & Boston Copper Co., has become associated with the firm of Weed & Probert in Los Angeles as their chief assistant. He will accompany Mr. Probert on his trip to the Guanajuato district in the interests of the Proprietary Mines Company.

Market Reports

LOCAL METAL PRICES

San Francisco, November 23.

Antimony	11—11½c	Quicksilver (flask)	45
Electrolytic Copper	14—15½c	Tin	47—49½c
Pig Lead	4.60—5.25c	Spelter	7¼—8½c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50—9.75, large $7.50—8.50

METAL PRICES

(By wire from New York.)

Average daily prices in cents per pound

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Nov. 16	12.58	4.30	6.40	56⅜
" 17	12.58	4.34	6.40	56⅜
" 18	12.63	4.34	6.43	56⅛
" 19	Sunday.	No market.		
" 20	12.70	4.34	6.45	56⅜
" 21	12.80	4.34	6.47	56⅜
" 22	12.80	4.34	6.50	56⅜

ANGLO-AMERICAN SHARES.

(Cabled from London.)

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

	Nov. 16. £ s. d.	Nov. 23. £ s. d.
Camp Bird	1 11 6	1 10 6
El Oro	1 2 9	1 2 6
Esperanza	1 12 9	1 11 10½
Dolores	1 5 0	1 5 0
Oroville Dredging	0 5 10½	0 5 10½
Mexico Mines	7 15 0	7 7 6
Tomboy	1 3 9	1 2 6

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing Prices. Nov. 23.		Closing Prices. Nov. 23.
Amalgamated Copper	$ 63⅝	La Rose	$ 3⅞
A. S. & R. Co	74⅝	Mason Valley	8⅛
Braden Copper	5⅛	Miami Copper	22⅜
B. C. Copper Co	4⅛	Mines Co. of America	4
Butte Coalition	18⅛	Nevada Con	18⅜
Chino	23⅛	Nevada Utah	⅛
Davis Daly	1	Nipissing	7½
Doble	1	Ohio Copper	1⅞
Dolores	4	Ray Central	2
First National	2⅜	Ray Con	15½
Foley O'Brien	⅝	South Utah	⅛
Giroux	4⅞	Superior & Pittsburg	16
Goldfield Con	4½	Tenn. Copper	37⅞
Greene-Cananea	8⅛	Trinity	3¼
Guanajuato Con	⅜	Tuolumne Copper	3⅜
Hollinger	11	United Copper	1⅛
Inspiration	8⅜	Utah Copper	51
Kerr Lake	3⅞	Yukon Gold	3⅜

COPPER SHARES—BOSTON.

(By courtesy of J. C. Wilson, Mills Building.)

	Closing prices, Nov. 23.		Closing Prices Nov. 23.
Adventure	5¼	Mohawk	$ 48½
Allouez	37⅜	North Butte	24½
Calumet & Arizona	56½	Old Dominion	46½
Calumet & Hecla	405	Osceola	96
Centennial	12¼	Parrot	10½
Copper Range	59¼	Shannon	9⅞
Daly West	5¼	Superior & Boston	3⅞
Franklin	9	Tamarack	28½
Granby	31⅞	Trinity	5
Greene Cananea, ctf.	8¼	Utah Con	17¼
Isle-Royale	18½	Victoria	2½
La Salle	5⅜	Winona	5⅞
Mass Copper	7⅞	Wolverine	91

NEVADA STOCKS.

(By courtesy of San Francisco Stock Exchange.)

San Francisco, November 23.

Atlanta	$ .18	Mayflower	$ .03
Belcher	.59	Mexican	3.62
Belmont	8.15	Midway	.24
B. & B.	.13	Montana-Tonopah	.93
Booth	.07	Nevada Hills	2.60
Chollar	.11	Ophir	1.62
Combination Fraction	.15	Pittsburg Silver Peak	1.25
Con. Virgina	.66	Round Mountain	.58
Florence	.70	Sandstorm Kendall	.03
Goldfield Con.	4.47	Savage	.26
Gould & Curry	.08	Tonopah Extension	1.10
Jim Butler	.23	Tonopah of Nevada	6.75
Jumbo Extension	.25	Union	1.42
MacNamara	.26	West End	.80

Decisions Relating to Mining

Specially reported for the Mining and Scientific Press.

Mechanics' Lien on Mining Property

The statute of Montana gives to any person performing any work on, or furnishing any material for, any building, structure, mining claim, etc., a lien on such property. Under this statute persons making repairs and alterations in a mining claim, building roads, and preparing fuel for use in carrying on the mining enterprise and keeping the machinery in order and clearing away débris accumulating from time to time about the buildings and machinery, are entitled to liens for such work. And the limitations prescribed in the statute defining the property affected by a mechanic's lien, and providing that where the interest of a person owning the structure is less than the fee, the liens affect his interest only, do not apply to mining claims. A lien on a mining claim extends to the whole claim, as such claim cannot be divided and the improvements or structures erected thereon cannot always be removed. And under this statute persons so employed and performing such services where a group of mining claims are improved as a consolidated claim, are entitled to hold a lien on the entire group of claims. In order to enforce such liens the person performing the work must file a just and true account of the amount due after allowing all just credits. But this does not require the character of the work done to be classified or even the items of it to be set out in the account filed, and such an account need not specify the amount due for each kind of work whether construction work, or on repairs, or in road building.

McIntyre *v.* Montana Gold Mountain Co., (Montana) 108 Pacific, 353.

Injury to Miner—Liability of Operator

A mine operator was not liable in an action for injuries to a miner injured while hoisting timbers by means of a rope and a block with a pulley, where the evidence showed that a similar rope had been used by other miners for a long time with profit, efficiency, and safety, and that while it was not as well adapted for the work as it would have been had it been fitted with an iron or steel attachment it was not obviously dangerous and the mine operator was not negligent in failing to furnish a rope with iron or steel attachment. And in no event would the mine operator be liable where the evidence showed that the timber escaped because the rope was not properly tied by the miner; neither would he be liable where the evidence showed that the timber escaped from some unknown cause. To make the mine-owner liable in such case it is necessary not only to show that the miner was injured during the course of his employment, but that the injury was proximately caused by the negligence of the mine operator.

Cummings *v.* Reins Copper Co., (Montana) 107 Pacific, 904.

Cutting Timber from Mineral Lands

The authority given by the United States statutes to cut timber upon mineral lands not subject to entry except for minerals does not extend to land adjacent to lands valuable for mineral purposes, but only includes lands known to be themselves valuable for minerals, which are the only lands excluded by the United States statutes from any but mineral entry.

United States *v.* Plowman, 30 Supreme Court Reporter, 299. Feb. 1910.

Injunction to Prevent Mining

An injunction to prevent the mining of coal was properly refused where the bill itself showed that no mining had been done for a considerable length of time, and where the evidence and the answer showed that it was not the intention of the defendant to prosecute mining operations in the future.

Safe Deposit & Trust Co. *v.* Mehaffey, (Penn.) 76 Atlantic, 862, Jan. 1910.

Recent Publications

Report of Topographic and Geologic Survey Commission of Pennsylvania, 1908-1910. Pp. 103. Index, ill., map. Harrisburg, 1911.

Labor Legislation Enacted by the Forty-Seventh General Assembly of Illinois. State of Illinois Bulletin. Pp. 142. Bureau of Labor Statistics, Springfield, Illinois, 1911.

Resume of Producer-Gas Investigations, October 1, 1904-June 30, 1910. By R. H. Fernald and C. D. Smith. Bureau of Mines, Bull. 13. Pp. 393. Index, ill., inserts. Washington, 1911.

Biennial Report on the Mineral Production of Virginia, 1909 and 1910. By Thomas L. Watson. Virginia Geological Survey, Bull. No. VI. Pp. 123. Index. University of Virginia, Charlottesville, 1911.

Notes on the Genus Desmostylus of Marsh. By John C. Merriam. University of California Publications, Bulletin of the Department of Geology, Vol. 6, No. 18. Pp. 10. Ill. Berkeley, November 1, 1911.

A Fossil Beaver from the Kettleman Hills, California. By Louise Kellogg. University of California, Publications, Bulletin of the Department of Geology, Vol. 6, No. 17. Pp. 2. Ill. Berkeley, November 1, 1911.

Commercial Paragraphs

An interesting aerial tramway has recently been installed at the mine of the Montana Coal & Iron Co., Washoe, Montana. It was necessary to dispose of many tons of slack coal daily, and a Broderick & Bascom Rope Co. tramway of the two-bucket type was used. The carriers operate back and forth on stationary track cables 1½ in. diam. They are pulled by a ⅝-in. cable, operated by a 15-hp. electric motor. Only one attendant is required. He controls the flow of material when the buckets are being loaded, as well as the power and speed of the line. The tramway is 1200 ft. long, with an hourly capacity of 25 tons. There are three intermediate supporting towers varying in height from 15 to 42 ft. Each bucket has a capacity of 40 cu. ft., approximately 2700 pounds.

The owners of The Bucyrus Co., in association with strong Eastern banking interests, have just completed a plan of recapitalization. The stock of the company will be increased to $10,000,000 authorized, $8,000,000 issued. For some years it has been evident that with its rapidly increasing business, the company must add to its plant and equipment. New shops are now being erected at Evansville, Indiana, which will be owned and operated by the company in addition to its plant at South Milwaukee. The site comprises 70 acres, and it is expected that the new shops will employ 1000 men. Large purchases have been made of material and patterns for the manufacture of wire-rope shovels as well as chain-shovels.

The Bucyrus Co. now builds dredges of all sizes and types, wrecking-cranes, pile-drivers, drag-line excavators, ballast plow-unloaders, and steam-shovels of the heavier types, for which it has a world-wide reputation. It purposes to bring out a full line of light revolving shovels, weighing up to 40 tons, and it will also take up the manufacture of other types of earth-handling and excavating machinery. It intends hereafter to give more active attention to the development of export business. With increased facilities and augmented capital it will be able to extend its business to all parts of the world. The interest of new and influential stockholders in the East has been secured through the banking houses of Pomroy Brothers in New York, and Edward B. Smith & Co. of Philadelphia. The personnel of the new company will be as follows: H. P. Eells, who has been president of the former company since its organization, will be chairman of the board of directors; Wm. W. Coleman will be president; E. K. Swigart, vice-president; G. A. Morison, secretary, and Dan P. Eells, treasurer.

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EDITORIAL

CONSULAR REPORTS from Hamburg bring the distressing news that a shortage in sauer kraut is impending in Germany. Let us hope that the beer and sausage supply holds out, otherwise the peace of Europe is likely to be seriously disturbed.

UNWISE friends are often a less valuable asset than ordinary adversaries. Porcupine is gradually proving its merits, and needs no exaggeration of its possibilities to make its way. Illustrated supplements of Sunday journals given over to 'write-ups' are potent aids to stock-selling schemes, but are valueless to legitimate mining.

PERSIA is in trouble with Russia, and W. Morgan Shuster, the American treasurer-general of Persia, appears to be the storm-centre. Both Great Britain and the United States have been requested to see that there is fair play in what between individuals would be called the fracas resulting from too great Russian activity in Persian affairs.

TANGLED skeins of litigation have been given a new twist by the appointment of a receiver of the Nevada-Utah Mines & Smelters Corporation by the United States District Court. Bankruptcy proceedings will be instituted, with the consent of the company, though it is not insolvent. Presumably they will at least clarify the situation somewhat and it eventually will be possible to educe some clear conception of what it is all about.

INSTITUTE MEMBERS who journeyed to Japan are finding that the heartiness and magnificence of the welcome accorded them surpasses even their expectations, which were high. Elsewhere in this issue an account of the sessions on board the *Manchuria* is given, and a member of the party writes that the Japanese engineers, not content with sending a representative to San Francisco to escort the party, also welcomed them by wireless while still many leagues from Yokohama.

DREAMS of untold wealth are pleasant, though evanescent, and on another page Mr. T. A. Rickard discusses, in his inimitable way, the possibility of the discovery of a "mountain of gold." We also present a quotation from 'Adventures in Mexico and the Rocky Mountains,' by George F. Ruxton. This fearless Englishman visited Mexico in 1846, riding horseback from Mexico City to Fort Leavenworth, unruffled by the Mexican War and hostile Indians. His account of the legend of the Black Vein of Sombrerete, courteously furnished us by Mr. Horace F. Lunt, will interest every miner, to whom reality is often so strange, that unreality allures.

APPROPRIATIONS for the work of the Bureau of Mines, for the fiscal year beginning July 1, 1912, have been recommended by Walter L. Fisher, Secretary of the Interior. They include $360,000 for investigations into the cause of mine explosions, and for general work tending to increase safety in mining operations; $135,000 for the investigation of fuel substances; $50,000 for investigations of the coals of Alaska, with reference to their mining, transportation, and utilization; and $100,000 for investigations into the treatment of ores, with special reference to the prevention of waste and the utilization of mineral resources. This is making the tail wag the dog; the last item might be multiplied by five, and the third item by ten. The purpose of the Bureau of Mines should be to aid the development of the mineral industry, not to prevent accidents and analyze fuels, with a side line of mineral investigations.

BANKING reforms continue to excite discussion, and the proposed National Reserve Association, urged by Nelson W. Aldrich, has found a friend in G. M. Reynolds, president of a Chicago bank, who has recently discussed the problems of credits and reserves. The ordinary citizen is inclined to exhibit a lack of faith in Mr. Aldrich's proposal; there is a general impression that something is the matter with our banking system, but that the correct diagnosis has been made, and that the proposed method of treatment will lead to complete recovery is, as yet, far from certain.

GOVERNMENT initiative in the operation of public service utilities is unquestionably gaining in popularity, though deprecated by many. The most recent proposal is that the Government shall build the necessary ships to operate a mail service to and from Panama and Colon. Such a plan, after the canal is opened, would do away with the necessity for illegal rebating in order to favor American shipping and is not so preposterous a suggestion as it may seem at first glance. When the American people have learned to appreciate the distinction between Socialism and socialism, progress along modern lines will be much facilitated.

Thanksgiving Day

The name awakens sentiments as varied as the individual. To the small boy it is vividly associated with roast turkey, cranberry sauce, and pumpkin pie, of sleigh rides (if the weather be propitious) to grandmother's, perhaps even skating, and, at any rate, a two days holiday from school, a delicious forerunner of the long Christmas vacation. To the business man it affords opportunity for a day in the clear bracing sunshine on the golf links, or an unusually long run in his motor car. Except to the goodly few who go to church and listen to a Thanksgiving sermon (too often deadly dull and full of little profit) few of us have any thought of the original significance of the day; our minds are too full of bright and kaleidoscopic pictures of the present to afford room for pictures of the past. But the engineer resident among alien people, who regard with curiosity this observance of a day that is a national festival, yet commemorates no great victory, no signal achievement, nor yet the natal day of a national hero, finds himself thrown back upon its origin and meaning. Though he may find much difficulty in conveying any real insight into the spirit of Thanksgiving Day to his associates, who have nothing similar in their own national customs with which to compare it, yet the American may well be proud of a lineage that boasts of ancestors who, though domiciled upon a wintry and rock-ribbed coast, surrounded by savages, cut off from intercourse with their homeland, and provided with but a scanty supply of food at the beginning of an arduous winter, yet had stout enough hearts and unyielding enough spirits to gather in solemn thankfulness to God that they were free and need bow to none other. Happily now we have outgrown the religious concepts of the Puritan forefathers, but it should be our proudest possession that their virile spirit still lives and has become a national characteristic even as their day of thanksgiving has become a natonal festival.

The State Mining Bureau

On Saturday last the appointment of Mr. W. H. Storms to the office of State Mineralogist of California was officially announced, and a matter which has dragged through many years, with but little credit to those in high places, was brought to a happy termination. Mr. Storms needs no introduction to our readers, for he has been closely identified with mining in California for almost twenty-five years, having been for some years upon the editorial staff of the *Mining and Scientific Press*. He came to California from the Black Hills in 1887, and was for six years in the service of the Mining Bureau under Messrs. W. H. Irelan and J. J. Crawford, resigning to engage in practical work in Tuolumne county. In 1899 he became editor of the *Mining and Scientific Press*, resigning a few years later to accept a special appointment to make a detailed survey of the Mother Lode region, the results of which appear in Bulletin 18 of the Bureau. Since that time he has been engaged in consulting practice as a mining engineer and geologist, having also assisted upon our editorial staff at intervals, most recently in the interval between the resignation of Mr. Courtenay De Kalb and the return of Mr. Thomas T. Read from the Orient. Mr. Storms is widely known through his contributions to the technical journals, which display equally a breadth of acquaintance with mining and geology, and a faculty of description and expression. He comes, therefore, to the office amply equipped by training and experience to perform its duties notably and well. Aside from the pleasure which the appointment gives to Mr. Storms' many friends, there arises the greater rejoicing that the State Mining Bureau has now at last opportunity to become both a credit to this great State and a useful factor in its development. It may be said without hesitation that the function of such a Bureau is service, impartial service. Political activities and private interests find no scope in its right administration; the service which it is properly called upon to perform is a highly important one, dealing as it does with one of the two foundation stones of all industry, mineral wealth and agriculture, and every citizen of California has cause for gratulation that an upright Governor, upon the recommendation of a group of public-spirited citizens of high repute and integrity, has appointed to this office a man at once able, experienced, and independent of private control. It remains now for all those who are interested in the mineral wealth of California (and their name is legion) to give the Mining Bureau and its head their loyal support, hearty co-operation, and continued, intelligent interest. There is much of present need for the Bureau to perform; further study may profitably be devoted to the Mother Lode region, the high Sierra is worthy of greater attention and study, and the petroleum resources and industry, to name but a few, can well be made the subjects of investigation and study, with profit to the commonwealth and to the individual citizen as well. There is no necessity for the reduplication of work done by the United States Geological Survey, for the purpose of effect; what is desired of the Bureau is useful service, not the 'putting up of a front.' Finally, the Bureau should play an important part in the Panama-Pacific International Exposition in 1915. And it would be fitting if, following the International Congress of Geologists' conference upon the iron ore resources of the world, at Stockholm in 1910, and the forthcoming conference upon the coal resources, this exposition in the Golden State, within the city by the Golden Gate, should be made, if possible, the occasion of an international conference upon the gold resources of the world, and the probable influence upon society of their present rate of development. In arranging for this the Bureau properly should take the initiative. Useful service is what is expected of the Bureau, and we may hope now to get it.

The Black Vein of Sombrerete

"Oh for the days of gold," sighed the old gambucino, "but that is all over now, neither gold nor silver is to be had nowadays for the picking or digging. Little bits one grubs up here and there, but the black vein, the black vein; where is it? Worked out long ago I was no older than your worship in those days, and my back was strong. Valgame madre santissima! but I could pack the ore nimbly in the mine and up the shaft. Ay, and then all worked with a will, for it was all bonanza; day after day, month after month, year after year, there we were at the same old vein; and the more we cut into it the richer it grew. Oh what silver came out of that old vein! White, rich, and heavy it was all silver, all silver. Five hundred pesos fuertes I made in one week. What a beautiful little vein was that black one!

"But your worship yawns, and my poor old head turns round when it thinks of that time. All the miners (for there were no gambucinos then) were making dollars as fast as they could, but the more they got the more they wanted, although not one of the laziest but had more than he ever before had dreamed of possessing. However, they were not satisfied, and all complained because they did not strike a richer vein as if that were possible!

"The most dissatisfied of all the miners was a little deformed man called Pepito, who did nothing but swear and curse his bad luck, although he had made enough money to last three of his lives; and the miserly style in which he lived was the byword of everybody. However, whether it was from a bitterness of spirit caused by his deformity, or from genuine badness of heart, Pepito was continually grumbling at the old vein, calling it by every opprobrious epithet which he could summon to the end of his tongue, which was enough to break the heart of any vein.

"One night—it was the fiesta of San Lorenzo—all the miners were away in the town, for they had agreed to give themselves a holiday; but Pepito took his basket and pick, and declared his intention of remaining to work: 'For,' said he, 'what time have I for holiday, when, with all my work, work, work, I only get enough out of that stony old vein to keep me in frijoles, without a taste of pulque, since—quien sabe—how long ago? Curse such a vein, say I!' Valgame dios!—this to the black vein, the black vein of Sombrerete!" apostrophized the old gambucino.

"Now your worship knows, of course (but quien sabe? for foreigners are great fools), that every mine has its metal-king, its mina-padre, to whom all the ore belongs. He is, your worship knows, not a man, nor a woman, but a spirit—and a very good one, if he is not crossed or annoyed; when the miners curse or quarrel at their work, he often cuts off the vein, or changes it to heavy lead or iron; but when they work well and hard, and bring him a good stock of cigarros, or leave him in the gallery, when they quit the mine, a little bottle of pulque or mescal, then he often sends bonanzas, and plenty of rich ore. Well, everyone said, when they hear Pepito's determination to remain alone in the mine, and after he had so foully abused the celebrated veta negra, 'Valgame! if Pepito doesn't get a visit from the mina-padre tonight, it's because he has borrowed holy water or a rosarioncito from father José, the cura of Sombrerete.'

"We were all going to work again at midnight, but the mescal was so good that none stirred from the pulqueria long after that hour. I, however, shouldered my pick and trudged up the hill to the shaft, first waking the watchman, who lay snoring at the gate of the hacienda, wrapped in his serape. I took him with me to the mouth of the shaft, that he might lower me down in the basket; and down I went. When I got to the bottom I called to Pepito, for, knowing he was working there, I had not brought a lantern, but heard nothing save the echo of my own voice, sounding hollow and loud, as it vibrated through the passages and galleries of the mine. Thinking he might be asleep, I groped my way to where he had been working the great lode in the morning, thinking to find him in that direction, and halloing as I crept, but still no answer; and when I shouted, 'Pepito, Pepito, where are you?' the echo cried jeeringly, 'Where are you?'

"At length I began to get frightened. Mines, everybody knows, are full of devils, and gnomes, and bad spirits of every kind; and here was I, at midnight, alone, and touching the 'black vein' which had been so abused. I sat down and fairly cried, when a loud shout of laughter rattled along the galleries, and broke as it was up the shaft; I trembled like quicksilver, and heavy drops of perspiration dropped from my forehead to the ground. There was another shout of laughter, and a voice cried out:

"'Come here, Mattias, come here.'

"'Where, most wonderful señor?' I asked, thinking it as well to be respectful.

"'Here, here to the black vein, the old leaden, useless vein,' cried the voice, mockingly; and I thought with horror of the abuse it had that day received.

"Half dead with fear, I crept along the gallery, and turning an abrupt angle, came upon the lode we had been working. Ave Maria purissima! what a sight met my eyes! What words can describe the glitter of the vein, now of sparkling silver, and white, as it were, with flame, but over which a black blush now and then shot, and instantaneously disappeared? I wanted not this, however, to tell me that I was looking at the endless veta negra, the scorned, abused black vein, which throbbed, miles and miles away into the earth, with virgin silver, enough to supply the world for worlds to come.

"'Ha, ha, ha!' roared the voice; 'the old leaden, useless vein. Where's the man that can eat all this silver's worth of frijolitos? Bring him here, bring him here.' And forthwith a thousand little sparkling figures jumped out of the scintillating rock, and, springing to the ground, ringing like new-coined pesos, they seized upon the body of Pepito, which I had not until now observed, who lay, blue with fear, in a corner of the gallery, and, lifting him on their shoulders, brought him in front of the silver vein. The brightness of the metal scorched his eyes, which still could not, even in his fear, resist feasting on the richness of the glittering lode.

"'What does he deserve who has thus slighted the silver king?' 'Turn him to lead, lead, lead!' answered the voice. 'Away with him, then.' The thousand sparkling silverines siezed the struggling miner. 'Not lead, not lead,' he shouted; 'anything but lead!' But they held him fast by the legs, and bore him opposite the lode.

"The rock sparkled up into a thousand times more brilliant coruscations than before, and for an instant I thought my eyes would have 'burned' with looking at the silver vein, so heavenly bright it shone. An instant after a void remained in the rock; a horrid black void. The vein had disappeared, but the rock itself was still as bright as ever, all but the black opening which yawned from out the brightness; and opposite this stood the thousand silverines, bearing the luckless gambucino.

"'Uno, dos, tres,' shouted the mine-king; and at the word 'tres'—with a hop, skip, and a jump—right into the gaping hollow sprang the thousand silverines, with the luckless miner on their shoulders, whose body, the instant that his heels disappeared into the opening, with these very eyes I saw him turned to lead. Santa Maria! then all became dark, and I fell senseless to the ground. When I recovered a little, I thought to myself, now will come my turn; but, hoping to conciliate the angry mine-king, I sought, in the bosom of my shirt, for a bottle of mescal, which I remembered I had brought with me. There was the bottle, but without a single drop of liquor. This puzzled me; but when I called to mind the fiery spectable I had just witnessed, I felt no doubt but that the liquor had been dried up in the bottle by the great heat.

"However, I was not molested, and in a short time the miners returned to their work, and, finding me pale and trembling, called me drunk and mad. We proceeded to the lode and grubbed away, but all we succeeded in picking out were a few lumps of poor lead-ore; and from that day not a dollar's worth of silver was ever drawn from the famous 'black vein of Sombrerete.'"

A Mountain of Gold

By T. A. Rickard

In a lecture recently delivered before the London School of Economics, in relation to the purchasing power of money, the lecturer, a professor, H. S. Foxwell, referred to the production of gold and its effect on commodity prices. A reviewer in the *Daily Telegraph* said that "it is conceivable that the day might come when the discovery of unlimited quarries of pure gold would compel the use of some other article for the measure of values." Indeed, those of us who are familiar with gold mining, and more especially the big bonanzas of the world, need not strain our imagination to conceive of an orebody or even a mass of gold big enough to upset international monetary standards. Many a prospector frying his bacon at the campfire and stimulated by a re-concentrated cup of coffee, must have seen visions of a golden mountain or a streak of pure gold that ran across creation as if it would never stop. Every now and then we hear of fabulous mineral discoveries, like that of Bitter Creek in June 1910, and when the irresponsible scribe in the *Daily Scream* has exhausted his vocabulary he usually ends by talking about "a mountain of gold." When the stampede to the Australian diggings was at its height in 1852, the ignorant emigrants, having heard that the gold was found in quartz, and not knowing that pervasive mineral, supposed it was 'quarts', and hence expected to gather the gold in pints and pails. This fact was related to me by E. J. Dunn, the Australian geologist, who as a boy went to the diggings at that time.

A THREE-TON MASS OF COPPER.

NATIVE SILVER FROM THE NIPISSING MINE, COBALT, ONTARIO.

Well! And why not? We may laugh at the simpleton from the farm and we may sneer (and we do) at the perfervid scribbler of the untechnical newspaper, but it is doubtful whether even that peripatetic philosopher known as the man-in-the-street could give adequate reasons for the improbability of such a golden discovery. For instance, what is the biggest mass of native copper that was ever found? Of course, it was in the Lake Superior region. It was in 1857 at the Minesota (not Minnesota) mine in the Ontonagon district. At a shallow depth there was discovered a mass of copper 46 ft. long, with a maximum thickness of 8½ ft. The mean width was 12½ ft. and the mean thickness 4 ft. The total weight actually recovered was 420 tons. Twenty men labored for 15 months to remove it from its encasing rock; they tried to do so by exploding kegs of powder, and finally extricated the copper by cutting it into fragments with chisels. The chips alone weighed 27 tons. A group of similar bodies of native copper having an aggregate weight of 600 tons was extracted from the Bay State mine forty-five years ago. The 420-ton lump was 80% pure copper and at $400 per ton was worth at that time $168,000. But a mass of pure gold weighing 420 tons is worth $252,000,000. The discovery of such a mass would add largely to the number of those sojourning in lunatic asylums and would paralyze the stock exchanges of the world for more than a few palpitating minutes.

Turning to silver mining, we shall find numerous instances of treasure trove astounding in its amplitude. 'El Cerro Rico de Potosi,' or the rich mountain of Potosi, as it was known to the Spaniards who followed Pizarro in his marauding expeditions into Peru, yielded $250,000,000 between 1545 and 1572. This came mostly from native silver. The size of the biggest mass of metal is not recorded, but the story of the original discovery is suggestive. An Indian, being in search of some lost llamas, ascended the mountain. Overtaken by the night, he made a fire and slept by the side of it. In the morning he was astonished to see that the rock under the ashes of his fire had melted and from it had flowed "a river of molten silver." Silver melts at a temperature of 960°C. Owing to the blackening caused by exposure, the silver had escaped his notice, but the heat of the fire had sufficed to release it from the encasing rock. That rivulet of metal was the beginning of a production estimated to have enriched the world by fully 1,000,000,000 ounces of silver. Without excessive exaggeration, the Cerro de Potosi can be called a mountain of silver.

The nearest parallel to Potosi is afforded by the Comstock, a lode penetrating the lower slopes of Mount Davidson, from whose depths enough silver was extracted to affect monetary legislation. The famous bonanza of the Comstock lode, in the Consolidated California and Virginia mines, was an orebody that extended from 1100 to 1800 ft. in depth; it did not reach the surface. It became productive in 1874 and for three years thereafter the average yield was $3,000,000 monthly, from which dividends of $1,080,000 were paid monthly. In 1876, John W. Mackay, who was then superintendent of the Consolidated company, took out $6,000,000 worth of ore in one month, in order to make an exhibit of bullion for the Centennial Exhibition at Philadelphia. It remains to be noted that while the yield of the Comstock is usually described as silver, it is a fact that nearly one-half of the money value of it was in gold, the ratio of gold to silver being 43 : 57. Thus the Comstock deserves to be classed under gold mines.

Coming to later days, I remember the excitement caused in Colorado in 1894 by the finding of masses of native silver in the Smuggler mine at Aspen. One mass weighed 1340 lb. and had to be cut by chisels into several pieces before it could be removed. Fully 90% of it was pure silver, so that it had a value of $17,500 at that time. Several tons of metallic silver were taken out of the same mine in the same year, but no single mass was bigger than the one mentioned.

The Kongsberg mines, in Norway, have yielded many masses of native silver, the largest recorded weighing 1537 pounds.

The Tonopah, in Nevada, is another example of concentrated richness. Discovered in August 1900 by poor men unable to conduct systematic operations on their own account, this mineral discovery was let on lease to small parties of miners, who, during the last three months of 1901, took out ore yielding over $3,000,000. To the end of 1903 this mine produced $5,576,000 in silver ore averaging $160 per ton.

Next we come to Cobalt, the greatest of modern silver discoveries. In September 1906 the stripping of the moss covering the rocky surface adjoining the Nipissing shaft led to the exposure of a vein that was 5 ft. wide of nearly pure silver. This was the celebrated No. 49 vein. A mass of metal weighing 800 lb., and 70% silver, was taken out of shallow workings. Subsequently this proved to be a part of a mass weighing 3000 lb. and worth $25,000 at 68 cents per ounce.

QUARRY OF 5-OZ. ORE, MOUNT MORGAN, 1889.

Other instances might be quoted, but these suffice. It will be observed that no mention is made of the Broken Hill, Bunker Hill & Sullivan, Mollie Gibson, Huanchaca, or other great orebodies yielding silver, because attention is only being directed to masses of nearly pure metal, not to famous deposits of complex silver-lead sulphide ores. That is another story, not pertinent to the one in hand.

Gold also has been won in lavish quantity. In 1851 the river-beds of California yielded $81,294,700, and in 1853 the shallow diggings of Victoria gave $63,000,000. This gold represented the cream skimmed from superficial deposits that had undergone concentration for geologic ages. It was picked up by inexperienced men and dug like potatoes by novices in the art of mining. We thought never to see the like again, until in 1898 the stampede to the Klondike proved that the golden age of adventure was not wholly a thing of the past. Among instances of extraordinary richness I quote the case of Dick Lowe, who cleaned up $46,000 from bedrock in 8 hours. He won $750,000 from a fractional claim 86 ft. long and the width of a narrow creek-bottom, about 50 ft. From another small claim, 40 by 60 ft., four men took out $208,000 in the form of gravel that yielded $10 per bucket. They made a profit in four months of $200,000, one-half of which went to the sole owner of the claim. One day in June 1899 no less than 20 packhorses came into Dawson from the creeks bringing gold belonging to one man, Alex Macdonald, a Nova Scotian, supposed at one time to have made $5,000,000 out of his gold mining. The biggest nugget found in the Klondike diggings weighed only 85½ ounces, worth $1,400, but much of the gold extracted was coarse, in pellets and nodules large enough to excite avarice. The mining methods were of the simplest, requiring the thawing of ground frozen by a perpetual frost and the washing (in summer) of the rich layer found on bedrock.

Nuggets have been mentioned. The biggest on record is the Welcome Stranger, found at Mount Moliagul, near Dunolly, in Victoria, in 1869. This mass of gold weighed 2280 oz., or 190 lb. Another found at Ballarat in 1858, and close to the surface, was the Welcome, which weighed 2195 oz., or 184 lb., and yielded £8376 10s. 6d. or $41,880. This nugget contained 10 lb. of quartz. The largest mass ever recovered in California is stated to have weighed 2340 oz., or 195 lb., but this was not extracted in one piece. A mass of vein gold weighing 95½ lb., constituting part of a mass weighing 145 lb., was taken out of the Monumental mine, at Sierra Buttes, California. In South Australia a nugget, called the Blanche Barkley, weighing 146 lb. and including two pounds of quartz, was found.

Another celebrated mass is the 'hundredweight of gold' found in 1851 at Hargraves, New South Wales. This was in three pieces, which originally were united, weighing 196 lb. and yielding 106 lb. of gold. Another mass of gold and quartz found at Burrandong, New South Wales, in 1858, on being pounded with a hammer, yielded 120 lb. of gold. At Hill End, in 1872, from 10 tons of quartz a clean-up of 11,424 lb., or over 5½ short tons of gold was made, indicating that the ore was more than half metallic gold. This was worth $3,300,000. One single mass out of this find weighed 630 lb. and contained gold to the value of $60,000. Most of these masses of gold contained some quartz adhering to them, so that there is every gradation, from the nugget of clean gold, 980 to 992 fine, to a mass of ore so rich in gold as to obscure the presence of quartz or other mineral impurities. This brings us to the 'pocket' mines of California, in Tuolumne and Calaveras counties more particularly. In these districts masses of free gold in quartz are found down to the water-level, at 100 to 150 ft. in depth. In 1887, at the Rathgeb mine in Calaveras county, I had the pleasure of extracting 170 oz. or $3000 worth of gold in two hours by aid only of my iron candlestick. This pocket yielded $25,000 at a cost of $200. Similar pockets have yielded as much as $500,000.

The Caledonian mine in the Thames district, New Zealand, is worthy of mention. The ore was so rich that sometimes, it is recorded, "the gold had to be cut out with a chisel." In 1871 this mine produced 10 tons of gold, that is, $6,000,000, and paid $3,000,000 in dividends. Another more famous bonanza in Australasia is the Mount Morgan, in Queensland. This mine, for the year ended November 30, 1889, produced 75,415 tons, yielding 323,542 oz. worth £1,331,484 18s. 5d., or $6,657,420, at an expenditure of £227,769 19s. 8d. The ore averaged 4 oz. 6 dwt. 4 gr. per ton; the profit was 83% of the gross; and the dividends for the year aggregated £1,100,000. At the Londonderry mine, near Coolgardie, Western Australia, in 1892, a hole not more than 2½ ft. deep, 6 ft. long, and 5 ft. wide, yielded 8000 oz. of gold, valued at over $150,000. At Kalgoorlie the Lake View Consols mine contained a bonanza from which 33,160 oz. gold, worth $660,000, was obtained in one month, namely May 1899; and during that year the same orebody gave 199,230 oz. gold, valued at $3,897,479. This was not native gold, but mainly the telluride. Another spectacular discovery was that of the Esperanza, at El Oro, Mexico, which, in 1904, after several years of disappointing development, suddenly became famous owing to the intersection of an unexpected orebody, which in November 1905 yielded $748,535, from 10,164 tons. In 1906 the output was 228,419 tons of ore worth $7,708,883 and yielding a profit of $4,644,279. In November 1905 I saw the rich stopes above the fifth level; these in places showed 5 ft. of $500 ore. The average width of the orebody was 9 ft. for a length of 680 ft., with an average yield of $50 in gold and $20 in silver per ton of ore.

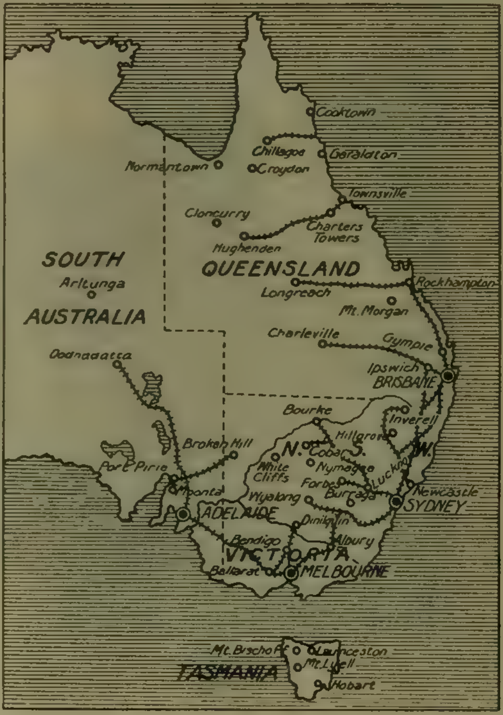
In January 1907 one carload of gold ore shipped from the Mohawk claim at Goldfield, Nevada, to the Selby smelter, near San Francisco, contained 47 tons, assaying 609 oz. of gold per ton. This ore was worth $12,230 per ton, or $6 per pound. It was shipped in sacks weighing 600 lb. each. This shipment was worth $591,637. In the Mohawk workings, at a depth of 200 ft., there was 8 in. wide of ore that assayed $250,000 per ton. The various leases in this mine yielded $50,000 per day for 106 consecutive days. The ore contained native gold and calaverite (the telluride of gold). The Mohawk became a part of the property of the Goldfield Consolidated Mines, which in 1907 yielded 31,338 tons containing gold to the value of $6,296,476.

These instances will stimulate an imagination ruminating on "a mountain of gold" or "unlimited quarries of pure gold." It must be noted, however, that the only approach to a mountain of gold is Mount Morgan, a hill about 500 ft. high, the crest of which was a gossan containing several ounces of gold per ton. This has been excavated in successive benches, so that it approximates to the "quarries" of gold ore mentioned by the writer in the *Daily Telegraph*. But the workings now are far below the foot of the hill. However, they have yielded a quantity of gold so great as to render the Mount Morgan unique in the history of mining. Since its discovery in 1886 to the end of October of the current year, this ore deposit has yielded 3,680,000 oz. of gold worth $73,000,000, besides 33,000 tons of copper. The company owning the mine has distributed $37,500,000, or £7,700,000, in dividends.

However, this is far from being "a quarry of pure gold", for the ore has averaged less than half an ounce per ton, or 1 part in 58,332, which is equivalent to 0.0017% only.

Reviewing the evidence, we find that the biggest mass of native copper ever found by man weighed 420 tons, the biggest chunk of native silver about 1½ tons, while the biggest nugget of native gold weighed only 190 lb. Thus the ratio is 190:3000:840,000. The present price of the metals is approximately as 2000:54:12.

Having passed in review the most sensational discoveries recorded as having been made by the indefatigable seekers after mineral wealth, let us now put ourselves under a cold shower of common-sense and enquire again why a mountain of gold is not likely to be found. In the first place, because none has ever been found. What has never happened may indeed happen, but it is unlikely to happen. Daily life is based on this doctrine of probability. The monetary standards of the world reflect the net result of human experience, which has gone to show that gold can be mined less lavishly than silver in the ratio of about 1 to 20. The surface of the earth has been scoured by the prospector; parts of it still remain to be investigated; many parts have been but inadequately searched. The Klondike suggests the possibility of finding new districts equal to the Californian and Australian diggings, which astounded the world sixty years ago. Cripple Creek proved how a well trodden tract may contain riches that have been overlooked, for Cripple Creek, at the foot of Pike's Peak, was on the way from Denver to Leadville, whose mineral development antedated that of Cripple Creek by 25 years. Moreover, Pike's Peak served as a beacon and a slogan to the pioneers of Colorado in 1852. Thus the face of the earth may break into a radiant smile at unexpected places. Granting this, it yet remains probable that even such unexpected discoveries, whether in virgin territory or in old mining regions, will not be unlike to, even if so rich as, those already recorded. In short, all that we know from mining experience renders it unlikely that "unlimited quarries of pure gold" or "a mountain of gold" will ever be found on this planet.



MAP OF QUEENSLAND, SHOWING MOUNT MORGAN.

The facts of experience are capable of explanation by scientific theory. Gold is a substance with difficulty soluble but readily precipitated. Hence it cannot travel far in the circulating waters that build orebodies. When thus on the move, it is easily arrested by a precipitating agent, so that the conditions favoring a large aggregate of the metal are rare. Gold is widely diffused in nature, both in the rocks and in the sea, but the largest lump ever found weighed only 190 pounds.

From a chemical point of view gold is susceptible of combination with many elements, forming compounds of more than academic interest. These include several chlorides, bromides, and iodides. Cyanides and oxides of gold, as well as sulphites and hyposulphites, play a part in metallurgy. Sulphides of gold have been artificially prepared, but they are readily decomposed. In nature, however, no chemical compounds of gold are known except the tellurides and selenides. Of these the tellurides are of great importance as constituting the characteristic enriching mineral of the ore deposits of Transylvania, Cripple Creek, Kalgoorlie, and, to a lesser degree, of Goldfield in Nevada. Sulphide of gold has been suspected in pyritic ore in which native gold could not readily be detected, but good reason exists for believing that in such cases the gold is intimately but mechanically mixed, not chemically compounded. The fact that fine crushing liberates such gold, so that it can be amalgamated, disproves its existence as a sulphide. It is possible that as a sulphide it may exist in thermal waters, for the sulphide of gold is easily soluble in hot solutions of alkaline sulphides. In the sea the gold may exist as an iodide. The least unstable of the halogen compounds is the tri-chloride, $AuCl_3$. This is the salt which is suspected to be the usual carrier of gold in lode-forming waters. But it is readily decomposed by reducing agents, such as organic matter, metals, and proto-salts. Among the metals zinc and iron, both highly electro-positive, reduce gold chloride rapidly. Ferrous sulphate is a precipitant used in chlorination works; so is charcoal. Oxidation of pyrite yields the one; vegetal remains when enclosed in the rocks furnish the other. Both are of common occurrence, especially near the earth's surface. Metallic gold is soluble in alkaline sulphides; also in ferric sulphate in the presence of a chloride; in a solution of ferric chloride and cupric chloride; and in hydrogen sulphide. Such solutions of gold are readily precipitated by numerous reagents, such as pyrite and other base-metal sulphides, by tellurides, by oxidation products such as ferrous sulphate, by carbonaceous matter generally.

A RECENT PHOTOGRAPH OF MOUNT MORGAN.

The mention of ferrous sulphate as a precipitant and of ferric sulphate as a solvent will suggest how easily the stability of a gold solution is affected and how readily the precipitated gold may resume its migration; for both these salts of iron are yielded by pyrite at successive stages of oxidation.

The nice balance of chemical equilibrium is probably potent in determining the distribution of gold within the zone of oxidation, but as regards its dispersion relative to depth it can be asserted that temperature and pressure are the dominant factors, for the increase of both favors solution, while the decrease of both promotes precipitation. That is why, in a broad geological way, ore deposits become impoverished in depth. In the approach to surface the decrease of temperature and the lowering of the pressure compel precipitation, just as in depth the opposite conditions increasingly prevail. From this we conclude that the biggest masses of gold and the richest bodies of gold ore are likely to be found within the range of shallow mining. It is fortunate for man that the substance he strives most to obtain is within the reach of his feeble efforts. He has found some of it and he may hope to find more, especially by applying skill to the winning of the larger and poorer gold-bearing lodes that persist deeply; but the farther he goes from daylight the less likely is he to find the El Dorado of his dreams. Even the dream is encompassed in a dream, for El Dorado itself is only the shadow of a myth. In 1525 a story was current among the Spanish settlements of the Caribbean coast that a tribe of Indians at the headwaters of the Amazon possessed such abundance of gold that they could afford each day to powder the body of their chieftain. Thus the legend of *el hombre dorado*, or the gilded man, became a lure to the adventurers of the Spanish main. Soon the chieftain became identified with the region over which he ruled, and the name El Dorado was passed down the centuries as the synonym for a country of untold gold. The rapacious Spaniard and the piratic Englishman scoured South America in search of it, but vainly. In later days other men, also greedy and energetic, but more experienced and more systematic, have chased the same lure, and they have called it "a mountain of gold." If it existed they would have found it ere now, for no flood has carried it away and no geological cataclysm has buried it. It never was, save in the rainbow of their imagination.

Dredging on the Gold Coast

The Ancobra Exploration & Dredging Co., Ltd., which has a dredging concession on the Ancobra river, Gold Coast Colony, West Africa, recovered, during the year ended June 30, 5120.7 oz. of gold, valued at £21,747. The dredging rights of this company extend from Prestea to the sea, a distance of seventy miles, large tracts on each bank being held in addition. S. Y. Weiss, who has had experience in California, was recently appointed manager, and reports that areas where the river has changed its course and left bare large sections of old channel would prove more profitable dredging ground than the present channel. An Empire drilling outfit has been shipped to test this ground, and if, after two or three months work, the results are satisfactory Mr. Weiss will recommend the erection of a 5-cu. ft. dredge, which should not cost over $100,000 when ready to work. The Ancobra river cuts across what is known as the Prestea quartz reef district, in which promising outcrops occur from Aufargah, on the southwest, to Broomassie on the northeast, though prospecting has been carried on over a much larger area, extending ten or twelve miles beyond Broomassie.

Mill and Cyanide Plant Records

By A. W. Allen

The necessity for the careful and accurate recording of every detail in the operations of a modern mill and cyanide plant is a point often overlooked, and carelessness in this direction, due in most cases to want of initiative in the compilation of suitable books and forms, is liable to extend to the work itself, especially where discrepancies (as, for example, between actual and assay extractions) pass unnoticed.

I propose to deal with a system of arranging the records in connection with the treatment of the ore and the recovery of precious metal, and append a number of forms (accompanied by short explanations where the latter have seemed necessary), which may prove of use as suggestions for other, and possibly more suitable, forms, complying with local conditions.

Mill Records

Date..........................
Shift..........................
Number of cars to bin................

Shut downs:
Battery (or mill) No. ....
From ....
Till ....
Cause ....

Running time:
Hours ....
Minutes ....

Remarks
....
....

No. 1. in book form.

In concentrating plants where the concentrate is sacked and shipped, an additional column will be needed showing gross weight of yield per day.

Amalgam Book

Date ....
Estimated tonnage ....
Estimated tonnage to date...............
Amalgam yield, oz. ....
Amalgam yield, oz., to date..............
Estimated yield per ton, $...............
Estimated yield per ton, to date, $........

Remarks
....
....

No. 2. in book form.

The tonnage may either be estimated from the running time and an average based on previous experience; or from the number of cars sent to the bins. In cases where approximately exact figures can be given (as in the case where the ore is automatically weighed), the average duty per stamp (or per mill), per 24 hours, can be included in the daily mill-return.

Mill-Return

For the 24 hours ending ...... m. ....19...
Mill ran .... hours .... minutes
Estimated tonnage ....
Estimated yield, by amalgam, per ton, $.......
Estimated yield, by amalgam, per ton to date, $...........

....
Mill-foreman
(or Battery-manager).

No. 3. in sheets.

In concentrating plants, and where the concentrate is sacked and shipped, an additional line will be needed giving gross weight of yield.

Agitator Vat Records

Charge No. ....
Vat No. ....
Commenced filling:
Date ....
Time ....
Finished filling:
Date ....
Time ....
Depth filled ....
Commenced discharging:
Date ....
Time ....
Hours of agitation ....

Remarks
....

No. 4. in book form.

This book, with perforated leaves, will be filled in by the shift-men and, when the charge is completed, the sheet will be detached for filing.

Vacuum-Filter Records

Date ....
Shift ....
Filter No. ....
From:
Charge No. ....
Vat No. ....
Taking on cake:
From ....
Till ....
Washing:
From ....
Till ....
Discharging:
From ....
Till ....

Remarks
....

No. 5. in sheets.

Filter-Press Records

Date ....
Shift ....
Press No. ....
From:
Charge No. ....
Vat No. ....
Filling:
From ....
Till ....
Washing:
From ....
Till ....
Discharging:
From ....
Till ....

Remarks
....

No. 5a. in sheets.

Slime Plant Records

Date filtered (or filter pressed) .
Charge No.
Vat No.
Tons .
Assay value
Heading, $ . . . .
Tailing, $ . . . .
Extraction, per ton, $ . . .
Extraction, percentage, per ton, $
Return as required by assays, $ . . .

TOTALS AND AVERAGES

Clean-up, No. . ... oz. bullion
.... 19. . . of average fineness
...... = ...oz.
fine gold.

REMARKS

....
... .

....
Metallurgist
(or Cyanide Manager).

No. 6. IN BOOK FORM, AND SHEETS.

In vacuum-filter plants the tonnage per vat will be calculated from the depth the vat was filled, and the specific gravity of the pulp. In filter-press plants, either as above, or from the number of presses.

Bullion-Book

Date of clean-up.................
Bar No. ....
Department ....
Weight ....
Fineness of gold.................
Fineness of silver................
Gold contents, oz. ....
Silver contents, oz. ....

REMARKS

....
....

No. 9. IN BOOK FORM.

Summary of Treatment Results

For the ...... weeks ending ....19. . .
Tonnage ....
Recovered by amalgamation:
...... oz. = $ ..... per ton = ... %
Recovered by concentration:
...... oz. = $ ..... per ton = ... %
Recovered by leaching of sand:
...... oz. = $ ..... per ton = ... %
Recovered by filtering of slime:
...... oz. = $ ..... per ton = ... %
Total recovery:
...... oz. = $ ..... per ton = ... %
Value of residue:
...... oz. = $ ..... per ton = ... %
Value of ore milled:
...... oz. = $ ..... per ton = ... %
....
.... 19. . . Metallurgist.

No. 10. IN BOOK FORM, AND SHEETS.

The above form, or a modification, may be used for summarization, the returns being made up from the actual bullion extracted, and the contents of the residues. Discrepancies or excesses between actual and assay extractions would, of course, render the use of the above form impracticable, and, if compiled, the figures would only be misleading.

Leaching Vat Records

Charge No ...... Vat No. .

TREATMENT

Tons .... % .... .
Commenced filling:
Date ....
Time ....
Finished filling:
Date ....
Time ....
Depth filled ....
Gross weight of 1 cu. ft. sand ....
Commenced transferring:
Date ....
Time ....
Finished transferring:
Date ....
Time ....
Commenced discharging:
Date ....
Time ....
Finished discharging:
Date ....
Time ....

REMARKS

....
....

No. 7. IN BOOK FORM.

This book, with perforated sheets, will be filled in by the shift-men and, when the charge is completed, the sheet will be detached for filing.

Sand-Plant Records.

Date filled ....
Charge No. ....
Vat No. ....
Tons ....
Assay-value:
Heading, $...........
Tailing, $...........
Extraction, per ton, $...........
Extraction, percentage, per ton, $............
Return required by assays, $...........

TOTALS AND AVERAGES

Clean-up, No. .... oz. bullion
.........19. . . of average fineness
...... = ...oz.
fine gold.

REMARKS

....
....

....
Metallurgist
(or Cyanide Manager).

No. 8. IN BOOK FORM, AND SHEETS.

The tonnage will be calculated from the depth the vat was filled and the weight of the cubic foot of sand, less moisture.

A convenient form for keeping assay records is shown below. In No. 11 a record of the assay operations is kept and No. 12 may be used as a record for the laboratory.

Assay-Book

Assay No. ....
Mark ....
Description ....
Value per ton ....

REMARKS

....
....

No. 11. IN BOOK FORM.

Determinations

No. ....
Determinations ....
Result ....

REMARKS

....
....

No. 12. IN BOOK FORM.

The Assay of Gold-Bearing Cyanide Solutions by Electrolysis

By C. CRICHTON

The estimation of metals by means of electrolytic deposition is in general use in most laboratories, the only difference between the determination of gold and, say, nickel or copper, by this means being that in the latter case the increase in weight on a platinum cathode is noted, and in the former a lead cathode is used and the gold obtained by cupellation. The apparatus at present in use at a well known assay office consists of four oblong frames, 2 ft. 10 in. by 3 by 6 in., connected in parallel, and each holding eight beakers. The frames or boxes are provided with two copper rods.

The anodes consist of ordinary $^5/_{16}$-in. arc-lamp carbons, and are held in position in the centre of each beaker by means of clamps fitted to a horizontal copper bar which runs parallel to and 6 in. above the top of the box. By means of a slot and thumb screw the anode connection rod is attached to two uprights fixed at either end of the box, so that each section of eight carbons may be either lifted clear of the beakers or lowered, as required, in one movement. The cathode connection-rod runs along the front side of the frame, slightly above the top, and about 2 in. from it; at suitable intervals along the rod are soldered eight single flexible insulated wires, forming a connection for the lead cathodes.

The cathodes are made from ordinary assay lead foil, a suitable length being 9 in., and as the foil is usually obtained in strips 36 in. long, a good quantity of the necessary lengths can be obtained in a short time by cutting the foil into four equal portions. About a dozen of the lengths are placed together and V shaped pieces cut out from along the edge intended for the bottom of the cathode, so as to allow better circulation of the ions through the solution. Arrangement has to be made for connecting with the flexible wire from the cathode rod; for this purpose a strip about $^1/_4$ in. broad is all but severed from one end of the foil and folded over, forming a terminal. The two ends of the lead are now brought together and connected by folding the edges; to ensure a smooth surface and circular shape a glass bottle having a slightly smaller diameter than the inside of the beakers in use will be found to be convenient for this operation. Very little time is occupied in making the cathodes; a native can, during a few hours, make a sufficient number for 200 or 300 assays.

The necessary current for the deposition of the gold in solution onto the cathode is obtained from three 2-volt accumulator cells, which being connected in series give a terminal pressure of just over six volts. The current varies, of course, with the resistance offered by the solution through which it passes, and the stronger the solution in KCN the greater will be the amperage. For example, a solution having a strength of 0.3% KCN passes 0.1 of an ampere, and a slime solution (0.02% KCN) will take a current of about 0.04 ampere. The accumulators are charged from a direct-current lighting circuit through a suitable lamp resistance, and connection can be effected between the lighting circuit and accumulators, or accumulators and electrolytic apparatus, as desired, by means of two-way switches. Little remains to be said, except that perhaps a few details regarding operation may be of interest. The usual number of solutions assayed each day is 22, which are sent up in marked bottles from the cyanide works at 6 a.m. Portions of 10 A. T. each are at once measured out from each bottle and placed in the beakers belonging to the apparatus, which are prepared the previous evening, so that as soon as connection is made no further attention is required. The time required for the complete deposition of the gold is four hours, after which period the carbons are removed clear of the beakers, the current is switched off, and the lead cathodes disconnected and removed to a hot plate to dry. When dry these are folded into a small compass and cupelled with a little silver, parted, and weighed, the results being reported to the cyanide works manager by 11 a.m. Although from start to finish this process occupies about five hours, only a few minutes are expended in actual personal attention, and the measuring out of the quantities of solution can be done either by the cyanide works shiftman, or in other cases by the reduction works sampler. I might mention that if 20 A. T. of solution is required for use instead of 10 A. T., the same time only is necessary for the complete deposition of the gold on the cathodes.

Precautions should be taken against having the carbon anodes in contact with gold-bearing solution when no current is passing through; negligence in this particular results in gold being precipitated on the anode. In the event of a solution offering too great a resistance to the current, the addition of a small quantity of KCN will remedy this, and accelerate the deposition of gold. It has also been found advantageous to add a little ammonia to solutions which deposit salts.—*Jour. Chem., Met. & Min. Soc., S. A.*

Cost Analysis

By G. L. WATSON

The efficiency of any system of cost-analysis depends, in the first place, on the accuracy of cost records. To serve the purpose well, these must be clear and reliable, and the conditions of the work concisely explained. Furthermore, the items of cost should be kept in accordance with some uniform system so that records for different jobs may be compared intelligently and used advantageously in the analysis of costs for future estimates.

One thing has always struck me very forcibly, and that is, no matter how good a cost-keeping system may be, I have yet to find an individual or a concern who has it kept up as it should be. To get costs and to make the proper distribution on the records should be the duty of one man alone. If this man is shown what to do and how to do it, where and what charges to make, and is on the job all the time, keeping a journal and photographs as well, then at the end of a job these records are worth something, but ordinarily the timekeeper simply makes the easiest distribution he can and gives no details. On one job not long ago, reports came to me for one week on a certain kind of work showing that, apparently, the same work had been done four times, according to the plans. I made an investigation and found that the clerk had simply charged up the easiest unit to figure out.—*Jour. Amer. Soc. Eng. Contractors.*

Principles of Gravel Mining

By William H. Storms

There are certain fundamental principles that underlie successful placer mining, whether it be by the simple method of shoveling directly from the pit into the sluices; by what is known as ground-sluicing; or by hydraulicking. These fundamental considerations are: (1) the grade of the stream, or the ground where the placer is situated; (2) the volume of water available for mining; and (3) in the case of hydraulicking, the pressure (head) that can be secured. The duty of a miners' inch of water is a variable quantity, but, obviously, in the same bed of gravel, whether it be loose and free-washing, or tight, due to admixture of clay and iron, the amount of gravel that can be moved within a specified time by a miners' inch of water must depend wholly upon the volume of water and head available, and, to a great extent, upon the grade that can be secered to carry away the tailing. In California mines the duty of the miners' inch has been found to range, under widely differing conditions, from 1 cu. yd., where the gravel was cemented with clay and iron, to as high as 36 cu. yd. where the gravel was free-washing and contained few boulders. It may be said of a bank of gravel of this description that it seldom carries much gold, though this does not necessarily imply that the tight cemented gravel is invariably rich, for such is not the case.

In simple sluicing and in ground-sluicing operations, the volume of water and the grade are the most essential considerations; in hydraulicking, the volume of water and head obtainable are the main features, for, lacking the necessary grade, this latter may be artificially created by employing what is known as the hydraulic gravel-elevator. Numerous attempts have been made in various mining regions to also create head for hydraulicking by pumping, even for the operation of elevators, but, while these installations have generally proved successful, as viewed from the standpoint of the engineer, they have in most instances been failures financially. C. W. Purington[*] states that out of nine plants visited by him in Alaska and in the neighboring British territory, at which pumping to secure head for hydraulic mining was in progress, not one of them was making expenses. It has been demonstrated in some instances that where this method has failed to produce satisfactory economic results, other methods, such as mechanical shovels operated by derricks, or by drag-ropes, and even horse-scrapers, have proved successful. In a general way it may be said that successful hydraulic mining requires a head of water of at least 200 ft., and a grade of not less than 200 ft. per mile must be available to carry the tailing away from sluices, or it will bank up and soon obstruct further operations.

On looking at the vast hydraulic pits made in the early years of hydraulic mining in California, at such places as Dutch Flat, Gold Run, Iowa Hill, Columbia Hill, and elsewhere, it is clearly evident that the monitors of the early miners caused mountains of gravel to crumble down and disappear before the resistless impact of their streams. The material which formed these gravel banks often had a width of from a hundred yards to over a mile, and was a few feet to over 600 ft. in thickness. In a great many instances these ancient streams, in beds of which the gravel lay, lacked the necessary grade for the water employed in hydraulicking to carry away the enormous quantity of tailing, but in every case a canyon of the more recent drainage of the region was near at hand, and to these bedrock-drains, and often tunnels, were cut for the passage of the débris, consequently the difficulty of insufficient grade was easily overcome. In a country of low topographic relief, this simple and effective method of disposing of tailing from gravel mines is not available, and then the hydraulic elevator, or some other mechanical means, must be resorted to in order to secure the necessary grade, both for the washing sluices and for disposal of tailing.

Sluices should have a grade of 6 in. to the 12 ft. length of box, or an excess of water will be required to move the gravel. However, whatever the grade, the amount of water should be such that it will just cover the largest rocks going through the sluice. When this is the case the best work is being done. Generally the grade given to each 12-ft. box is 8 to 12 in., if that much fall is available, and sometimes even more than 12 in. is desirable. Steep grades facilitate the disposal of material going through the sluice, and are advisable where the quantity of water is somewhat limited. Sluices should be wide, rather than narrow and deep, and, as previously stated, the depth of water should be just sufficient to cover the largest rocks passing through. Narrow sluices are much more likely to jam than wide ones. Where shoveling into the boxes is the method of mining, a grade of 5 or 6 in. to the 12-ft. box, with a flow of 40 in. (60 cu. ft. per minute) will wash 6 to 7 cu. yd. of gravel per hour. As a general rule there should be only sufficient water running through the boxes to move the largest stones, and to keep the sand from packing, no matter what the grade.

Where gravel-elevators are employed it is the usual practice of experienced miners to employ about two-thirds of the available water in the elevator, the remaining one-third being used by the giant in washing the gravel to the pit at the foot of the elevator. It is also good practice to use just as little water as possible in operating with the hydraulic-elevator, or, in other words, endeavor to get all the gravel possible to the pit, that the elevator may be worked to its fullest capacity. Nearly all miners who have used the elevator say it will handle more gravel than they have been able to send to it. It has been found that the hydraulic elevator will, under favorable conditions, successfully lift gravel to a height equal to 20% of the total head of the stream of water used in the elevator. However, a lift of 10% is much more common. Where there is a large quantity of water seeping into the pit, which accumulates at the foot of the elevator and thus lessens efficiency, it is generally feasible to lift this surplus water from the pit by means of an independent elevator. Such an elevator, in use in Alaska, according to C. W. Purington, lifted 80 in. of water to a height of 26 ft. by employing 70 in. of water under a head of 100 ft. delivered through an 8-in. pipe, choked to a 2-in. nozzle, the lift-pipe having a 4-in. throat. Ditches usually have a grade of 7½ to 18 ft. per mile. To secure the greatest volume of flow through a ditch it should be from 1¾ to 2¼ times as wide on the bottom as the depth of the water at the sides. This also applies to flumes.

As gold has a very high specific gravity it is usually found in the deepest part of a stream that has a moderate grade, but where the current is swift the gold is usually found on the bars, as the inside, or shorter side of the bends are called. Since gold has so high a density many think, very naturally, that where potholes exists these should be rich in the accumulated gold, which once having entered cannot escape. Those who have mined these potholes have almost invariably been disappointed, finding no gold. Potholes are formed by boulders lodging in a depression in the bedrock, generally at the side of the stream, and are usually uncovered in stages of low water. In time the rocking of the boulders upon the sand that settles in the depression gradually wears the hole deeper and deeper, until it becomes a pothole. Any gold that chances to drop into one of these holes will be literally worn out by the attrition of sand and boulders that are swirled about by the water rushing over the hole, and by the time the stage of low water arrives the gold has disappeared. Crevices in bedrock may be, and frequently are, rich in gold, but potholes rarely, if ever, are found to be so.

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[*] Bulletin 263, U. S. Geol. Survey.

The British Home Office has issued a report in which it is stated that the number of persons employed in the mines and quarries of the world in 1909 was 6,000,000, of whom 1,250,000 were employed in the British Isles and 1,000,000 in other parts of the British Empire. The total value of the mineral production is estimated at $4,209,522,500, the value of the coal output being $1,946,600,000.

Concrete Shaft-Stringers

By A. N. Wold

Owing to the scarcity of timber and the heavy cost of transportation, many of the large mining companies in the Lake Superior district have of late years been experimenting with reinforced concrete as a suitable substitute. The experimental stage, as far as concrete shaft-stringers are concerned, is now past and it is a well established fact that they are far superior to the timber stringers. The chief claim to superiority lies in their permanence. Barring accidents, such as derailing of the skip, they are everlasting; and even in such cases the repairs are easily made and at a comparatively low cost, without delaying hoisting to any great extent.

One of the mines at the northern end of the peninsula is now experimenting with the so-called reinforced concrete mine timbers, square-sets, studdles, caps, and even lagging. From all indications they promise to be successful, in which event a revolution of the present mine-supporting methods of the district may be expected. If this substitute for timber can be made cheap enough the practice of leaving pillars of ore may be abandoned and most of this ore, which is now either lost or held up indefinitely, may possibly be taken out at a profit. The accompanying sketches show the different methods now in use of laying concrete shaft-stringers.

Where the dip of the shaft is not greater than about 50°, the tendency to slip is overcome by the irregularity of the rock in the foot-wall of the shaft, but with a greater angle of dip it is necessary to anchor the stringer to the foot. Fig. 1 is a side view of a section of a concrete stringer used in a steep shaft, with a dip of about 70°. The parts A, B, and C constitute the Anchors, which are placed at intervals of about 25 ft. (See detail sketch, Fig. 4.) This interval, of course, depends upon the dip of the shaft and upon the weight of the load carried. The rails are fastened to the stringer by means of clamps L (Fig. 2) and bolts F, which open into the hand-holes H. These hand-holes are formed by galvanized iron boxes, open at both ends, and are held in place, during the process of laying the stringer, by the wooden blocks O, which are nailed to the form boards P. These in turn are supported by the temporary 2 by 6-in. pieces G (Fig. 1). The forms for these hand-holes may be built of wood instead of galvanized iron. The bolts pass through galvanized iron tubes, which are placed over the openings in the boxes. A rectangular washer, N, is used at the lower end of the bolts in the hand-holes. These rail-clamps are placed about 3 ft. apart. The tendency of the rails to slip is overcome by anchors, composed of the pieces D and E, placed about 3 ft. from the ends of each rail. (See detail sketch, Fig. 5.)

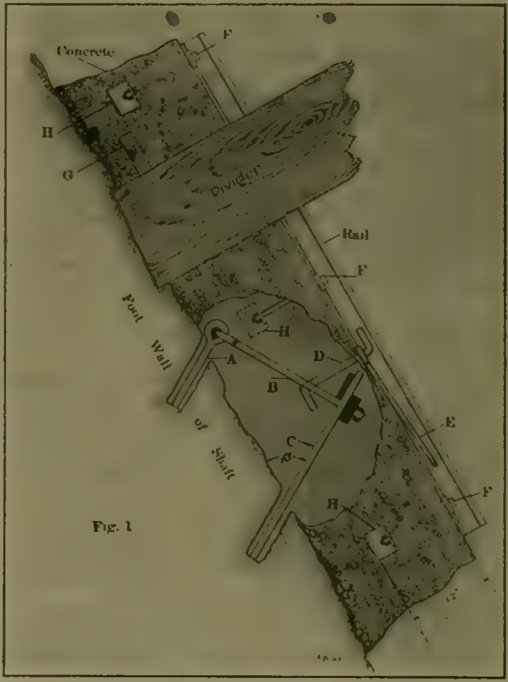
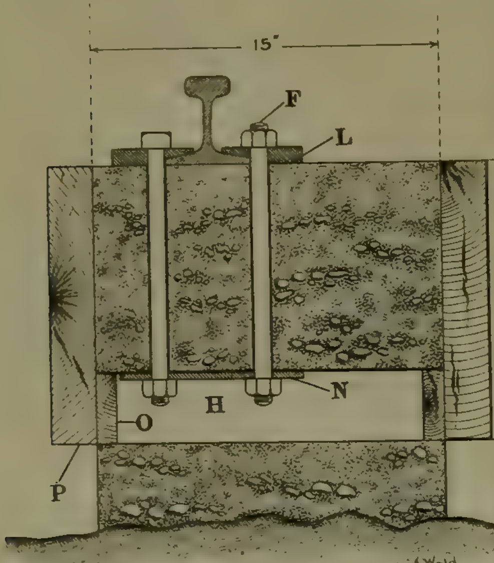
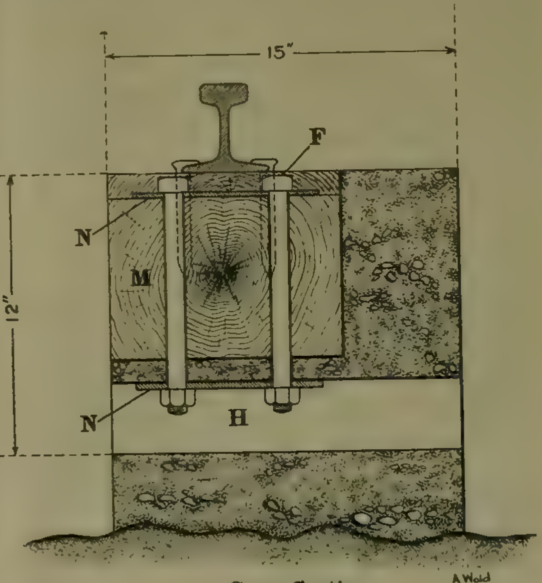


Fig. 1.



Cross Section

Fig. 2



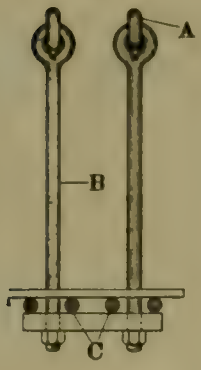
Cross Section

Fig. 3

Another method combines wooden and concrete stringers, as in Fig. 3. An 8 by 10-in. fir timber, M, is tied to the concrete foundation by means of the bolts used to fasten the rails in the first case. The interval between the bolts is greater, however. The bolts F are countersunk on top of the timbers, using the rectangular washer N. The washer, N, in the hand-hole, H, is made wide, so that it has a larger bearing-surface on the concrete. The rails are spiked to the wooden stringers, the flanges being notched for the spikes, to prevent slipping. Fig. 6 shows a method used in a shaft having a dip of about 45°. At first the rails were laid directly on the concrete, but it was found that the jar and vibration was so great as to actually crystallize the steel axles of the skip, often causing them to snap off.

The normal (to the track) component of the weight of the loaded skip increases as the dip decreases. To remedy this difficulty blocks of wood, B, 2 by 4 by 12 in., are set in the concrete every 3 ft. and projected ½ in. above the surface of the stringers. By placing the rails on these blocks all the jar is taken up by them. A different method of fastening the rails can also be used. The bolts are set in diagonally and form a claw which grips the rail firmly. The recess, C, in the concrete corresponds to the hand holes in the preceding cases. These bolts are spaced 6 ft. apart. These methods, or their combinations, have proved to be entirely satisfactory in all cases.

Fig. 4



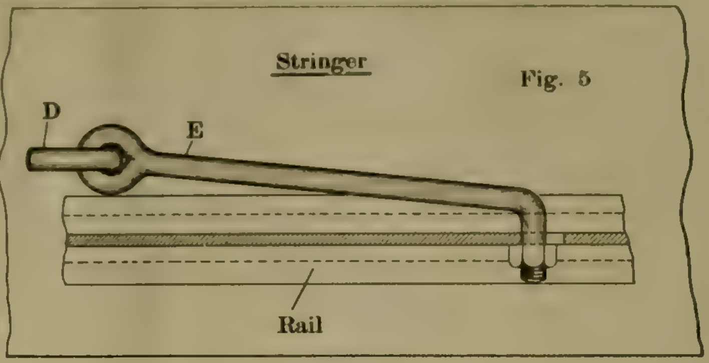
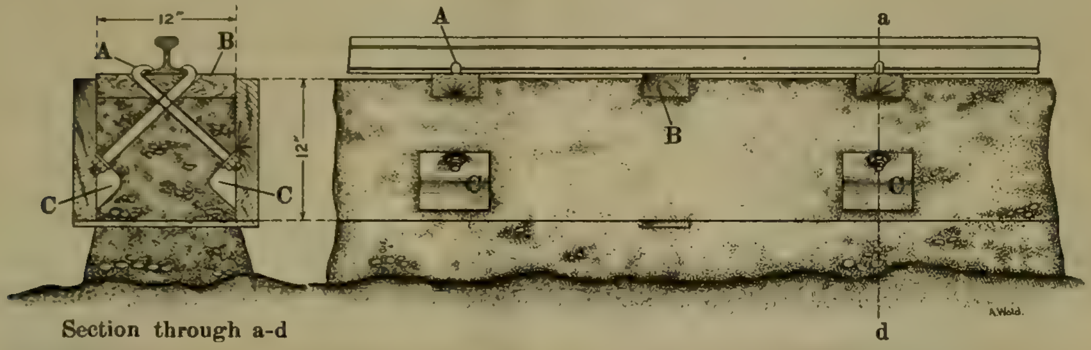


Fig. 5

Fig. 6



Treatment of Lead-Zinc Sulphides

London Correspondence

During the last three or four years much has been heard in a mysterious way of a new process that would completely revolutionize the metallurgy of zinc-lead sulphides. The process sprang originally from a proposal made by Sulman & Picard for the leaching of the roasted ore by means of sulphurous acid direct, thus obviating the great expense of sulphuric acid manufacture. The practical application of the idea bristles with all sorts of technical difficulties, and the number of patents issued covering modifications is legion. Sulman & Picard lost interest in it, and further work was done by Hommel & Durrant. The presiding genius, however, is Martin Fradd. Works have been acquired at Swansea, and the patent rights in Tasmania have been acquired by people interested in Mount Read and other complex ores. As far as can be gathered, the process consists of roasting the ore, and passing the sulphurous gases through pulp consisting of roasted ore and water. In this way the soluble bisulphite, $ZnH_2(SO_3)_2$, is formed. The resulting solution is taken to vats where insoluble monosulphite, $ZnSO_3$, is precipitated. This monosulphite when heated is dissociated into zinc oxide and sulphurous acid. The zinc oxide is free from lead and is a desirable raw material for the zinc distiller. The remaining pulp, after the removal of the bisulphide, can be treated for lead or copper in any ordinary way, according to its composition. The process gets along so slowly that its final success is considered problematical by skeptics. Anyhow, the owners and exploiters of the process have never taken the technical public into its confidence, so the average scientist knows nothing of the difficulties to be overcome. The process would be of no use in places where the ejection of sulphurous fumes is prohibited, for the final part of the operations involves the roasting of the monosulphite. It is no use saying that this sulphurous acid can be used over again, for the acid is being continually generated at the roasters. If the eventual sulphurous acid has to be neutralized, why not neutralize the gases coming from the first roast?

Time in Tunnel Driving

The time consumed in one cycle of operations in driving the Laramie tunnel was as shown below, the figures being given in a paper read by D. W. Brunton before the American Institute of Mining Engineers:

Opration.	Hr.	Min.		Hr.	Min.
Exhausting smoke at face		10	to		12
Picking down roof and sides		5	"		10
Jacking cross-bar in place		6	"		8
Attaching drills, making hose and water connections		5	"		15
Drilling from top set-up	3	0	"	4	15
Dropping bar to lower position		15	"		20
Drilling from lower set-up	1	0	"	1	15
Removing drills, cross-bar, etc.		15	"		20
Blowing out holes, loading, and firing		20	"		25
Ignition to explosion of last hole		8	"		8
Total	5	24	"	7	28

The Argentine Government has resolved to construct moles at Comodoro Rivadavia for the discharge of materials to be used in the exploitation of its petroleum resources.

The Mining Engineers in Japan

EDITORIAL CORRESPONDENCE

The party of engineers and guests that sailed for Japan following the meeting of the American Institute of Mining Engineers in San Francisco last month had a pleasant journey across the Pacific. Forming a majority of the cabin passengers on the *Manchuria*, they were actively represented in all the activities on board ship. It is difficult to say whether more renown came to the party through Dr. Raymond's Sunday sermons to the missionaries, C. L. Goodale's prowess at shuffle-board, or W. L. Saunders' impersonation of a life saver at the masque ball. In everything that took place the engineers were well represented. Following a busy but pleasant day at Honolulu October 23, a series of lectures and technical sessions, presided over by J. W. Richards, vice-president of the Institute, was organized. Interspersed with the technical sessions were others at which Reiji Kanda, C. L. Goodale, and other passengers talked of Japan, Hawaii, and China in popular vein.

The first technical session was held October 25, when D. W. Brunton read a most interesting paper on the Laramie tunnel recently completed under his supervision forty miles west of Fort Collins, Colorado. The tunnel was remarkable for the speed at which it was driven, especially in view of the fact that it was but 11,306 ft. long, and the work occupied but 18 months, so that the increased efficiency due to continuous operation of a trained force was not fully realized. In driving the tunnel standard equipment was used, for the sake of salvage, despite the fact that the cars were higher and the gauge narrower than would have been preferred. The greatest footage in one month from one heading was 653, made in March 1911. From March 1 to 8 an average of 24 ft. per day was maintained, and for four successive days the breast was advanced 28 ft. The cross-section was larger than usual, 7½ by 9½ ft. (actually driven 8 by 10 ft. to avoid trimming) and required 18 holes, but the shape was oval so that the corners were not cut out. The holes were drilled to an average depth of 7½ ft., and shot with Repano 80% gelatine exploded by means of fuse. The bonus system of payment was adopted and is regarded by Mr. Brunton as an important factor in obtaining the high speed noted. Another feature was the use of Leyner drills, especially a new type, known as Model 8, developed in part in the course of the work. Operating with air at high pressure, on a clean face of rock, with a cool bit, these drills made remarkable speed. While costs were not given, the enumeration of men and wages, as well as quantities of powder and supplies used, indicate that in this particular as well as in speed the work compared favorably with that done elsewhere.

The paper was discussed by W. L. Saunders, H. F. Bain, and others. Mr. Saunders pointed out that despite the good work done in America, European practice was still ahead of that in the United States. This he attributed in large part to the longer tunnels driven abroad, which permitted the more prolonged training of an individual crew. The drilling of shorter holes and use of a drill-carriage were also considered important, but at the present rate of improvement in America he expected to see practice here overtake if not surpass that of Europe. In the further general discussion of the paper it was shown that otherwise excessive use of powder in a tunnel is economical because of the resulting pulverization of the rock and increased speed in clearing away the débris. In large stopes and quarries where 'bulldozing' is possible and speed less important it is proper to economize in the use of powder.

At the second technical session of the Institute, held October 30, Will L. Clark discussed the need of a thorough revision of the United States mining laws. He introduced the subject by reading from the report of the committee of the American Mining Congress on 'General Revision of Mineral Land Laws,' presented at Los Angeles last fall. This committee consisted of E. B. Kirby, Will L. Clark, F. G. Tyrrell, W. H. Dickson, and M. Baumgartner, and reported in favor of asking Congress to appoint a commission charged with the duty of holding public hearings in the various mining districts and formulating a comprehensive mining law. The committee stated that "in spite of the good intentions of the makers of these early acts, the fact remains that our mineral land laws are imperfect and obsolete, and not sufficient for our present conditions, and that many of the existing provisions tend to unsettle rights to discovery, to discourage investments, and to retard development of latent resources." The extralateral right, defective regulations relating to discovery and locating, obscurity of tunnel rights, locations of an unlimited number of claims by one person, abandonment and relocation by the same individual, location by proxy, uncertainties of placer location, and conflicts between placer and lode location were all mentioned as causing vexatious litigation. It was suggested by Mr. Clark that the present was an opportune time to secure something better than patch-work revision, in view of the interest in 'conservation' legislation, the leasing system, Alaskan, and other matters. The report of the committee, he said, had already been sent to every senator and representative, as well as to the governors of the public-land States, and many promises of support had been secured. He quoted approvingly a suggestion made some time since by R. W. Raymond that apex and extralateral rights be abandoned, vertical side lines adopted, and the public lands be promptly surveyed and classified. The fact that by purchase and private contract vertical boundaries had come to be the rule in the large mining camps was mentioned as an instance of the mining men working toward the simpler system in spite of the law.

Mr. Clark also presented the report made by another committee, consisting of W. R. Ingalls, J. Parke Channing, James Douglas, J. R. Finlay, and John Hays Hammond, in which was formulated a draft for a law governing mine inspection and designed to further the movement toward a uniform system among the States. Finally Mr. Clark submitted the first draft of a law regulating metalliferous mining in Arizona and prepared by the Arizona Mining Code Commission, of which he is a member. These various papers led to a lively discussion, participated in by R. W. Raymond, W. L. Saunders, D. W. Brunton, H. F. Bain, F. H. Proske, R. W. Hunt, and closed by Mr. Clark. Dr. Raymond pointed out many of the difficulties of work under the present mining law, instancing that the apex was first regarded as a point, then a line, and now an area. The law of the apex operates in cases to wipe out discovery rights, and the whole law was characterized as one involving mathematical impossibilities, stated in language that is grammatically impossible, and requiring physical impossibilities. He deprecated any increase in Governmental activity and urged as evidence of beaurocratic inefficiency that even now the public lands are largely unsurveyed and unclassified. Later, in discussing safety in mining, he condemned the lack of discipline among miners, and imputed this to the growth of unionism among the men. Mr. Saunders pointed out that the unions, like the poor, "would be always with us," and stated that for one abuse on their part there had been five by the operators. He urged the necessity of sticking to the main point and making progress without wasting time on unavoidable conditions. He pointed out the necessity for legal action to increase safety in mining, and instanced the dangers incident to 'blasting off the solid' in coal mines, and to silicious dust in metal mines. He paid a tribute to the excellent work lately begun by the U. S. Bureau of Mines. Mr. Bain pointed out that the classification of the public lands was the legal function of the U. S. Geological Survey and suggested that the speed of the work was largely a function of amount of money appropriated. Mr. Proske suggested that the Administration at Washington seemed already committed to urging a leasing system, at least as regards oil, coal, and phosphate lands, and urged the necessity of prompt action if this change was not approved by mining men. For himself he considered the proposed system pernicious. Mr. Hunt urged the importance of the commission suggested by Mr. Clark and expressed his belief that if the matter were properly presented at Washington the appointment would be made. Mr. Clark closed by asking the assistance of the members of the Institute as individuals, since the rules forbade any official action.

At the third technical session, held November 1, R. W. Hunt presiding, J. W. Richards discussed the 'Electrochemical Industries of Sweden and Norway,' giving the results of his studies there during the past summer. These countries, he said, show striking similarities to Canada and Alaska, Sweden resembling Ontario and Quebec, and Norway being like British Columbia and Alaska. Neither Norway nor Sweden has any coal supply except the mines at Spitzbergen, but both have abundant water-power. That of Sweden comes from large rivers with slight fall, while that of Norway is derived from shorter and smaller rivers with high head. The development of these powers has become a matter of first importance. The Swedish iron industry has been built up on the basis of abundant charcoal, but the supply is now scant and wood is more valuable for making pulp. The price of charcoal has doubled in five years. English coke is being substituted to some extent, but this is temporary, and electric furnaces are being rapidly built. These use one-third ton of charcoal per ton of pig, as against an old ratio of 1 to 1. In Norway the high head enables power to be developed at a cost of $25 to $30 per horse-power for first cost. In Sweden the cost is higher, $40 to $80 usually, but occasionally as high as $100. In Norway power has been developed at a cost as low as $22 and rarely costs over $35. The annual charge for operation, including interest and depreciation, is $7 to $11 per year in Sweden and $4 to $7 in Norway. Water-powers in both countries belong to the Government and are merely leased to operating companies for terms of 50 to 70 years, with the requirement that the whole property, including plant, shall revert to the Government at the end of the lease. The powers are being rapidly developed, in the main by local capital.

Electrochemical industries need cheap raw material, cheap transportation, good labor, and capital. These are all available in Sweden and Norway. The former has the advantage in possessing iron ore, more labor, and more capital. Norway has the cheaper power and better transportation, since the waterfalls are generally at the head of deep fjords. Numerous new industries are being established and old ones revived. Among the new industries are those in which nitrogen is taken from the air to form nitric acid, nitrites, and nitrates. In the heat of an electric furnace the nitrogen and oxygen combine, and if the product can be cooled quickly a small but commercially profitable amount remains in combination. In central Norway 80,000 hp. is used at one point in industries based on this reaction, and by the end of next year probably 300,000 hp. and works representing an investment of $15,000,000 will be employed. The products are sodium nitrate, nitric acid, and 'nitro-lim' or 'Norwegian saltpeter.' The last is used for making fertilizer. These works are affiliated with important German companies. Another important industry is that of the manufacture of calcium carbide. This was first made in the United States, but the industry early obtained a foothold in Norway. The Alby United Carbide Factories, Ltd., at Odde, uses 20,000 hp. in making 30,000 tons per year. About one-half of this is used for generating acetylene and the remainder goes into calcium cyanamide, which with acid obtained from roasting mixed sulphide ores is transposed into ammonium sulphate and used for fertilizer. Other carbide works are in operation in Sweden.

Electrochemical processes are also used in the production of numerous metals. At Vadeim nearly all the sodium used in Europe is made, 400 hp. being used. The plant will be doubled this year and as much more added in 1911. There are also two aluminum works. The Anglo-Norwegian Aluminum Co., at Vigeland, uses 12,000 hp. and the British Aluminum Co., at Stangfjord, 2500 hp. Since, however, aluminum abroad only brings 15c. per pound, the industry is not flourishing. Nickel is produced at Christiansand from an ore containing 1.2% Cu and 1.8 Ni. This is made into a matte containing 10% Cu and Ni, and then refined electrolytically. The metals are recovered as sheets on lead plates and are sold in Germany. Zinc reduction is a field of great promise, and after spending $100,000 in experimental work on mixed sulphides the Swedes may fairly claim to have solved the problems involved. Work is now conducted at Halfslund, Tyssaa, Tyssedal, and Hardanger. DeLaval furnaces are used, and one 7000-hp. plant is being built. Near Odde, where 125,000 hp. is available at an annual charge of $8.10 per horse-power, 20,000 is to be used in treating zinc ores, 10,000 in making steel, and 40,000 in making cyanamides. The sulphide ores are first roasted to make acid for converting the cyanamide into ammonium sulphate. Australian ores are so far used mainly. Ferro alloys, such as ferro-silicon and ferro-chrome are made, but low prices prevent expansion of the industries.

The most striking and significant change produced by the introduction of electro-chemical processes has been in the iron and steel industries. It cost nearly $250,000 to develop the processes, but now plants are being put into operation as fast as they can be built. On the basis of a six months' test with a furnace using 700 hp., it was found that pig iron could be made at a cost of $1.50 per ton less than in ordinary blast-furnaces in Sweden. A large furnace, which ran from November 1910 to April 1911, used electrodes to the extent of but 5% of the weight of iron. In one week 1350 kw. produced 131 tons of iron, and it is found that 5 tons of pig iron can be made per kilowatt-year. The cost for power is $2 per ton of iron. Probably even better results will be realized. There are now four furnaces in Sweden that will be operating by the end of the year and six others are building. It is feasible in the electric furnace to make pig iron containing as little as 1.2% carbon, and nearly free from sulphur, and phosphorus. This is really a 'pig steel,' and permits cheap manufacture of steel billets. In steel-making, proper, the first development was the making of an equivalent of crucible steel. In Sheffield it cost $25 per ton to perform the operation, while in Norway the cost is $3. It can also be made in Norway with inferior material. Steel furnaces are accordingly going up all along the coast. At one the power contract calls for $6.75 per horse-power year for the first 1500 hp., and $5.40 thereafter. This covers cost of power on the turbine shaft; the steel company must furnish the electrical machinery. It is found that coal at $6 per ton is equal to power at $6 per year in making the initial melt, but that the electric furnace holds the melted material cheaper. Open-hearth furnaces are therefore used for melting the scrap from which the steel is made. It is then refined in the electric furnace. At Arendal it is estimated that steel billets cost $29.16 per ton, using 12,000 hp. to produce 14,500 tons per year.

This paper by Mr. Richards provoked a lively discussion centring mainly on the low cost of power. No very satisfactory explanation was given as to why there should be the very great difference between power costs in Norway and the United States, though many factors evidently enter into the problems.

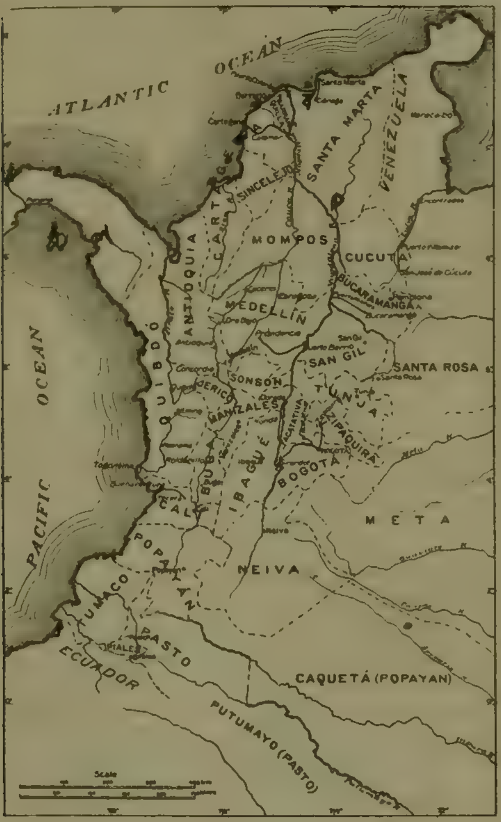
At the final session on board the *Manchuria*, Reiji Kanda discussed the 'Mines, Minerals, and Volcanoes of Japan,' giving a general outline account of the geology of the various islands and the distribution and character of the mineral deposits. This was well calculated to be of great service to the visiting engineers.

WASHINGTON'S production of lead in 1910, although small, was the largest which the State has had in recent years. It amounted to 661 tons, as against 144 tons in 1909. Practically all of this output came from Stevens county and was derived chiefly from the Northport district, with a smaller quantity from the Bossburg district. The lead ore of the Northport district is non-argentiferous and was shipped to the soft-lead smelters of the Mississippi Valley. The Jupiter mine was the principal producer.

Prospecting in Colombia

By A Peripatetic Engineer

Cali, in the central cordillera of Columbia, is reached about two months after leaving San Francisco. The delay is chiefly due to the five weeks' trip down to Panama on a Pacific Mail boat, which goes even to the length of waiting in some ports to pick up cargo coming down by train in two or three days' time. This will soon be a thing of the past on that route. For about three months I was opening, for the owners, a coal prospect about two miles northwest of Cali and uncovered a 5-ft. seam of coking coal. It lies almost vertically and should have about a thousand feet of backs from the level of the Cali river, but from the lay of the surrounding country I should say it will be found to be much faulted. I know of three other exposures of coal in that neighborhood which ought to be valuable when the railroad gets through. The track extends now to a point about six miles out of Caldas, a little town which is the present terminus of traffic. In that six miles there are seven or eight tunnels, all short, owing to the numerous deeply cut *quebradas* running down from the main ridge. They say they will get the railroad into Cali in two years time. They had considerable trouble in driving and keeping open those tunnels in the heavy clayey decomposed rock. After British Columbia, where fresh solid rock is found under 2 or 3 ft. of soil, the amount of decomposition here comes as a surprise. Without exception, every prospect I have seen has been in the bottom of a *quebrada*. Everywhere else is covered up deep with soil and decayed vegetation. After about four months in Cali, my partner got 'fed up' with the country and people, and returned to British Columbia. A good-enough partner, but too cultivated and refined for a mining life; he couldn't get along without music and books.



MAP OF COLOMBIA.

Then I went to a district called El Quindo, in the central range, two days' ride from Cartago, and made a few assays and reports for local companies, and examined prospects on my own account. At this I found I could hardly make expenses. I arrived at the tail of a local mining boom and found they had already put wooden mills up on all the veins that showed a trace of gold at the surface, without doing any previous development, and were reaping the natural consequences. That is one of the greatest hindrances to a man like myself, looking for a small property to work. The Colombians have unbounded mining optimism, and rush in where angels fear to tread; put up a wooden mill if the rock pans a few colors, and trust to luck. Of course they may open up something which will prove profitable, but in the majority of cases they lose their money. But it makes it difficult for a stranger to buy a prospect except at an exorbitant price.

After that I took over the management of a gold-quartz mine belonging to a local company, and was there about six months. They had two wooden 10-stamp mills, into which I put plates. But the ore only ran about $5, with a narrow vein, not enough to stand much development expense, so that when stoping overtook development, it was up to them to put their hands in their pockets to keep the mine going. They refused, and it was closed down.

This country seems to be attracting attention. Ben S. Revett has a party of 25 white men prospecting placer ground in the Choco for the Consolidated Gold Fields of South Africa; and the Oroville Dredging Co. of London is putting up an electric generating plant on the Nechi river, a tributary of the Cauca and also building a dredge at Zaragoza. If they make a success of it, it will give the country a big boost. Wernher, Beit & Co. have six engineers in Antioquia looking for properties and have taken over the Marmato mines, and are said to intend putting up a 100-stamp mill, to work the whole hill by the open-cut method.

Goldfield Consolidated Report

During the month of October, according to the report of J. F. Thorn, general superintendent of the Goldfield Consolidated Mines Co., the total production was 30,626 tons, containing $860,154, or an average of $28.09 per ton, the whole being milled with an average extraction of $26.77 per ton, or 95.31%. The total net profit was $616,142, or $20.12 per ton. During the month 3152 ft. of development work was performed. The total cost of mining, development, milling, office and general expense was $6.80 per ton, distributed as follows:

Mining:		
Development	$0.83	
Stoping	2.04	
		$2.87
Transportation		0.08
Milling		1.96
Marketing		0.74
General expenses		0.38
Bullion tax		0.31
Construction		0.46
Total cost of operation		$6.80
Miscellaneous earnings		0.15
Net cost per ton		$6.65

In the Clermont the 466 intermediate between the 600 and 750-ft. levels, and just south of the 428 and 401 stopes, has been extended 30 ft. and produced 153 tons of ore averaging 1.53 oz. This orebody has also been found by a raise from the 427 drift (750-ft. level) 150 ft. south of the 483 cross-cut, at a height of 20 ft. above the level. The 413 sill was considerably extended during the month, and produced 879 tons of ore averaging 2.87 oz. The continuation downward of the 413 orebody was again proved, first by 420-I raise, driven in the hanging wall of 420-H raise, at a point 60 ft. under the 413 sill, and again by 420-K raise, driven from the 750-ft. level opposite 420-H and into the hanging wall, which intersected the ore at a height of

35 ft. The average content of the ore exposed is 2 oz. The 510 sill from 521 intermediate was extended and produced 156 tons of ore averaging 1.02 oz. The Grizzly Bear shaft was sunk to a depth of 95 ft. below the 1200 ft. level.

In the Mohawk the No. 20 and 21 cross-cuts from No. 3 drift have been cut for a sill, and produced 653 tons of 1.55 oz. ore. The sill in No. 13 drift was extended and produced 375 tons of ore averaging 2.11 oz. The continuation downward of this ore was proved by a raise from the 290 intermediate, which intersected the ore 40 ft. vertically under the 13 sill. On the 450 ft. level the 345 sill was extended and produced 145 tons of 1.89 oz. ore. The 101 sill of the Red Top was extended and produced 563 tons of 5.62-oz. ore. The 477 intermediate was advanced in ore, producing 151 tons of 1.67 oz. content. A cross-cut in the hanging wall of 305 drift, 180 ft. north of the main cross-cut from the shaft, produced 19 tons of 5.05-oz. ore. The Hazel shaft of the Laguna was cleaned out to the bottom, and the drifts on the 718-ft. level cleaned out preparatory to prospecting the quartz mass in this area. The 136 sill in the Combination was extended and produced 422 tons of 3.92-oz. ore. The mill tonnage for the past month, 30,626 tons, was the largest for any month since the mill has been in operation. The construction of the concentrate-residue treatment-plant is progressing at a satisfactory rate.

Petroleum in New Zealand

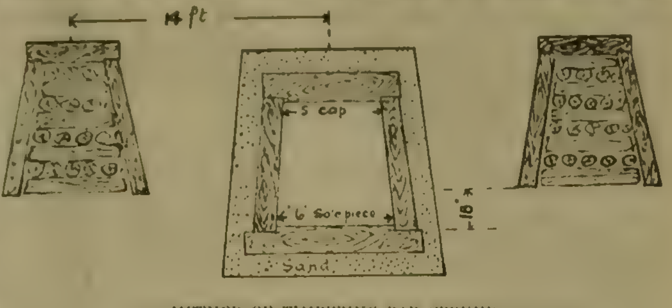
London Correspondence

The oil resources of New Zealand are to be introduced to the public once more during the next month or so. These have been known long enough and have been boomed before in London; but for several reasons their output has been restricted and most of the ventures have been failures. With the increased knowledge of handling petroleum deposits that is now current, the new scheme should prove more successful. The deposit is on the coast at Taranaki, near the famous three Sugar Loaves sighted by Captain Cook in 1770. In 1838 attention was drawn to Taranaki because it was considered a suitable district for the formation of a colony, and this agitation caused the British Government to annex New Zealand before France obtained possession. The presence of oil in the district was known to the earliest settlers, for it was found floating on the sea round the Sugar Loaves, and the Maoris had a tradition that the oil was the result of the burning of bituminous matter in a submerged island. It was not until 1865 that a technical examination was made. In that year samples were sent to London, and prospecting licenses were granted by the Government. Boring started in 1866, and gas and oil were struck at a depth of 20 ft. and 60 ft. respectively. Just at that time the New Zealand Geological Survey was created, and James Hector was appointed as chief. His first commission was to report on this new oilfield. The first ventures were not successful commercially, and the development of the district lay in abeyance until 1888, when interest was revived by H. A. Gordon, the inspecting engineer of the Mines Department. In 1889 companies were floated in England to continue the work. There was another boom in 1906. The Taranaki coast is also noted for its deposits of iron sand along the seashore, but the commercial value of these has never been ascertained.

New Method of Driving in Bad Ground

A few months ago, at the New Langi Logan mines, much difficulty was experienced with 'heavy' ground in the new main drive; but it has been completely overcome. W. H. Toole, the manager, devised a method, purely his own, of remedying this trouble, which for a time threatened to defeat every effort to keep the main drive open. There was an entire absence of any layers or strata; the whole of the country rock being crushed into small blocks, and forming what appeared to be a huge dike or cross-course. Altogether about 350 ft. of this ground has been passed through. The accompanying sketch will help to explain how the difficulty was overcome.

The manager's first object was to exclude the air. This was accomplished by cutting the drive larger than usual, a layer of finely crushed rock was then laid in the bottom of the drive, in which 12-in. sole pieces were bedded; when the sets were put in the fine sand was continued up the sides as shown, and formed a packing 12 in. thick between the laths and the sides of the drive. The whole was then double-lined with 12-in. timbers—all on sole pieces.



METHOD OF TIMBERING BAD GROUND.

The next step, and probably the most important of all, was to drive two small relieving drives parallel to the main drive, and about 7 or 8 ft. away. These drives were afterward 'horsed up' with firewood. The drive, at this point and throughout, is now perfectly sound, and has been standing for over three months without showing the slightest signs of crushing.—*Australian Mining Standard.*

Mass Copper

An interesting point in regard to the large masses of native copper, described on another page by T. A. Rickard, is the difficulty which they offer to extraction by any ordinary means. The very great toughness of metallic copper is seldom fully appreciated by those who have not learned by experience, and the loungers on the docks at Hancock find a perpetual source of amusement in the efforts of innocent tourists to break off a small fragment of native copper from the masses on the docks, as a souvenir. When large masses are found in the mine, high explosives are of little use in reducing the mass to fragments of a movable size, and the work required in cutting up such masses with a chisel is so expensive as to consume the larger part of the profit from their extraction. An oxy-acetylene torch might be of service in this connection, but there is no record of its having been so used.

A GROUP OF MINERS POSING BESIDE A MASS OF COPPER (WEIGHING FIVE TONS), WHICH THEY ARE CUTTING WITH CHISEL AND HAMMER.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

PROUSTITE is often called light ruby-silver, just as pyrargyrite is known as dark ruby-silver. The former is a sulph-arsenide, and the latter a sulph-antimonide of silver.

CADMIUM is imported into the United States as metallic stick cadmium and as the pigment, cadmium sulphide (CdS), known as cadmium yellow. The former is free of duty; the latter is dutiable at 30% ad valorem.

ADDITION of small quantities of certain substances, such as CS_2, solutions of iodine, or guttapercha in chloroform, or some heavy hydrocarbons, to electroplating baths increases the density, brightness, and non-crystalline character of the deposited metal.

LOGS are occasionally cut several inches longer than necessary, and thus several inches must be thrown away. Another waste results from splitting stock instead of sawing it. Much wood is lost because of small defects which a saw would remove, but which cannot be split out without sacrificing more or less good timber.

RHODONITE, though a silicate of manganese, is of no economic importance and is not included with the ores of manganese. It is a brownish to bright red mineral and may be mistaken for red feldspar or rhodochrosite. But the latter dissolves with effervescence in warm acids, while feldspar is less fusible and does not give the manganese reactions.

SULPHUR is used in immense quantities for the manufacture of sulphuric acid, gunpowder, matches, rubber goods, bleaching powder, and medicines. Large quantities of it are recovered in various chemical and metallurgical operations as by-products, but the chief source of supply for the United States is the natural deposits of Louisiana, where it is obtained from deep-seated strata by the Frasch process. Large quantities are also imported from Japan and Sicily.

CITY water often contains large quantities of lime and magnesia in solution, and these coming in contact with the heated walls of the air-compressor precipitate in the form of scale. This scale cuts down the radiating capacity, the air-compressor overheats, and the efficiency is very greatly reduced. Not only this, but, due to the pressure, the water in the jackets has been known to leak through the packing and get into the cylinders, causing wet air with its attending troubles.

AN alloy suitable for small metal patterns is composed of tin, one part, and lead, one part by weight. The result is a somewhat soft alloy which requires care in the handling of the patterns. Some harder mixtures are as follows:

Lead.	Antimony.	Tin
55	30	15
55	22.7	22.3
61.3	18.5	20.7

THE point was made in a recent discussion on safety attachments for machinery that the designer was not called on to make his machine 'fool-proof,' but only to make it safe. The argument was raised that to overdo the protection of moving machinery was not only to make the cost of the machine prohibitory when many were to be used, but also that a safeguarding which was too complete was demoralizing to the operator, in that it made him careless and what may be called 'sloppy' in his mental attitude. A certain alertness incident to a knowledge that the machine has capacities for harm is derived from the use of a machine made safe, but not completely 'fool-proof.' That alertness represents a certain sort of attention to his work which makes a man more valuable, and for a longer time.

SUCKER-RODS used in pumping oil wells are preferably made of hickory, though ash will serve. These rods must be clear and straight pieces from 18 to 35 ft. in length, long strings of them being coupled end to end to reach the bottom of deep wells. Hickory will sustain nearly as much load on a longitudinal pull as a rod of iron of the same size, and it weighs less than half as much. Sucker-rod buyers demand the best parts of the choicest hickory. Skewer manufacturers are making some use of hard maple, beech, birch, basswood, and persimmon. Hickory, however, imparts the least taste, and will not break or splinter when thrust into the meat or candy. Ash and hard maple are used to some extent for picker sticks. The strength and toughness of hickory, however, places it first for this purpose.

FALLING bodies are responsible for many accidents. In the *Bulletin* of the Department of Labor of the State of New York the number of accidents due to the fall of objects in course of manufacture or undergoing repair by the injured person is given as 773. These are mainly injuries to the fingers. Objects being moved or carried by hand caused 447 accidents, of which 168 were to the fingers or the feet. Objects being loaded or unloaded on vehicles hurt 343 persons as respects either fingers or feet. Falling objects which were not dropped by anybody, but fell on the victim, caused 460 accidents. Injuries caused by vehicles and animals resulted in 225 cases. It will be interesting to note that locomotives and trains caused only 81 accidents in the list given. This must be by reason of the inclusion only of such accidents as occur within the walls of a factory.

A LOCATOR may change his boundaries or the name of his claim at any time, provided he does not interfere with existing rights. He may even swing his claim at right angles. However, he should hold substantially to the same ground as before, and if possible use the same discovery or location point. While it is clear that the rights of others shall not be interfered with in changing boundaries, it is not certain what would be the result where a claim-owner, having done the amount of work required for patent purposes upon his claim, should swing part of his claim over upon the valuable locations of others and immediately ask for patent, while the senior locators of the ground now in conflict would fail to adverse through presuming that the claim up for patent was still occupying its original position, but would afterward discover their loss. The only redress that appears would be to attempt to take the matter into court asking that the patent owner be declared to hold the conflict area in trust to be conveyed to the defrauded locators.

HICKORY is the world's foremost wood for certain purposes, because of its combination of strength, toughness, and elasticity. It offers excellent resistance to strains, twists, and shocks. The superior place held in many countries by the American axe is due as much to the hickory handle as to the steel in the bit. The same may be said of American hammers. The enviable reputation of harvest machinery made in the United States has placed it in every important grain-producing region of the world, and to the use of hickory is due much of its success. Other woods are satisfactory for heavy vehicles where strength is the chief requisite, but for light, graceful, handsome, springy buggies, carriages, and traps hickory is unequaled. It goes into wheels, poles, shafts, spring bars, and other straight and bent parts. The lightness and resiliency of the American racing sulkies has won universal admiration, and their superiority is due to hickory. The severe thrust, strain, twist, and compression which automobile wheels must sustain demands spokes of absolutely the best material obtainable, and for this the manufacturer is dependent on hickory.

Special Correspondence

MEXICO

Mexicans May Make Oil Lands Subject to Denouncement.—Labor Troubles and Rumors of Rebellion Disturb Business. New Mining Developments.

A bill making oil lands open to denouncement, placing them on the same basis as mineral lands, has been introduced in the Chamber of Deputies by a congressman, José Maria Lozano, and is attracting much attention. The measure seeks to do away with oil concessions, and to provide against the possible control of the oil supplies of Mexico by the purchase of land. In introducing his bill, Lozano said: "A sale of the Pearson oil interests to the Standard Oil is now pending, and if we do not pass this bill a time will come when the old Viceroy's palace and the Castle of Chapultepec will be ruled from Wall Street, as the Standard Oil money will buy the votes and the magistrates, the courts and the deputies, the senators and the presidents. I want to keep Mexico out of reach of the golden arms of the ferocious octopus." According to a recent report, Lord Cowdray has been negotiating with the Standard Oil for the transfer of the Pearson holdings and oil business. The Lozano bill will come up for discussion soon, and developments will be awaited with great interest.

GREENE-CANANEA CONCENTRATOR.

Mexico has been having more labor troubles, several thousand workmen at Torreon going on strike, with a demand for increased wages and an eight-hour day. The strikers included employees of the Torreon custom smelter, which is controlled by the Madero interests. It is reported that the strike fever has spread to workmen of the Velardeña smelter of the American Smelters Securities Co., and that the employees of the Mapimi smelter of the Peñoles Mining Co. are ready to walk out. Many of the Torreon strikers have returned to work, and the labor troubles may be of short duration. The Chihuahua smelter of the American Smelting & Refining Co., which closed several months ago as a result of labor troubles following the triumph of the Madero revolution, only recently resumed operations. Reports that General Bernardo Reyes, who recently was arrested in the United States, was planning to launch a revolution against the Madero government, are causing uneasiness in business circles, notwithstanding the declaration of President Madero that the new government is in a position to quell any uprising. He has announced that bandits and those who rise in arms against the Federal government will be crushed with an iron hand. An appropriation of ₱14,000,000 for army increases has been made, the greater part of the money to be used in organizing additional regiments of rurales.

In the month of October the Greene-Cananea company had a record production of copper, the output reaching 6,000,000 lb. Of that amount nearly one-third resulted from the Miami concentrate, the Cananea production being 4,058,000 lb. The gold production in October—763 oz.—established a record for Greene-Cananea, and the silver output—127,568 oz.—was the next to the largest since the present management assumed control. The copper cost of 9c. per pound, which was reached some months ago at Cananea, is being maintained. In October the Lucky Tiger G. M. Co. shipped 78 bars of bullion valued at ₱95,000. The company's new cyanide plant is working successfully, and operating costs have been reduced by bringing in electric power from Douglas, Arizona. It is now expected that the new 100-ton smelter of the Sonora Copper Co., near Noria, a station on the Sonora division of the Southern Pacific, will be in operation about the first of the year. An aerial tramway that will carry the ore to the smelter is being completed. The mines have been under development for several years.

JOPLIN, MISSOURI

Zinc Ore Prices Touch Highest Figure of the Year.—Smelters Constructing New Plants.—Zinc and Lead Notes.

The latter part of November saw the price for zinc ore go above $50 per ton, on an assay basis of 60% metallic content—the highest figure of the year. Mine operators had grown discouraged with the long-continued low prices, and talk of a general shut-down of the heaviest producers was current. Even with the advance in offerings, many operators did not feel that the ratio between metal and ore was fair to the miner. With East St. Louis spelter quotations at $6.60, they felt that bids should range from $50 to $52 per ton, basis. Instead, the open market offerings failed to pass the $48 mark, and only the ores sold on contract to the American Zinc, Lead & Smelting Co. commanded a basis in excess of $50. Conditions at present are generally satisfactory, the production and shipments being about 5500 tons per week, the heaviest of 1911.

Inadequate smelting capacity has caused stronger metal prices, due to the fact that the present plants are unable to meet the heavy demand for metal. Several companies are constructing new furnaces, a number of idle smelters are to resume operation, and several large new smelters are being constructed at various points, chiefly in Illinois and Oklahoma. A great quantity of Colorado calamine has flooded the smelters of the Oklahoma and Kansas natural-gas belts, and because of the peculiar qualities of this Western ore the metal output has not been so heavy as might be expected. The National Zinc Co. began the erection of two new blocks at the Bartlesville smelters early in the fall, and they were put in operation the last week in November. The Prime Western company's plant at Collinsville, Okla., also was increased by the addition of five blocks. During the ensuing year a heavier smelting capacity will be available through the construction of a number of new furnaces, now under course of erection. The American Metal Co. is constructing a remodeled plant at Collinsville, much of the material coming from the old Lanyon plants at Iola, Kansas. In many of the new plants, steel and concrete are used extensively, and thoroughly modern smelting methods are being employed. At Nevada, Missouri, the old Cockerill Zinc Co.'s plants have been taken over by W. H. Robertson and B. K. Blair, of Webb City, and extensive repairs are being made. The new company expects to be turning out metal by January 1.

Amasa Corbin, owning extensive mining lands in Galena, Kansas, and representing the East Empire Syndicate, owning additional tracts, has arranged for extensive development and pumping in what was the banner camp of the Missouri-Kansas district in the early days of the Galena region. Fabulously rich turn-ins were made from comparatively shallow mines on these properties; the ground was extensively cut out to a certain level, but below this no development could be undertaken because of the water which baffled the ingenuity of the early-day pump operators. A. M. Gaines and associates have now leased large tracts of the lands mentioned, enormous pumps are to be installed, prospect drills are to be put to work, and hundreds of acres are to be mined if the lower runs of ore prove even partly as rich as were the deposits near the surface. With the lands well drained and several large companies at work, the output from this part of the camp should materially increase Galena's weekly production, which is now averaging less than 1,000,000 lb. of blende.

After months of tireless pumping, during which millions of gallons were lifted, the Carson-Dodge company, in the North Miami, Oklahoma, field, has penetrated the deep zinc and lead formations intersected in drilling early in the spring, and heavy turn-ins are beginning to be made. The mill dirt occurs at a depth of 280 ft., extending to 320 ft., and carries about 25% zinc and lead, of which 60 is zinc and 40% lead. Chapman & Lennan, drilling on an adjoining lease, discovered a 40-ft. ore deposit and are now sinking a shaft. Galena clippings in several drill-holes were so rich that the water taken from the drill-holes resembled ink. Heretofore development at Miami has been conducted at the 90-ft. level, extending down to 160 ft. Between the upper formation and the extremely deep ore, intermediate runs of ore have been penetrated in drill-holes sunk at the extreme west edge of the district. The discovery of this deep formation, which shows every indication of covering a great area, is considered one of the most important features of mine development of recent years.

Open-cut mining methods are to be adopted at the Wyssbrod M. Co.'s property in the Zincite district, west of Joplin. Where an old cave-in occurred years ago, the débris is to be removed, a large concentrating plant is to be erected, and the dirt from the surface down to a depth of 150 ft. will be milled. The mineralized dirt, in places, reaches to within a few yards of the surface. In other open-cut operations throughout the district it has been found cheaper to mill the entire deposit, from the surface down, rather than endeavor to first scrape away the thin stratum of surface soil, which carries no ore.

Zinc and lead, occurring in a thin but very rich stratum, were found recently in several drill-holes sunk near Butterfield, in Barry county, Missouri, a region remote from the developed zinc and lead area. The first find was made by drillers who were seeking water. Other drillers, in quest of ore, promptly invaded the field, and several encouraging finds have been reported. The ore is found, in most instances, at a depth of 120 to 125 feet.

LONDON

Popular Subscription Necessary to Maintain Camborne School of Mines. — London Financiers Actively Seeking Larger Tin Supply. — Progress in South African Tinfields.

The facilities for technical education in connection with metallurgy and mining, apart from the branches relating to iron and coal, are still not so great as they should be in a country like England, that controls mines of all sorts in all parts of the world. It is true that the Royal School of Mines has been put on a satisfactory and permanent basis as part of the Imperial College of Technology, the new Bessemer laboratory has been added to its equipment, and a handsome College Union building has been opened to provide the necessary social amenities for old and present students. But much more has yet to be done in extending teaching facilities. This is not an immediate need, and in any case the improvements can be made gradually and as opportunity offers. A much more pressing matter is the future of the Camborne School of Mines. This was recently amalgamated with the smaller schools at Penzance and Redruth, and its control came under the Government Education Department in accordance with the new Education Act. It still lacks the dignity required for State aid, because it has no recognized standard entrance examination or course for a degree. In fact, it is only "a place where mining is taught," and not a college or university. At the present time the school is being run at a loss, and the deficit will become alarming unless something is done, and that quickly. Unfortunately, the school has hardly any endowment, though it owes much to private generosity for its buildings and equipment. But the benefactor who gave the land took care not to part with any of the best sites on his books, and consequently the student is struck with dismay when he first makes acquaintance with the approach to the school. The governors have placed their position before the Royal Commission on Metalliferous Mining now sitting, though such a policy seems to be one that will lead to nothing, and in fact to be a step in the wrong direction. They ask the State and the County Council to make good the annual deficiency, and to provide just a little more to keep things going. It is impossible to raise any more money in Cornwall from private sources, for Cornish mining is not sufficiently profitable. The only people making money liberally in Cornwall out of mining royalties are Lords Falmouth and Clifden, who draw large incomes from their china-clay estates. It seems hopeless to expect them to interest themselves in the Camborne School. Nor could C. S. Goldmann be expected to provide money at present, though he might be inclined to consider the proposition some other time. He is a Member of Parliament for the towns of Falmouth and Penryn, and the law is so strict in England that if he paid out any money for a college he would be unseated for bribery and corruption. He is rich enough, being a Rand magnate connected with the Neumann group, and he lives at beautiful Trefusis on the opposite shore of Falmouth harbor. What the governors ought to do, and what I am doing now, is to advertise the present position of Camborne School to Cornishmen all over the world, and to ask them to subscribe to a fund for the provision of a suitable endowment, and for additional buildings in a more dignified position. I hope that both the governors and Cornishmen generally will take this hint.

Tin is a metal much sought by financiers in London, and anybody with a reasonable proposition will be received with open arms. Much money is being spent in South Africa in the investigation of geological formations favoring the presence of cassiterite, and we have recently heard much of the Abercorn and Victoria districts, in Rhodesia, both of which are promising. The yearly progress reports of the two leading producers in the Transvaal have once more drawn attention to the possibilities of the Waterberg and Rooiberg districts. The Rooiberg company, though it only started development in the summer of 1908, earned a profit of over £50,000 during the year ended June 30 last. During that period 17,781 tons of ore was raised and treated, averaging 7% tin, and 1077 tons of concentrate was produced averaging 67%. The recovery was not high, being only 58%. The reason for this is that the imperfect experimental machinery was still being used. Edward J. Way, the consulting engineer, and Amos Treloar, the mill manager, have designed a modern plant which will cost £40,000, and this will be at work shortly. By its means the extraction will be greatly improved; not only so, but the accumulated slime and middling will be treated. The reserve of ore on June 30 was 21,650 tons averaging $4\frac{1}{2}\%$, but the engineers point out that this average is unreliable, for thin seams of pure cassiterite are being continually found during stoping that could not be detected when estimating reserves. They have found by experience that the mill-screen samples are almost always higher than those taken in the mine. Unfortunately, as with other mining operations in South Africa, this mine has suffered from scarcity of labor, and the scheme for increased development is in abeyance.

The other tin-mining company in the Transvaal, the Zaaiplaats, is further advanced, so is able to make greater profits. The present report covers the year ended July 31, and shows that 24,105 tons of ore was crushed, yielding 1763 tons of concentrate, averaging 70% tin. This sold for £190,553, out of which £111,000 has been distributed as dividends, being at the rate of 185% on the capital, £60,000. Until the present time the battery has consisted of 5 heavy stamps and 10 light ones; the latter are now being replaced by 1550-lb. stamps similar to the other heavy ones. This has been made necessary by the increasing hardness of the ore. It is further announced that another 20 are to be added, as the extent of the orebodies is found to be far greater than was at first supposed. Additional dressing plant equipment also will be required, as the cassiterite tends to become of finer grain and more disseminated in depth; also, a roasting-furnace to deal with the pyritic matter which is making its appearance. A voluminous report on the property by Hans Merensky has recently been published; it was due to the information therein contained as to the great extent of the deposit that the directors decided to increase the scale of operations.

TORONTO, CANADA

New Equipment for Porcupine Mines. Dome Mill to be Ready March 1. Development Notes of the District.

There will be great activity in the forwarding and installation of machinery in the Porcupine district, as soon as the winter has fairly set in, with the roads in good condition for transportation. At the Dome, where the expenditures on construction and development so far are estimated to run close to a million dollars, rapid progress lately has been made, and it is announced that the mill will be in operation by March 1. It has been decided that only low-grade ore will be treated for about a month, in order to wear down the stamps into good condition and to give opportunity to make the necessary adjustment in the working of the plates. Ambrose T. Monell, managing director, says that as regards ore, the only certainty is as to the surface and down to the 50-ft. level, at which depth there are two drifts, one of which runs uniformly for 136 ft., carrying ore assaying $28 per ton, and the other running parallel shows $30 and for the last 20 or 30 ft. $40 per ton. Below that level diamond-drilling shows good ore, and under the 'Golden Stairway' the same process gives high gold content at depth, though it is not possible to strike an average. There is no question, however, of the enormous quantities of milling ore occurring on the property. A second shaft is being put down on what is known as the 'second dome' for the purpose of getting to the north side of the lenses of quartz that project in parallel rows, overlapping each other.

The Vipond is expected to be early in the field in actual milling operations. The mill will be erected on the Hardinge system, with a tube-mill and pebble mills in place of stamps. The ore will be crushed to 200 mesh before it will be amalgamated. It is so free-milling in character that for a time the company will dispense with the cyaniding process, until at least the tailing has accumulated. As in the case of the Dome, the earlier treatments will be of lower grade ore. The Doric is getting in new equipment, including a 9-ton locomotive boiler to give additional power, and a hoist for work in the deeper levels. W. R. Bauder has assumed the management of the McIntyre mine, where the sinking and underground development work, amounting to 750 ft., has demonstrated a considerable orebody. A 10-stamp mill will shortly be built.

At the Hollinger the machinery of the mill is being put in place. Connections are being made at the 200-ft. level of the shaft, which will be put down to 400 ft. with a station at 300 ft. It is hoped to have the mill in operation by March 1. It will have a capacity of 250 to 300 tons. The orebody at the Miller-Middleton shows a width of 10 ft. A shaft is down 50 ft. on the bluff and a cross-cut is being run in connection with it. The Apex, which has two shafts sunk to about 40 ft., has let a contract to put them down to the 110-ft. level. Two 80-hp. boilers and an 8-drill compressor have been installed. The main shaft of the Eldorado is down 28 ft. and has found many quartz stringers. The option held by B. E. Cartwright on the McAuley claim, Bristol township, has been dropped, as the gold content shown in 80 ft. of sinking and 1200 ft. of driving was only 80c. per ton. A report of the operations of the La Rose Consolidated presents a favorable showing. During the first nine months of the year the output amounted to 2,751,946 oz. of silver, with a gross value of $1,444,271. The shipments during this period amounted to 3,179,958 oz. The income was $1,453,958 and the expenses $536,868, leaving an operating profit of $916,765.

At the Nipissing the hydraulic pump installed for the removal of the overburden next spring on a large scale has been tested and proved satisfactory, throwing a stream of 4800 gal. per minute with a head of 415 ft. Recent development work on the Trethewey has opened up large bodies of milling ore. A 3½ in. vein on the 100 ft. level has for 200 ft. a wall rock for 6 ft. on each side heavily charged with silver. A smaller vein on the Nipissing boundary, which has been opened for 60 ft., carries 3000 oz. per ton with 5 ft. of milling ore on each side. The Temiskaming has passed its dividend for the current quarter in order to raise funds for the purchase of a controlling interest in the North Dome of Porcupine, taking 138,000 shares for which it will pay $229,000 or about $1.66 per share.

The Crown Reserve recently has opened some new ore shoots, the principal being on the 170-ft. level, where the Ross vein shows 4 in. of high grade ore. A winze put down to the 200-ft. level and cross-cutting at that depth show the ore to be persistent. The shoot, which is 70 ft. long, occurs in the Keewatin formation.

NOME, ALASKA

Dredging Output Smaller Than Last Year. -Pioneer Clean-Up.- Weather Mild.—Development in the District.

Although several dredges are still running and their output will increase the returns from this season's operations quite materially, it is clearly evident that the 1911 output from Seward Peninsula will fall below its output for 1910. The gold shipped so far this season, according to Customhouse returns is $2,815,425.64, while for 1910 it was $3,482,319.32 on the same date. The falling off is due entirely to a decrease in the output last winter as compared with the year before. The output this summer has been greater by several hundred dollars than what it was last summer. This increase is due to the many dredges that have been operating so successfully this season.

DRILLING TO RECLAIM A FLOODED DRIFT MINE.

The Pioneer M. Co., which in the spring of 1910 cleaned up $700,000 from its winter dumps, did not take out a dollar last winter, though its output this summer has greatly exceeded its output of last summer. The season has been an exceptionally long and favorable one.

Ditch owners, believing the real freeze-up had arrived, turned the water out and laid up equipment for winter. However, the cold snap passed quickly, and up to today, November 1, sluicing of all kinds could have been carried on just as well as in August. Nor does it appear at this time that freezing weather is likely to come for some time. Small operators pumping water around the tundra and some small sluicing operations around the nearby creeks are still going on, but all large operations have been closed since the first of October.

The Wild Goose company has done a large amount of drilling and other prospecting in the Nome district this summer, but its attention has been centred on Ophir creek in the Council district. The Fairhaven Ditch Co. seems to be at last coming into its own. It has worked two hydraulic elevators all summer, and their output is not much short of $100,000, according to some testimony that was given in a lawsuit here some time ago. Much work was done in the Kougarok district this summer, but I have been unable to get a Kougarok operator to make an estimate of the output for this season, though I have talked with most of them.

The Taylor creek ditch, under the management of Joe Mathews, has worked two elevators and quite a crew of men. The Davidson ditch, under the management of the Pioneer company, has also done a good deal of work. Many small operations have worked as usual, but it is probable the total is less than $150,000.

The Candle creek district has a little new life infused into it by the starting of the Candle Hydraulic Ditch Co.'s operations under Leo Loewinherz and others who bought the property in at a judgment sale. The Squirrel river excitement of last winter in which Nomeites were so much interested proved to be short lived. Some very rich spots were found on the creek, but it was too limited in extent to amount to much. There are about fifty people in the camp at present and some further prospecting is still being done.

Nome is trying to follow the lead of Fairbanks and develop a quartz camp. A number of public spirited citizens, led by Conrad Freeding, W. A. Gidmon, Joe Jordon, and Russ Downing, have had a stamp-mill built on the bank of Dry creek back of the town, and the citizens now rise in the early morning at the signal of the stamp-mill whistle and the rumbling of the stamps as they crush the quartz that is being hauled in from various prospects for testing purposes. The mill consists of two, 2-stamp, triple-discharge batteries of Joshua Hendy standard type, fed by Challenge automatic feeders. The ore is first fed through a 7 by 9 Blake crusher and falls into a bin from which it passes through chutes to ten automatic feeders and to the stamps. The crushed material passes over a plate surface about 4 ft. wide by 12 ft. long and is delivered by a launder to a No. 2 Deister table where the concentrate is saved. The ore treated the day the mill opened returned $34 per ton in free gold. Just now there is quite a little activity in developing quartz prospects in the nearby hills and the mill is kept busy testing small lots of ore, from a half ton to several tons. The power used in the mill is steam and so far they have burned coal, but Mr. Freeding says they will shortly change to crude oil.

NEW YORK

Metal and Stock Markets Active. — Amalgamated is Higher than Steel Common.—Situation Analyzed. — Arizona Developments. — Greene-Cananea Dividend Expected.

Coppers have held the centre of the stage in the New York markets during the past week. The metal market and the share market are enjoying more activity than has fallen to the lot of either for several months. A 13c. copper market is now spoken of as an assured fact. There have been advances all along the line in the leading copper shares, and traders on the New York Stock Exchange have made much of the fact that 'Copper', as Amalgamated is known in Board parlance, is selling for more than Steel common. Just how much of the present movement is due to sentiment and how much to an early discounting of real conditions is hard to tell. To say that business conditions had so far improved as to create a marked increase in the demand for copper would seem to be a little audacious. Recent heavy sales of copper are said to have been mostly of 'spot copper', that is, for November and December delivery, which would indicate that domestic consumers are still pursuing a hand-to-mouth policy and are not attempting to stock up in anticipation of higher metal prices. There have been several factors that have been instrumental in making for low prices in copper: the weight of the existing surplus, the added production from several new important producers, the general prevailing stagnation in business, especially in new constructive enterprises. To say that any of these elements have been so far removed as to justify the present advance would be a rather radical statement. Amalgamated's leadership of the copper list and its place as a favorite speculative issue on the New York Stock Exchange has, as is well known, nothing to do with its intrinsic value: Amalgamated's quotation around 65, with a dividend distribution of $2 per year, is one of the familiar market absurdities of Wall Street. It may be added that, if conditions are found to really justify higher levels for copper metal, the stimulus to production will be such that there will be grave danger of a sudden increase in the surplus and that it will assume within a few months threatening proportions.

The development of the Inspiration, which adjoins the Miami, near Globe, Arizona, is being pushed as rapidly as possible, and this property will be one of the next to join the ranks of the producing mines. The plant to be erected is to handle 5000 tons of ore per day; water is to be brought from Wheatfields, Arizona, where large reservoirs are to be constructed, the dams being already in course of construction and surveys made for the pipe-lines. Ray Consolidated, which is probably the most important of the group of developing coppers, from which a large output is looked for in 1912, has been producing at a rate somewhat less than was expected. Sherwood Aldrich, president of the company, who has just returned to the East from an inspection trip, explains that some low-grade ore, near the edge of the main orebody, had to be handled at this time to get it out of the way and to avoid sinking another shaft later, if it were not milled now. Next month, it is said, the Ray mill will handle 5000 tons per day, as compared with 3700 tons treated now. The average recovery is about 28 lb. of copper per ton. Ray Consolidated has been one of the active issues in the recent advance, moving up from around $12.50 to $16. Charles Hayden, of Hayden, Stone & Co., of New York and Boston, was one of the party, which has just returned from a trip, which included visits to all of the Guggenheim string of porphyries, Utah Copper, Nevada Consolidated, Ray, and Chino. Mr. Hayden is evidently much pleased with the outlook at all of the properties mentioned. The two older properties of this group, Utah and Nevada Consolidated, are prepared to produce at full capacity whenever the metal market will justify such action. The October output for Utah Copper was not so large as that for August or September, but the Nevada Consolidated made more copper than it has in any month since March. Utah produced 8,660,729 lb.; Nevada Consolidated, 5,547,131 lb. of copper.

Attention is called to the showing made by the Lake properties in 1910. Total output for Lake Michigan copper mines was 222,683,000 lb., or about one-fifth of the output of the American mines. Ore tonnage is computed to have been 10,869,561 tons, from which an average recovery was made of 20½ lb. per ton. The fact that from rock of this low content, with a market at practically 13c. for the entire year, the Lake mines were able to pay $6,240,526 in dividends, shows that not all of the skill in winning profits from low-grade ores belongs to the porphyry operators.

The better feeling in coppers has not been all confined to this side of the water: there has been an active market and higher prices in Rio Tintos, which are traded in on the Paris Bourse, and, like Amalgamated Copper shares, are favorites with the speculative element.

In precious-metal mining there is almost nothing afoot in New York. There is evidently to be a strong effort made to galvanize some life into the Porcupine issues. There has been some trading in the shares of the 'big' Dome around $40 per share, but so far the public has not followed the market with any interest.

The situation in Mexico has been so uncertain that no new Mexican mining enterprises have been fathered in New York for a long time, and recent developments seem to point to further unsettlement rather than a restoration of tranquillity. Some American interests are again becoming uneasy, and that there is reason for uneasiness is evidenced by the action of the War Department in massing soldiers upon the border and the issuance of emergency orders to troop officers. Pedro Alvarado's Palmilla mine, one of the most widely advertised properties of Mexico, about which clever newspapermen delighted to invent fantastic tales of fabulous wealth, is now ensnarled in a mass of litigation between two of the Boston promoters who took the property over from Alvarado.

General Mining News

ALASKA

Juneau

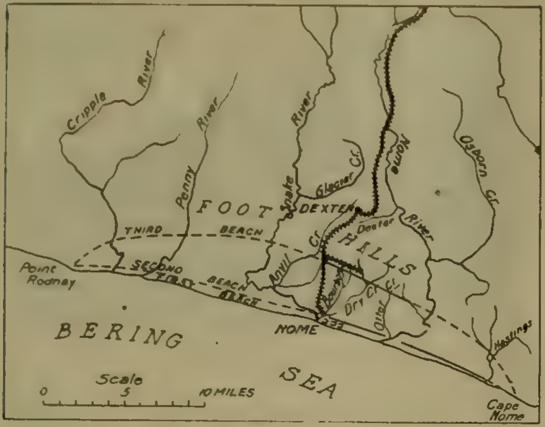
The Alaska Mexican G. M. Co. paid a dividend of 20c. per share on November 28. The Alaska United G. M. Co. paid a dividend of 30c. per share, and the Alaska Treadwell G. M. Co. a dividend of 50c. per share on the same date.

Prince William Sound

Rich ore has been found by Ralph Williams in an adit on the Shoup bay property owned by Tiffany & Boyle. The ore is said to be as valuable as that found in the cropping.

Seward Peninsula

Reports from Nome state that rich gravel has been found on the third beach line. The ore was found by H. R. Bounds, who has been prospecting on Cunningham creek. The gravel is said to extend along the old beach line for about four miles.



BEACHES AT NOME.

The Tanana

Reports from Iditarod state that Harry Johnson, Al Burke, and Jonas Bruce have found an unusually rich 'pay-streak' on the right limit bench of Flat creek.

The ground on Allen creek for five miles has been staked recently, owing to the discovery of a small nugget and rich sand by Morris R. Moon, says a report from Fairbanks. Allen creek is tributary to the Goldstream. The discovery was made on the Asia association claim.

Near Ester, Tyndall & Finn have purchased a two-thirds interest in a claim at the head of St. Patrick creek, operated by Pat McLaughlin.

ARIZONA

Gila County

(Special Correspondence.)—The experimental mill at the Inspiration is expected to start this week, and J. M. Callow, consulting metallurgist, is now at the mine and will supervise the tests. Topographical surveys are in progress at Wheatfields, eighteen miles from the mine, which is the site of the proposed dam and pumping station. The foundations of this dam are now being tested. There is practically no underground work going on at present.

Churn-drilling continues at the Live Oak, there being four drills in operation. The cutting of the station in No. 2 shaft at the 800-ft. level has been completed and driving on the orebody will be started. Driving is also being done from No. 1 shaft, on the fourth level. This drift is in the orebody.

Churn-drill hole No. 1 of the Southwestern Miami Development Co. is now 1210 ft. deep and has been in ore for the last 100 ft. The ore has the same general character and appearance as the Live Oak ore and there seems to be no doubt that it is a continuation of the Live Oak orebody. This hole is the deepest hole that has ever been drilled in this district.

At the Superior & Boston a station is being cut in the McGaw shaft at the twelfth level and exploration of the veins by diamond drilling continues. The 1000 gal. Prescott station pump is being moved from the sixth to the twelfth level. A similar pump is stationed on the tenth level and is handling 700,000 gal. of water per day, only a small part of this coming from the shaft. A. C. Stoddard, formerly associated with George Kingdon, superintendent of the Old Dominion, recently was made superintendent of the Superior & Boston, succeeding J. D. Wanvig, who resigned to accept a position with Weed & Probert. W. G. Rice, the president, has just completed a visit of inspection of the mine.

Pumping has been discontinued at the Arizona Commercial and the mine is now entirely idle. Charles S. Smith, president of the Old Dominion, who will be president of the reorganized Arizona Commercial company, recently made a visit to the property and stated that the reorganization would probably not be effected until after the first of the year. The outstanding bonds will have to be foreclosed and the property sold to the new company; and the new company will start with not less than $300,000 in the treasury.

The local management of the National Mining Exploration Co., which formerly operated the Williams and Iron Cap shafts on Copper Hill, states that the National Mining Exploration Co. in bankruptcy will wipe out its local indebtedness this week, and that the deed to the property will be delivered to the Iron Cap Copper Co. not later than December 1, after which the new company will be able to begin work.

Globe, November 23.

Mohave County

Ore assaying $200 per ton has been discovered near Mineral, about three miles south of Chloride, by Christopher Brain, according to recent press reports. The Western Railway of Arizona crosses the land. Brain is now sinking a shaft.

Pima County

Ore assaying as high as $50 per ton has been found in the Sierritas by Lorenzo Boido and R. E. Ballinger of Tucson, according to newspaper reports. Several claims have been filed.

Pinal County

Development is to be resumed at the London-Arizona mines, near Kelvin, in conjunction with the Gila Sulphide mines at Christmas, Gila county. Large deposits of smelting ore assaying about 5% copper have been prospected.

Santa Cruz County

The erection of a tube-mill and cyanide plant at the Huebabi mine, on the Santa Cruz river, soon will be completed. The property is owned by California investors. Large deposits of low-grade gold ore have been developed. The new equipment will give a capacity of 50 tons per day. Epes Randolph is reported to have an option on the Austerlitz property, of which William J. Partridge is manager, the terms providing that Partridge is to retain a quarter interest in addition to receiving $25,000 cash.

Yavapai County

(Special Correspondence.)—The Jerome Oil Co. has been incorporated at Jerome by R. A. Armstrong, T. C. Stone, and W. M. Neagle. Drilling will be started soon on the Duff mesa on the Upper Verde. Mr. Armstrong has gone to Los Angeles to purchase a drilling outfit.

The United Verde Copper Co. has purchased all of the ranches on the Upper Verde near the new smelter site. Work is being rushed on the railroad from Cedar Glade and several miles of grading has been completed. Work on the smelter will not be started for several months. W. A. Clark is now having the specifications prepared.

Prescott, November 25.

CALIFORNIA

Nevada County

The Black Bear mine, in the Moore's Flat part of the Alleghany district, has been reopened by William Gregory and J. C. Lew, who also have secured a bond and lease on the Metropolitan mine, in Grass valley, from the Reynolds estate. They will work the Black Bear in conjunction with the Metropolitan mine. The veins cross at a point 350 ft. from the mouth of the Metropolitan adit.

Shasta County

The smaller of the two smokestacks of the Mammoth smelter is being lowered to the ground. The stack was 150 ft. high and 12 ft. diam., and constructed of steel from $\frac{1}{4}$ to $\frac{1}{2}$ in. thick. The steel will be used in various departments of the smelter and mine, according to reports from Kennett. About 35 tons of steel and 5 tons of rivets were used. The stack is lowered a section at a time after the rivets are chiseled through.

Siskiyou County

(Special Correspondence.)—The River Bend M. Co. has a force of 50 men at work near Walker. The company acquired the Lou Dugget placer property about a year ago and has opened good gravel. A bond has been obtained on the Quigley bar. San Francisco people are interested in the company. The McKinley mine and mill, Yellow Jacket and Sanborn mines, in the Humbug Creek district, have been purchased by J. C. Nash, of Medford, Oregon. It is stated that development will be vigorously conducted. Work has been resumed in the Hunter mine on Prospect hill, Blue Lakes district. A small cyanide plant has been installed, and if developments continue satisfactory a reduction plant will be provided. The vein is reported 32 in. wide with ore assaying $45 per ton up. Some samples gave return of $800. The property has been opened by a long adit and 90-ft. raise. J. A. Hunter is manager. The mill at the Little mine has been remodeled and will go into commission as soon as sufficient water is available. Development is progressing at the mine. C. S. Little is manager. The property is situated on Prospect Hill. Louis McClellan has leased the Del Bondeaux claim and has started preliminary work. The management reports improving conditions at the Cub Bear mine, with development progressing steadily. The vein is 36 in. wide, with ore averaging about $50 per ton. Sixty tons is on the dump. The property is controlled by the Siskiyou Syndicate, and lies in the Salmon River district. James J. O'Connel is superintendent. The same company has developed a 4-ft. vein of ore running over $10. per ton in the Blue Jeans. An 18-in. shoot has also been opened, and is said to assay $150 per ton. Most of the placer mining companies have completed arrangements for the winter season, and with the first rains giants will go into commission on numerous holdings.

Etna, November 24.

The Hazel mine, Tom Salsbury lessee, near Hornbrook, has resumed operation. Recent rains have enabled Salsbury to use five stamps in the mill, which, with the ditches and other equipment, recently was thoroughly overhauled.

Tuolumne County

(Special Correspondence.) A body of remarkably high-grade ore has been developed in the deepest two levels of the New Albany mine, one of the group owned and operated by the United Mines Corporation. The orebody was uncovered some time ago, but the real importance of the mine did not become known on the outside until this week. Long drifts have been driven into the shoot at the 800 and 900-ft. levels and these have proved it to be large and show that the content is well distributed throughout its length. The rich streaks will go high into the hundreds of dollars per ton, and all is high milling grade. The United Mines Corporation, organized under the laws of Colorado, and having a capital stock of $5,000,000, with shares at $1 each, filed articles of incorporation in this county last week. The directors are Howell Hinds, S. M. Bond, R. A. Harmon, W. J. Rattle, Charles Babcock, W. S. Briggs, W. H. Warner, D. R. Taylor, and William C. Eakins.

The botttom of the winze being sunk 500 ft. from the mouth of the adit of the Big Four mine, which was recently bonded to R. E. Edgar of Los Angeles, is in 4 ft. of ore that is estimated to be worth a few hundred dollars per ton. No assays have been made recently, but a shipment of one carload will probably soon be made to determine the exact value of the ore. The property is situated a short distance east of the Dead Horse, near Tuolumne.

C. J. Sullivan and Frank Thomasson plan erecting a cyanide plant before long for treating the tailing and sulphide recently purchased by them from the Soulsby mine.

William Olsen, an old prospector of this district, is developing a 5-ft. vein near the south fork of the Tuolumne river, southeast of here, that promises well. Samples brought in from the property this week show countless flecks of free gold. The Dante Cinelli mine, on the Knapp ranch, near Columbia, has been bonded to E. Greenwood, and some development work is being done. It is reported that the Moccasin Creek Mining Co. contemplates the resumption of operations at its property in the near future.

Tuolumne, November 25.

Yuba County

Reports from Marysville state that Henry Appleby has started suit against the Yuba Con. Goldfields Co. for $50,000 damages. He alleges that he was crippled for life through the starting of the machinery of a dredge at Hammonton while he was engaged in cleaning a cylindrical screen.

COLORADO

Clear Creek County

(Special Correspondence.)—Ritter & Co., operating the P. T. property, have started a new shaft. A small streak of $40 gold-silver ore is being followed. A streak of ore 3 in. wide has been found in the shaft being sunk on the Neptune mine that is worth $300 per ton in gold and silver. The property is being operated by the Investors Mutual M. Co., C. F. Cabeen serving as manager. A 15-hp. whim is being installed at the Gladstone mine. The shaft is down 75 ft. C. L. Jayne is manager. A body of ore 3 ft. wide has been found on the Gem vein, 400 ft. east of the lateral run from the Newhouse adit, that is worth $90 per ton. Claypoole & Hauser have completed their contract of 1500 ft. at the Lucania adit, making the bore 6808 ft. long. L. Sternberger will put a force of men to work at once in driving a lateral east on the J. L. Emerson vein. Arrangements have been made by John Owen, manager of the mine, whereby work will be done in the Specie Payment mine through the Lucania adit. Work is now going ahead through the Two Brothers adit and one carload of ore is being shipped daily. Shipments are going out from the Harrison mine at Freeland, returns of $80 per ton in gold and silver being received in settlement. Charles Williams is manager. Work was resumed last week on the Merry Monarch mine on lower Fall river. J. W. West is manager of the property.

Idaho Springs, November 25.

(Special Correspondence.)—The Capital M. & T. Co. will carry a raise on the Aetna vein from the adit-level to surface, a distance of 1775 ft. This raise is now up 450 ft. E. Bauman is manager. Cavanaugh & Co., leasing in the Peters property on Republican mountain, has penetrated an 8-in. streak of ore that assays about 310 oz. silver per ton. M. Bonham, owner of the North Star property on McClellan mountain, shipped two tons of ore this week that milled $82 per ton in gold and silver. The vein is 6 in. wide and is exposed for 30 ft. It is reported that W. E. Renshaw, of Idaho Springs, will shortly take over the Kelly adit property on Democrat mountain and that he has announced development will be commenced. The Empire T. Co. is making ready to resume work on its property situated on Covode mountain. The adit that has been driven 2500 ft. is to be extended 2000 ft. Work will also be carried forward in the six upper levels of the Gold Dirt mine. A concentrating plant of 200 tons daily capacity is being considered. A. Harley is manager. Shipments have been started from the Eureka mine on Silver mountain. The ore is worth $65 per ton in gold and silver. Development is under way at the Pioneer mine and shipments are going out to the Golden smelter. The ore is worth $70 per ton.

Georgetown, November 25.

GUNNISON COUNTY

Development work, principally sinking the inclined shaft, will be continued throughout the winter at the Italian Mountain mine. Shipment of ore to the Salida smelter is to begin in the near future.

The Doctor mine, at the end of the Italian mountain mineral belt, is shipping ore to the Salida smelter. The ore yields about 30 oz. of silver per ton and 40 to 50% lead, according to press reports.

TELLER COUNTY (CRIPPLE CREEK)

Stratton's Independence, Ltd., has declared a dividend of 10% on its $600,000 worth of stock. This is the second dividend this year and its payment will make the distribution for the year $120,000. The development in the year ended June 30 amounted to 9186 ft., the largest since 1903, when 10,100 ft. of development work was done. The company in this period produced 1752 tons of ore, which had a gross value of $41,889, and a net value of $28,190. In addition to this shipping ore the company produced 7441 tons of low-grade milling ore which had a net value of $9502. The total net profits of the company was $37,692 for the year, against $37,467 for the preceding year.

LOGAN SHAFT, STRATTON'S INDEPENDENCE MINE.

IDAHO

SHOSHONE COUNTY

The Sunset mine, in the Sunset Peak district of the Coeur d'Alene, will be opened upon an extensive scale early next spring by William A. Clark of Butte, Montana. The property has been idle nearly twenty years. It is announced by Mr. Clark that a large force will be put to work when operations begin.

The Bunker Hill & Sullivan Mining & Concentrating Co., operating in the Coeur d'Alene, brought its total disbursements to $13,094,250 by the payment of the 190th dividend of $65,000 for November.

William T. Tracy of Galesburg, Illinois, who recently acquired the Amazon-Manhattan mine in the Sunset district near Wallace, announces that a mill and compressor will be installed as soon as the Washington Water Power Co. completes its transmission line up Nine Mile creek.

Over $2,300,000 has been disbursed among its stockholders to date by the Hecla Mining company, operating in the Coeur d'Alene. The November dividend was $20,000, at the rate of 2c. per share, bringing the total for the 11 months of 1911 to $220,000. The company is said to have sufficient ore blocked out and in sight to maintain its present output for at least five years and has about $250,000 in cash in its treasury. The company is capitalized at $250,000, in 1,000,000 shares of a par value of 25 cents each.

The Federal M. & S. Co. has declared its regular quarterly dividend of $1\frac{3}{4}$c., amounting to $210,000, on $12,000,000 of its preferred stock outstanding. This brings the total for the year to $840,000, and $6,851,250 to date. The last dividend paid on common stock of the Federal company was in January 1909.

MONTANA

LINCOLN COUNTY

(Special Correspondence.) Bringing out with him a gold brick worth about $1000, A. M. Balfour, who is operating the Blacktail mine in the West Fisher district, is in Libby and states that the gold was secured as a result of a few hours' run of the mill. The mill was only run for a short time on account of a cold spell of weather which came on shortly after starting up the machinery, but the brief run proved satisfactory. A small force of men has been at work at this property for several months breaking down ore and getting the stamp-mill in shape to run, and the short test-run that was made convinces the lessees that the property will prove to be a rich one. The mine has produced considerable gold in the past, but has never been extensively developed.

Libby, November 25.

MISSOULA COUNTY

The Success Mining Co. paid a dividend of $15,000 for November, making $60,000 paid so far this year. Another dividend of $15,000 will be paid this year. H. F. Samuels, chief owner and manager of the mine, says the property is in excellent condition, adding that there is ore to last for years above the present working tunnel.

SILVERBOW COUNTY

(Special Correspondence.)—The Butte & Superior company has decided to erect an experimental plant on its property for the purpose of practical tests of the Peterson process of smelting zinc ores. Mr. Peterson, who is a Butte man and a graduate of the School of Mines, claims that he has discovered a method of treating by electricity zinc ores in which the cost will be of minor importance. A. B. Wolvin while in this city recently had several conferences on the question of the use of the process by the Butte & Superior company, with the result that the president of the company decided to give Mr. Peterson a chance to demonstrate in a practical way the practicability of his process. The experimental plant will be constructed at once.

The Consolidated Gold & Sapphire M. Co. has had its patent on the Ruby First placer claim cancelled by the United States Land Office. A protest was filed against the issuance of the patent last summer and a hearing was had which extended over a considerable period of time, the evidence covering 800 pages of typewriting. The receiver of the Land Office reached the conclusion that the protest was justifiable. It was taken on the grounds that the company had not done $500 worth of work and that the land was non-mineral in character. The company had a dredge which was at work on some adjoining property do a lot of work and put this in as evidence to show that the required amount of work had been performed.

The claim against the Basin Reduction Works of about $240,000 which is held by the State Savings Bank of this city, has been redeemed, but just who has advanced the money is yet uncertain. The works were originally owned by F. Augustus Heinze, and nearly one year ago the property was sold at auction and bid in by the bank which held a note for the money loaned. Within a short time W. A. Clark has had experts looking over the property and it is believed that he put up the money. For some time he has been looking over various sites for the purpose of building a zinc smelter, and it seems that he has reached the conclusion that the Basin works could be remodeled and equipped at less expense than the erection of a new building.

Butte, November 24.

NEVADA

CHURCHILL COUNTY

Much of the mine equipment for the Jack Pot, at Wonder, has been ordered and the mill will be erected in the near future. It will be necessary to build about 7600 ft. of transmission line between the property and the power company's line. Among the mine machinery ordered are electrical transformers and material for the sub-station. E. S. Cunningham is superintendent for the company.

Esmeralda County

Stockholders in the Goldfield Silver Pick M. & M. Co. will have until December 16 to exchange their shares for those of the Silver Pick Consolidated Co. recently organized. At that date the stock of the old company will be withdrawn from the San Francisco Stock Exchange. In an official report to the stockholders, A. S. Haskell, of Santa Cruz, stated that the workings of the lease operated by the Golden Pick M. & M. Co. are open and in good condition to, and including, the 250-ft. level. He recommended exploring the property.

Lyon County

The Nevada Douglas Copper Co. recently made its first shipment of gypsum from the property to the Western Gypsum Co. at Reno. The former company is shipping 100 cars per day to the Western Gypsum Co., according to recent press reports. The construction of a spur track is now under way.

Nye County

Shipments from the Tonopah district last week were as follows: Tonopah M. Co., 3300 tons; Belmont, 2550 tons; Montana-Tonopah, 1033 tons; Tonopah Extension, 1008 tons; West End, 525 tons; and Midway, 50 tons of ore. In addition to these shipments of ore, the West End shipped 280 tons of old tailing. The total shipments were 8466 tons, valued at $211,650.

J. S. Austin, president of the Tonopah M. Co., is quoted as saying that the company is considering purchasing the Cain properties at Aurora, as ample cash resources are on hand. The option held on the properties, which originally would have expired December 31, has been extended.

The Tonopah M. Co. mill during last week crushed 3300 tons of ore, of an average value of $20.50, and produced 26 tons of concentrate valued at $13,000. Construction of the Tonopah Belmont continues at a satisfactory rate. The Montana-Tonopah mill crushed 1033 tons of ore.

Lander County

Many prospectors have gone to Carroll on account of reports of valuable ore being found there. The ore is black manganese, and it is asserted that a shipment of 11 tons recently netted $2700. The original discovery was made on a claim owned by Watt brothers, and by them sold to a syndicate of Salt Lake City men headed by E. A. Wall.

Storey County

The report for the year ended November 15 of the work done in the Union Con. mine shows a production of 1069 tons of ore, assaying on the average $10.33 per ton, and having a gross assay-value of $11,054.

The Ophir and the Con. Virginia mines were the only ones to see the customary activity last week. The Ophir produced 380 tons of ore, of which the average value was $53.09. In the Con. Virginia the southwest prospecting drift on the 2550-ft. level was advanced 17 ft. and now is in 317 ft. The face is in low-grade quartz. The pumps were working all week, and last Saturday the water was 295 ft. below the 2350-ft. station. No production for the Con. Virginia was reported. Little mining was done at the Union shaft and other Comstock mines.

Washoe County

The Nevada United M. Co. has started erecting a new 40-ft. head-frame and equipping its property, in the Wedekind district, with modern machinery. Charles L. Roberts, on the Pay Rock claim, has intersected the Conchay vein. Ball & Taylor have secured a lease on the City View claim, which is owned by Bales, Pettigrew & Pratt.

White Pine County

In the Zack shaft of the Ely Con. Copper Co. the miners are working three faces of ore. After many unexpected delays the Veteran mine, according to late reports, is about ready for the resumption of development work. Tests are being made in the concentrator at McGill to ascertain exactly what return is yielded by the concentrate under the present treatment, and to learn of any possible improvement in the method.

NEW MEXICO

Socorro County

(Special Correspondence.)—The October bullion production of the Socorro mines was about 35,000 oz. gold and silver, with 10 tons of high-grade concentrate, from an ore-treatment of 4400 tons. Good progress is being made on the new power-plant. Work in the lower levels of the Deadwood mines is being pushed. The mill is handling a good tonnage, partly custom ore.

A contract has been let by the Alberta M. Co. to drive 50 ft. on the vein in the Independence Jr. mine.

Most of the heavy machinery for the new power-plant of the Ernestine M. Co. has been delivered. The new 10-stamp battery is nearing completion. The bullion product for the first 10 days of November was 7610 oz.; concentrate, 9200 lb. The ore treated the past two weeks amounted to 1382 tons, yielding 115 sacks concentrate, in addition to precipitate.

A development adit was started on the vein on the Pacific mine of the Oaks Co. The South shaft has been timbered and is in readiness for breaking ore. The north working shaft was sunk 6 ft. during the week. The Treasure M. & R. Co. added two more ore-teams during the week, increasing the regular delivery to 80 tons per day.

An average of 10 tons of ore per day from the Little Charlie mine of the Mogollon Gold & Copper Co. is being delivered to the Deadwood mill. Contractors are steadily advancing the 200-ft. level west of the Trilby group.

Mogollon, November 24.

UTAH

Juab County

After a temporary shut-down, the Utah Con. M. Co. has resumed operation. William Mathews is superintendent of the property.

Work is progressing well in the prospecting drift from the main adit of the Uncle Sam mine. This drift, which runs south, is developing the ground of the Richmond & Anaconda company, of which four-fifths is owned by the Uncle Sam company. The Eureka Comstock, in the North Tintic district, will resume sinking the shaft, which now is 50 ft. deep. James Larson is manager of the property. The Grand Central last week made lighter shipments, but the ore was more valuable than usual.

Summit County

The Daly-Judge M. Co. has declared dividend No. 3, for the quarter ending December 31 and payable December 20, of 15%, which will require the distribution of $45,000. An official announcement has been made that this rate of quarterly dividends will be maintained in the future. With the announcement is a statement for the eight months ended October 31, showing that during that period the company produced 32,278 tons of concentrating ore and 5495 tons of shipping ore. The company sold 7870 tons of lead concentrate and 2385 tons of zinc concentrate. No zinc concentrate has been sold since September. The monthly averages for the eight months are as follows: shipping ore, 687 tons at $27.51; lead concentrate, 984 tons at $27.47; zinc concentrate, 340 tons at $11.06; development expenditures, $8287; mining cost, $3.55 per ton; milling cost, 80c. per ton; earnings, $16,032. The average earnings for the last three months were $23,630 per month. There was an available balance of $421,235 on November 1.

Tooele County

The Utah Con. Copper Co. has maintained shipments averaging 600 tons of ore per day to the International smelter at Tooele from the deposits in Salt Lake county, since November 1, according to a recent statement by E. P. Mathewson, general manager for the International S. & R. Co. Mr. Mathewson last week spent three days at the smelter and after the inspection said that the lead smelter should be in commission soon after January 1. He expressed gratification at the work done at the smelter.

WASHINGTON

Ferry County

Frank Ansley, manager of the White Elephant mine in the Orient district, says that a mill will be installed next spring.

The North Washington Power & Reduction Co. is erecting a pulp thickener for its mill, also a 325 hp. engine, three boilers, and a 225 kw. generator for the power plant, at its property at Republic.

(Special Correspondence.)—The Republic Mines Corporation has constructed an incline tramway, for the purpose of raising ore from the top of the main inclined shaft to a Great Northern railway spur, at a considerably higher elevation, and a switch has been put in at the Spokane & British Columbia railway depot for transferring the ore cars to the Spokane Falls & Northern railway track and facilitating shipments. Retaining walls are under construction for an auxiliary compressor plant, and a new 12 by 12-in. cylinder Ingersoll-Rand compressor, to be driven by a 75-hp. electric motor, is being placed, for reinforcing the power already in use. A smaller hoist at the main shaft has been replaced by a 6 by 8-in. double-cylinder hoist, good for 800-ft. depth. Development has been resumed.

At the Knob Hill mine a stope is being opened on the No. 3 level, at a vertical depth of 280 ft. on a pay-shoot 5½ to 6 ft. wide, the ore averaging about $30 per ton. The ore shipments are maintained at the usual rate of five to six carloads, being from 250 to 300 tons per week, all that the Trail, B. C. smelter will take.

At the Black Tail mine operations are now confined to the 300-ft. level, where a B. C. 11 Ingersoll-Rand drill is in commission on a lateral vein of 3 to 8 ft. in width.

The Gold Ledge Mining Co. has been organized by C. F. Crum, of Spokane, Washington; A. A. Booth, consulting engineer for the Hecla Mining Co., at Burke, Idaho; and John Cochrane, of Modesto, California.

Republic, November 25.

Stevens County

(Special Correspondence.)—The British Columbia Copper Co. is about to add a filter-press to the equipment of the mill for the Napoleon mine, situated between Marcus and Orient.

Orient, November 25.

WYOMING

Uinta County

At a public sale J. W. F. Volker, of Ogden, Utah, bought the Elk Coal Co. at Evanston. The company owns 2000 acres of land, eight miles of railroad which connects Elkol, the company road, with the main line, a telephone line, a church, 40 residences, a school house, a store, and complete mine equipment. The winning bid, presented by Mr. Volker, was $245,000.

CANADA

(Special Correspondence.)—The iron and steel interests are agitating for increased protection. This week a strong deputation representing the leading mills and furnaces waited on the Government with the request that it consider the claims of the industry for an increase in the tariff and in the meantime, as a temporary expedient, renew the bounty on pig iron. The Government has declared in favor of appointing a permanent Tariff Commission to report upon all questions of tariff changes, so that it is hardly likely that anything will be done in the way of increasing duties before that body is constituted. It is not unlikely, however, in view of the recent political change, that the pig-iron bounty may be restored.

Toronto, November 23.

British Columbia

(Special Correspondence.)—The British Columbia coal strike has at last been settled and the mines reopened, but probably too late to prevent widespread distress and calamity in the province of Saskatchewan, owing to fuel shortage. It is stated that stocks in the hands of local dealers are exhausted and settlers unable to obtain their winter's supply. The Canadian Government, which temporarily removed the duty to enable the West to procure coal from the American mines, has re-imposed the duty from December 6, although the situation continues extremely serious.

Greenwood, November 25.

The annual report of the Red Cliff M. Co., in the Portland Canal district, states that during the preceding eleven months 2100 ft. of development work was done. Of this work 1680 ft. was done since April. It is stated that several orebodies have been found.

Ontario

(Special Correspondence.)—Cobalt ore shipments show a steady decrease in tonnage, the figures for the first ten months of the year being 21,370 tons, as against 36,125 for the first ten months of 1910. As has been previously explained, this does not indicate a decreased silver output, as an increasing proportion of the ore mined leaves the camp in the form of silver bullion or concentrate. The La Rose Consolidated has lately considerably improved its position by new finds. An ore-shoot 6 in. wide and stated to run 5000 oz. per ton, has been found in cross-cutting on the Lawson half way up the stope from the 180-ft. level on vein No. 8. At the Princess a 2-in. vein of low grade has been cut at the 100-ft. level, and a good find consisting of a 12-in. quartz and calcite vein carrying native silver has been made on the Fisher-Eplett property. This will be sunk on immediately. The City of Cobalt has leased the King Edward concentrator at Cross Lake for the treatment of its low-grade ore. The Cobalt Lake has picked up the Cobalt vein worked some years ago at about 100 ft. from the shaft at the 160-ft. level. It runs about 200 oz. silver per ton, and large shipments are being made. The mill is running steadily, treating about 75 tons per day. The Coniagas has paid its fourth dividend for the year, of 6%, with an additional 3% bonus.

M'KINLEY-DARRAGH SHAFT IN 1908.

Toronto, November 11.

The McKinley-Darragh-Savage mines of Cobalt have declared a dividend of 10%, payable January 1. The last dividend was paid October 1. The dividend just declared will bring the disbursements to stockholders up to $2,156,521.

Yukon

The Yukon Gold Co. shut down its last dredge for the season on November 3. The Canadian-Klondyke M. Co. still is operating two dredges on the Boyle concession, and will run as long as possible. Last year the company operated until December 12. The other dredging companies are reported to have stopped operating some time ago.

MEXICO

Chihuahua

At the Adela mine, in the Roncesvalles district, mining is to be resumed on a larger scale than ever before. Work was stopped several months ago owing to the depredations of bandits in the district, but the outlaws have been suppressed by the authorities. I. E. Van Dreveldt is manager of the property.

Decisions Relating to Mining

Specially reported for the Mining and Scientific Press.

Failure to Discover Ore in Mining Discovery Shaft

The failure to discover ore in a discovery shaft sunk on a mining claim does not affect the validity of the claim or the claimant's title, where the locator subsequently found valuable ore in other workings on the claim, and where the work done in other parts of the claim where ore was unquestionably discovered was more than the equivalent of that required by the discovery shaft.

Gibson *v.* Hjul, (Nevada) 108 Pacific, 759.

Lease of Mine—Payment of Rent

At the time of making the lease of mines the lessee deposited money with the lessor as an advance payment of certain sums to become due from time to time by the terms of the lease; and the lessor could not sue the lessee to recover any sums due under the lease while a sufficient amount of such deposit remained in his hands to pay the amount due.

Patton *v.* Hamilton Coal & Mercantile Co., (Kansas) 107 Pacific, 764.

Injury to Miner by Falling Rock—Liability of Mine Operator

In an action for the death of a miner who was killed by falling rock from the roof of a tunnel, it was held competent to show that rock and earth had fallen from the roof at different times prior to the accident and at other places, for the purpose of showing the character of the ground and the necessity of supporting the roof, and as a means of conveying notice to the mine-owner and operator to the defective and dangerous condition of the roof.

Sargent *v.* Union Fuel Co., (Utah) 108 Pacific, 928.

Taxation of Mining Claims—Description of Claims

The statute of Arizona provides that the assessor in preparing an assessment roll shall describe real estate by common designation or name, and it also provides that the description shall be sufficient if the land or premises can be readily identified thereby. Under this statute the Supreme Court of Arizona held that the description of a patented mining claim was sufficient, as the name of such claim was a "common designation or name" within the meaning of the statute, and that by such name the premises might be "readily identified." The court also suggested that the practice of assessing patented mines by name has obtained too long in the territory to be questioned, and that such practice is a practical construction of the statute as the mode of assessment, and of which the courts may take judicial notice.

Territory *v.* Copper Queen Consolidated Mining Co., (Arizona) 108 Pacific, 960.

Care Required of Operator of Mine

An operator of a mine must use such care for the protection of the miners as would be exercised by an ordinarily prudent man in the same business, and he must observe the same rules in selecting the tools and appliances furnished the miners. Accordingly, where the operator of the mine selects an appliance in general use and reasonably adapted to the purpose for which it is used, a mere continuance of its use does not of itself indicate negligence, though there may be safer devices used by other operators to accomplish the same purpose. When an appliance is not obviously dangerous, but has been proved by long use to be safe and efficient, its use may be continued. An operator of a mine, like other employers, is not required to furnish the best appliances nor the safest, nor provide the best method for the operation, as such a rule might require a continued change of appliances and tools.

Cummings *v.* Reins Copper Co., (Montana) 107 Pacific, 904.

Book Reviews

Any of the books noticed in these columns are for sale by, or can be procured from, the Mining and Scientific Press.

Illustrated Guide to the Malay States. By C. W. Harrison. 333 pp. Ill., map. The Malay States Information Agency, London, 1911. For sale by the *Mining and Scientific Press*. Price $1.50.

This little volume, of pocket size, is not an ordinary guide book, though it will serve excellently for that purpose. The first chapter, over one-third of the book, is devoted to a description of the ethnology, geography, history, and present condition of the Malay States. Like the rest of the book, it is beautifully illustrated with halftones and plates in color, and will prove interesting reading even to one who has no intention of visiting the country. Chapters devoted especially to hints for travelers and motorists follow, and big game shooting has a chapter to itself. The mining industry, which is of so great importance to these States, is well treated at some length, and a chapter of tariffs, distances, and weights and measures completes the book. As a means of disseminating interesting and accurate information regarding the Malay States the book is a conspicuous success.

The Lay-Out, Design, and Construction of Chemical and Metallurgical Plants. By Oskar Nagel. 201 pp. Ill. Published by the author, New York, 1911. For sale by the *Mining and Scientific Press*. Price $2.

Opinions as to the excellence of this book are likely to vary widely, according to the purpose for which it is read. The scope of the book is wide, and the manner of treatment is somewhat popular, giving the impression that the subject matter is a compilation of descriptions which have appeared in technical journels. To one who wishes to acquire a general knowledge of methods of procedure in various lines of industry this will be most interesting and useful, and engineers will find much that is suggestive in the descriptions of plant designs for widely different types of industry. The limitations of the book are well exhibited in the chapter on the design of copper smelting plants, that topic being covered by a single paragraph of fifty words illustrated by two drawings. Similarly, the design of cyanide plants is covered by a description of the 600-ton plant of the Goldfield Consolidated which, though excellent, scarcely embodies all the principles of cyanide plant construction. Plants for chemical industries, such as sugar and alcohol making, and for peat and brickmaking, are described at some length.

Handbook of Steam-Shovel Work. Pp. 374. Ill. The Bucyrus Company, Milwaukee, 1911. For sale by the *Mining and Scientific Press*. Price $1.50.

This excellent compendium of steam-shovel practice was prepared by the Construction Service Co., chiefly by Messrs. R. T. Dana, F. M. Gaiger, Charles Houston, E. C. Wilder, A. C. Haskell, and W. T. Ball. The first four chapters are general and deal with the nature of excavation work and its problems, the general conditions and formulas, field conditions of work, and the estimating of excavations. The following chapters discuss in detail forty-five examples of steam-shovel work, handling sand, earth, glacial drift, clay, and iron ore. The information, especially regarding operation and costs, contained in these reports, is of the greatest value, and it is to be regretted that examples of the excellent work being done in the mining of copper ore and in the handling of earth and rock on the Panama canal were not included, especially since the records for capacity and cost are being made in these two places. But, as it is, the book is a veritable mine of information, and will be of the greatest interest to all engineers who are concerned with the handling of material. The usefulness of the book is greatly decreased by that common error of inexperienced authors and editors, the omission of a full and complete index. In spite of this defect, this little volume is likely to be widely appreciated.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

W. H. **Aldridge** is in Arizona.

Albion S. Howe is at Miramor, Costa Rica.

Malcolm Maclaren is at Plymouth, California.

Willis Lawrence has returned from Nevada City.

Charles W. Wright is at Genoa for a short stay.

Pope Yeatman is on his way to Ely and Salt Lake City.

E. P. **Mathewson** has been at Tooele, Utah, for a few days.

Charles F. Spaulding has returned to Denver from Parral.

Corridon H. Putnam was in San Francisco early in the week.

F. L. **Sizer** has gone to Idaho and Montana on professional business.

Edmund Juessen was at Blair recently and has returned to San Francisco.

Philip Argall, general manager of Stratton's Independence, is in London.

W. S. **Noyes** is at Shafter, Texas, expecting to return in about two weeks.

D'Arcy Weatherbe will be in London in December from St. Petersburg.

C. W. **Purington** announces that his St. Petersburg office is at 42 Moika.

R. H. **Chapman** has returned from Vancouver and has gone to Washington, D. C.

Theodore L. Lammers has gone to Alaska to examine mining property near Valdez.

E. J. **Schrader** has been confined for six weeks at St. Joseph's hospital, Nogales, Arizona.

F. F. **Kett** has gone to Nora, Sweden, as general manager for the Swedish Iron Mines & Furnaces, Ltd.

Frank Healy, of the Nevada Wonder Mining Co., is in San Francisco recovering from a nervous breakdown.

A. W. **Kean** left Birmingham, England, recently, to be with the Sefwhi Goldfields, Ltd., at Dunkwa, West Africa.

E. R. **Buckley** has engaged in practice as a consulting mining geologist, with offices at 1364 People's Gas building, Chicago.

George Schroter is in Mexico on a regular trip of inspection of the various properties of the Mines Company of America.

E. H. **Harrington** has resigned as superintendent of the Bunker Hill, in Amador county, and will be succeeded by **Elisha Hampton**.

Emile Huguenin has returned to San Francisco, having left Minas Pedrazzini, Arizpe, Sonora, Mexico, on account of labor trouble, causing a general shut-down.

J. M. **Leaver**, general manager for the Pearson company at El Paso, has resigned his position, and will devote his time to his manufacturing interests in Los Angeles.

D. L. H. **Forbes** has moved his office to 306 Manning Chambers, 72 Queen W., Toronto, Ontario, where he will practise mining and metallurgical engineering on behalf of the Merrill Metallurgical Co. of San Francisco.

James Douglas delivered an illustrated lecture on 'The Development of the Copper Queen and the Warren Mining District' at a special general meeting of the Institution of Mining and Metallurgy, on November 23 in London.

J. W. D. **Moodie** has resigned the position of general manager for the Yampa Smelting Co., and has accepted the position of general manager for the Britannia Copper Syndicate, Ltd., at Britannia Beach, British Columbia. D. F. **Sheehan**, formerly with the Copper Queen company, will succeed Mr. Moodie at the Yampa.

Market Reports

LOCAL METAL PRICES

San Francisco November 29.

Antimony	11—11½c	Quicksilver (flask)	44.50
Electrolytic Copper	14—15½c	Tin	47—48½c
Pig Lead	4.70—5.65c	Spelter	7½—8½c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50—9.75; large $7.50—8.50

METAL PRICES.

(By wire from New York.)

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Nov. 23	12.95	4.35	6.55	56¾
" 24	12.90	4.35	6.55	56¼
" 25	13.05	4.35	6.55	[illegible]
" 26	Sunday.	No market.		
" 27	13.07	4.45	6.55	55⅞
" 28	13.07	4.45	6.55	55⅞
" 29	13.07	4.45	6.55	55¾

ANGLO-AMERICAN SHARES.

(Cabled from London.)

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

	Nov. 23. £ s. d.	Nov. 29. £ s. d.
Camp Bird	1 10 6	1 10 6
El Oro	1 2 6	1 2 6
Esperanza	1 11 10½	1 11 3
Dolores	1 5 0	1 5 0
Oroville Dredging	0 5 10½	0 5 6
Mexico Mines	7 7 6	7 13 9
Tomboy	1 2 6	1 3 9

COPPER SHARES—BOSTON.

(By courtesy of J. C. Wilson, Mills Building.)

	Closing prices, Nov. 29.		Closing Prices Nov. 29.
Adventure	5	Mohawk	$ 46½
Allouez	34	North Butte	21½
Calumet & Arizona	56½	Old Dominion	45
Calumet & Hecla	—	Osceola	97
Centennial	11¼	Parrot	11
Copper Range	54	Shannon	9¾
Daly West	5	Superior & Boston	3½
Franklin	8½	Tamarack	24½
Granby	31	Trinity	14
Greene Cananea, ctf.	8	Utah Con	15¾
Isle-Royale	19⅝	Victoria	2¼
La Salle	4½	Winona	5
Mass Copper	7	Wolverine	86

NEVADA STOCKS.

(By courtesy of San Francisco Stock Exchange.)

San Francisco, November 29.

Atlanta	$ .16	Mayflower	$ .02
Belcher	.40	Mexican	3.87
Belmont	8.10	Midway	.24
B. & B.	.13	Montana-Tonopah	.92
Booth	.06	Nevada Hills	2.57
Chollar	.11	Ophir	1.67
Combination Fraction	.13	Pittsburg Silver Peak	1.15
Con. Virgina	.66	Round Mountain	.58
Florence	.70	Sandstorm Kendall	.03
Goldfield Con.	4.50	Savage	.26
Gould & Curry	.08	Tonopah Extension	1.12
Jim Butler	.22	Tonopah of Nevada	6.75
Jumbo Extension	.22	Union	1.45
MacNamara	.25	West End	.73

OIL SHARES.

(By courtesy of San Francisco Stock Exchange.)

San Francisco, November 29.

Associated Oil	$43.00	Peerless	$ 4.25
Brookshire	.50	Pinal	2.95
Caribou (New Stock)	1.37	Premier	.40
Claremont	.95	P. S. Petroleum	.20
Coalinga National	.10	Republic	.30
Con. Midway	.03	Silver Tip	.80
Cresceus	—	Sterling	1.25
Enos	.17	S. W. & B.	.18
Maricopa National	.21	Turner	.80
Midway Premier	.27	Union	99.75
Monte Cristo	1.25	United Oil	.44
Palmer	.87	W. K. Oil	2.25

Current Prices For Chemicals

(Corrected monthly by Braun-Knecht-Heimann Co.)

Prices quoted are for ordinary quantities in packages as specified. For round lots lower prices may be expected while in smaller quantities advanced prices are ordinarily charged. Prices named are subject to fluctuation. Other conditions govern Mexican and foreign business.

	Min.	Max.
Acid, sulphuric, com'l, 66°, drums, 100 lb.	$0.75	$1.00
Acid, sulphuric, com'l, 66°, carboy, 100 lb.	1.00	1.50
Acid, sulphuric, C.P., 9-lb. bottle, bbl., lb.	0.13	0.18
Acid, sulphuric, C.P., bulk, carboy, lb.	0.09½	0.12
Acid, muriatic, com'l, carboy, 100 lb.	1.60	2.00
Acid, muriatic, C.P., 6-lb. bottle, bbl., lb.	0.15	0.20
Acid, muriatic, C.P., bulk, carboy, lb.	0.10½	0.15
Acid, nitric, com'l, carboy, 100 lb.	5.25	6.50
Acid, nitric, C.P., 7-lb. bottle, bbl., lb.	0.16	0.22
Acid, nitric, C.P., bulk, carboy, lb.	0.12½	0.15
Argols, ground, bbl., lb.	0.20	0.25
Borax, cryst. and conc., bags, 100 lb.	2.75	3.85
Borax, powdered, bbl., 100 lb.	3.00	4.00
Borax glass, gd., 30 mesh, cases, 100 lb., tin lined	10.00	13.00
Bone ash, 60 to 80 mesh, bbl., 100 lb.	4.50	5.50
Bromine, 1-lb. bottle, lb.	0.55	0.65
Candles, adamantine, 12 oz., 40 sets to case	3.50	4.15
Candles, adamantine, 14 oz., 40 sets to case	4.00	4.55
Candles, Stearic, 12 oz., 40 sets to case	4.95	5.50
Candles, Stearic, 14 oz., 40 sets to case	4.65	5.20
Clay, domestic fire, sack, 100 lb.	1.50	2.00
Cyanide, 98 to 100%, 100-lb. case, lb.	0.20¾	0.24¾
Cyanide, 98 to 100%, 200-lb. case, lb.	0.20	0.24
Cyanide, 129%, 100 lb. case, lb.	0.27½	0.28½
Cyanide, 129%, 200-lb. case, lb.	0.26¾	0.27½
Lead acetate, brown, broken casks, 100 lb.	8.75	9.00
Lead acetate, white, broken casks, 100 lb.	10.00	10.25
Lead acetate, white, crystals, 100 lb.	11.75	12.25
Lead, C.P., test., gran., 100 lb.	13.00	15.00
Lead, C.P., sheet, 100 lb.	15.00	18.00
Litharge, C.P., silver free, 100 lb.	10.50	13.00
Litharge, com'l, 100 lb.	7.50	9.00
Manganese ox., blk., dom. in bags, ton	20.00	25.00
Manganese ox., blk., Caucasian, in casks, ton (85% MNO_2—¾% Fe)	42.50	50.00
Nitre, double ref'd, small cryst., bbl., 100 lb.	7.00	8.00
Nitre, double ref'd, granular, bbl., 100 lb.	6.50	7.50
Nitre, double ref'd, powdered, bbl., 100 lb.	7.25	18.00
Potassium bicarbonate, cryst., 100 lb.	12.00	15.00
Potassium carbonate, calcined, 100 lb.	15.00	18.00
Potassium permanganate, drum, lb.	0.11	0.12½
Silica, powdered, bags, lb.	0.03	0.05
Soda, carbonate (ash), bbl., 100 lb.	1.50	1.75
Soda, bicarbonate, bbl., 100 lb.	2.00	2.50
Soda, caustic, ground, 98%, bbl., 100 lb.	3.15	3.50
Soda, caustic, solid, 98%, drums, 100 lb.	2.65	2.85
Zinc shavings, 850 fine, bbl., 100 lb.	11.25	12.00
Zinc sheet, No. 9—18 by 84, drum, 100 lb.	9.75	10.75

Current Prices for Ores and Minerals

(Corrected monthly by Atkins, Kroll & Co.)

The prices are approximate, subject to fluctuation, and to variation according to quantity, quality, and delivery required. They are quoted, except as noted, f.o.b. San Francisco. Buying prices marked*.

	Min.	Max.
Antimony ore, 50%, per ton	*$20.00	$25.00
Arsenic, white, refined, per lb.	0.02	0.02½
Arsenic, red, refined, per lb.	0.07¼	0.08¼
Asbestos, according to length and quality of fibre, per ton	100.00	350.00
Asbestos, lower grades, per ton	10.00	100.00
Asphaltum, refined, per ton	15.00	20.00
Barium carbonate, precipitated, per ton	42.50	45.00
Barium chloride, commercial, per ton	37.50	42.50
Barium sulphate (barytes), prepared, ton	20.00	30.00
Bismuth ore, 10% upward, per ton	*75.00	upward
Chrome ore, according to quality, per ton	10.00	12.50
China clay, levigated, per ton	15.00	20.00
Cobalt metal, refined, f.o.b. London, per lb.	2.50	
Coke, foundry, per 2240 lb.	15.00	17.50
Diamonds:		
Borts, according to size and quality, per carat	2.00	15.00
Carbons, according to size and quality, per carat	75.00	100.00
Feldspar, per ton	5.00	25.00
Firebrick:		
Bauxite, per M	175.00	
Magnesite, per M	190.00	275.00
Silica, per M	42.50	47.50
Flint pebbles for tube-mills, per 2240 lb.	15.00	25.00
Fluorspar, per ton	10.00	15.00
Fullers earth, according to quality, per ton	20.00	30.00
Gilsonite, per ton	35.00	40.00
Graphite:		
Amorphous, per lb.	0.01½	0.02½
Crystalline, per lb.	0.04	0.13
Gypsum, per ton	7.50	10.00
Infusorial earth, per ton	10.00	15.00
Magnesite, crude, per ton	7.50	10.00
Magnesite, dead calcined, per ton	22.50	27.50
Magnesite, brick (see firebrick).		
Manganese ore, oxide, crude, per ton	10.00	25.00
Manganese, prepared, according to quality, per ton	30.00	70.00
Mica, according to size and quality, per lb.	0.05	0.30
Molybdenite, 95% MoS_2, per ton	400.00	500.00
Monazite sand (5% thoria), per ton	150.00	200.00
Nickel metal, refined, per lb.	0.45	0.60
Ochre, extra strength, levigated, per 100 lb.	2.25	3.25
Platinum, native, crude, per oz.	30.00	40.00
Sulphur, crude, per ton	15.00	25.00
Sulphur, powdered, per ton	40.00	45.00
Talc, prepared, according to quality, per ton.	20.00	50.00
Tin ore, 60%, per ton	450.00	475.00
Tungsten ore, 65%	455.00	520.00
Vanadium ore, 15%, per ton	150.00	180.00
Vanadium ore, 15%, per ton	200.00	250.00
Wolframite (see tungsten ore).		
Zinc ore, 50% up, per ton	*15.00	20.00

Commercial Paragraphs

THE THIOGEN PROCESS for the elimination of sulphur dioxide from smelter fumes has been adopted by the Penn Mining Co. at the Campo Seco smelter, and negotiations have been completed for its installation. This process was described in detail in the *Mining and Scientific Press* of September 23, 1911, by Stewart W. Young.

Various types of mine pumps are required for different conditions of service. Two of recent design, built by THE DEANE STEAM PUMP CO., of Holyoke, Massachusetts, are high-efficiency machines, direct connected by single reduction of gears to moderate-speed motors, and making in either case a very compact, yet wholly accessible arrangement. The construction is necessarily heavy, as continuity of service is the most important item of all. Similar parts are all made exact duplicates, and there are no rights and lefts to introduce confusion in the substitution of new parts. Individual valve-pots with swing bolts for the covers allow quick access to the valves. The horizontal machine is a 3¾ by 12-in. double-acting triplex outside-packed plunger pump, connected by single reduction of spur gears to a 125-hp. Westinghouse induction motor. The motor runs 495 r.p.m., the pump 53 r.p.m., and delivers 175 gal. per minute against 2000-ft. head. The water end is made of steel castings. This unit was built for the Sunnyside mine of the Utah Fuel Co. The vertical pump is one of a pair of 7 by 10-in. triplex, single-acting, built for the Cleveland Cliffs Iron Co. Each is to be driven by a 50-hp. General Electric induction motor through a single reduction of herringbone gears, which make a smooth, quiet-running combination of high efficiency. The motor runs 490 r.p.m. Each unit delivers 300 gal. per minute against 400-ft. head. Either of these pumps, as shown by careful tests, will give an efficiency of 85% under actual working conditions; and, with proper care, the efficiency can be maintained without the gradual falling off that occurs in some other types.

Recent Publications

QUARTERLY OF THE COLORADO SCHOOL OF MINES. Vol. 6, No. 3. Pp. 23. Colorado School of Mines, Golden, Colorado, October, 1911.

PRODUCTION OF COAL IN THE UNITED STATES FROM 1814, THE DATE OF THE EARLIEST RECORD, TO THE CLOSE OF 1910. U. S. Geological Survey. Washington, 1911.

PHOSPHATES. PART I.—METALS AND NONMETALS EXCEPT FUELS. By R. W. Richards, G. R. Mansfield, H. S. Gale, and Eliot Blackwelder. U. S. Geological Survey Bull. 470-H. Pp. 115. Ill., maps. Advance chapter from 'Contributions to Economic Geology.' Washington, 1911.

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EDITORIAL

APPRECIATION of copper shares has been the natural result of the increased price of copper, and the market shows a firmer tone.

RICH gold deposits in the Assuan region are the objective of the Star of Egypt Mines Company, Limited, recently organized in London. Strange to say, it has not yet been claimed that these are the mines of Ophir.

AN excellent type of skip is described elsewhere in this issue. It was designed by Mr. Willis Lawrence for use at the Florence mine at Goldfield, while manager for that company. It is unfortunate indeed that this issue must also chronicle the total destruction of the Florence mill by fire, early in the week.

AUSTRALIA possesses large unsettled areas in its Northern Territory, and during the present year several parties have been sent out by the Government to explore that little known area. It is not probable that all the important mineral areas of Australia have yet been discovered, and it is to be hoped that the explorations now in progress will be fruitful of result.

THE part which Great Britain played in the recent Moroccan negotiations was recently analyzed by Earl Grey, and the fact was disclosed that the situation was more serious than was generally supposed earlier. The action of the foreign secretary in the crisis has been unsatisfactory to the radical element in the ruling party, and it is not impossible that they may be able to bring about his retirement, as Mr. James Bryce has already been suggested as a possible successor.

IN our 'Discussion' column this week Mr. W. H. Storms outlines plans for the work of the State Mining Bureau and urges that all members of the mining fraternity in California give steadfast support to the Bureau. We heartily second Mr. Storms' appeal. The Bureau is for the purpose of serving the best interests of those engaged in the mineral industry. By their cordial support, generous aid, and intelligent sympathy and interest they can make it of the highest possible service, by their neglect they can render its efforts of little avail. Boost, gentlemen.

CONDITIONS in China continue much disturbed, the latest occurrence of note being the abdication of the Prince Regent and the appointment of a Manchu prince and a Chinese statesman as joint guardians of the throne. Apparently Yuan Shih-kai is practically in supreme command of the central government and appears to be making good progress in subduing the rebellion. Internationally the situation is serious, though little of this appears in the daily journals, as strict diplomatic secrecy is observed. It is fortunate for the United States that its interests are in such capable hands as those of Mr. William J. Calhoun, our Minister to China, who is ably aided by experienced men in Chinese affairs.

INVESTMENTS, whether in gold mines or in corner groceries, possess perpetual interest. Elsewhere in this issue Mr. Morton Webber discusses gold mines as investments in a way that is novel and original. The matter may be regarded from other viewpoints, however, and not every investor will acquiesce in designating as a "blessing in disguise" a method of management which conserves dividends, in the fear that he may unwisely spend them. Mr. Webber's contribution is provocative of thought, and we hope many of our readers will be stimulated to discuss the matter further.

MUCH interest has been aroused by the recent acquisition of control in the Live Oak Development Company by Mr. J. D. Ryan of the Amalgamated Copper Company, and the suggested possibility of the inclusion of the Inspiration Copper Company. Various constructions are put upon the significance of such a move, but, on the whole, it looks very much as if "those who came to scoff remained to pray," and that an initial disbelief in the real importance of large bodies of low-grade disseminated copper ores has altered into a desire to secure a prominent place in this field before it is too late.

SUPREME COURT decision, at Washington, affirming the decision of the Circuit Court in the case of the Stracey coal land claims in Alaska definitely establishes the principle that power of attorney locations of mineral lands are invalid. On the other hand, Mr. Walter L. Fisher, Secretary of the Interior, is evidently bent upon constructive legislation which will lend itself to proper development. His address at Chicago before the American Mining Congress, given in abstract in these columns recently, has been published in full as Bulletin 36 of the Bureau of Mines. It is accompanied by an excellent map showing the mineral resources of Alaska, and both as a source of accurate information and as an authoritative pronouncement of a wise and definite policy, is a notable publication.

CRIPPLE CREEK, at least, had cause for Thanksgiving this year. The greatly increased flow of water developed last month in the deep-drainage adit, known as the Roosevelt tunnel, appears to be persistent, and by December 1, the flow from the mouth of the adit was 8500 gallons per minute. From the south drift on the C. K. & N. vein a flow of 3500 gallons per minute is obtained, and an additional 2000 gallons per minute from the north drift. This corresponds to a rate of recession of the water-level of 4½ inches per day. During November the advance of the main heading, 245 feet for the month, was the highest yet obtained. The growing effectiveness of the drainage adit is most encouraging, deep-level development in the district will be stimulated, and the outlook for next year is correspondingly bright.

SPOKANE members of the American Institute of Mining Engineers have formed a local section, with Mr. R. S. McCaffrey as chairman, and interesting papers by Messrs. H. W. Newton and C. A. Stewart were read at the initial meeting. The rapidity with which local sections of the Institute have been organized is evidence of the service which they can be made to render, and it is to be hoped that wherever a sufficient number of members can be gathered together, sections will be formed and frequent meetings held. The technical discussions are of the greatest service both in crystallizing the ideas of the participants and in obtaining an accurate perspective in viewing a subject, and the usefulness of any paper is greatly increased by thoughtful discussion of its subject matter. Much good, both to individuals and to the profession, should result from sectional meetings, properly conducted.

DECORATION of Messrs. Rossiter W. Raymond and G. F. Kunz with the Order of the Rising Sun by the Emperor of Japan, is worthy recognition of distinguished and honorable professional careers and another token of the high esteem in which the Japanese hold scientific and professional work. It was a particularly gracious courtesy to present the decorations during the visit of the American Institute of Mining Engineers. As our representative with the party relates in another column, every possible arrangement has been made for the comfort and pleasure of the visitors, and the Japanese evidently feel keenly that mutual acquaintance is the best possible basis for good understanding between nations. The party returned to San Francisco on the *Siberia* on Thursday, enthusiastic over the reception which they had received in the land of chrysanthemums, and next week we shall describe at more length the events of their journey.

The President's Message

The annual message of the President to Congress was read before that body on Tuesday. Like most such messages, it is lengthy, even prolix, and the average citizen is likely to content himself with a perusal of the abstract of the document which the daily journals are usually kind enough to provide. But the difficulty with an abstract is always that in selecting which portions to omit and which to retain, the abstractor is guided by his own opinions or prejudices, and is thus enabled to produce an abstract either progressive or reactionary in tone from a message that may be neither. In this case the document is entirely devoted to the question of large corporations and the Sherman law, and following the recent pronouncement of Mr. Theodore Roosevelt upon the same topic, is of great interest. Mr. Taft is an enthusiastic supporter of the Sherman law, which was passed over twenty years ago, lay in abeyance for a long time, and has only comparatively recently proved an effective instrument in the control of large aggregations of capital, and he is opposed to any attempt to secure its amendment. Progress in industry during the past twenty years has been revolutionary, and that a law framed at that time by men who doubtless only imperfectly understood the problems involved, is the best possible law to meet present conditions is remarkable, if true. Nor would the final result in the case of the American Tobacco Company seem to be as effective as Mr. Taft regards it. Court orders to a corporation to dissolve into fragments and to the fragments to compete with each other are academic triumphs, but industrial futilities. The essence of competition is lack of information, information as to cost of raw material, methods of manufacture and sale, and selling costs and prices. This is the kind of competition that is effective as an economic factor, and it is idle to suppose that the dissolution of the American Tobacco Company into a smaller new company of the same name, Liggett & Myers Tobacco Company, P. Lorillard Company, R. J. Reynolds Tobacco Company, and others, will be effective in restoring this kind of competition. The organization of enterprises into single large units commonly known as trusts, is for a variety of purposes, among which is the securing of the economy of large-scale operation and the exchange of information which leads to the elimination of competition in the true economic sense. Dissolving a large 'trust' into smaller units removes the economy of large-scale operation, but has little effect on the interchange of information, and what result can accrue beyond a slight increase in production and selling costs, is difficult to see. It appears very much as if, in the Tobacco case, the shadow had been secured, but not the substance. In following such a line of supposed progress as this we are only getting farther into the bushes, the way does not be in that direction. In economics 2 + 2 + 2 differs as little from 6 as it does in mathematics. When it is clearly recognized that a large corporation which controls the production of any of the necessities of life and thereby draws support from every consumer is therefore rightfully subject to the scrutiny of the great body of consumers as to its conduct of business and the profits which it secures, a notable step in advance will be made. This is already recognized in the case of life insurance corporations, but the principle is of universal applicability and with its general recognition will come a readjustment of relations that will result in new methods of business conduct and great good to society as a whole. But meanwhile, we suppose, corporations will for awhile continue to be subjected to the 'slicing process,' while the stock market performs arpeggios and speculators rejoice.

Enemies of Society

War news from China, Tripoli, and Persia was entirely overshadowed at the close of last week by the announcement that J. J. and J. B. McNamara, then on trial at Los Angeles for the dynamiting of the *Times* building and the Llewellyn Iron Works, would plead guilty to the charges and throw themselves upon the clemency of the court. For the benefit of our many readers who, on mountain and in mine, are engaged in the search for the treasures of Nature and give little heed to the far-away doings of men, it will be useful to briefly review the history of the case.

The *Times* is a well known daily journal, published in Los Angeles by Mr. H. G. Otis, who is perhaps even more widely known for his opposition to labor unions and union labor, an opposition in which he frequently exhibited more zeal than discretion. On October 1, 1910, the *Times* building was destroyed by the explosion of a bomb, and twenty-one men were killed. Suspicion immediately was directed toward labor union members, and inquiries were pursued so successfully that on April 12, 1910, J. B. McNamara and O. E. McManigal were arrested in Detroit and ten days later J. J. McNamara, who is secretary of the International Association of Bridge and Structural Iron Workers, was arrested in Indianapolis. The three were taken to Los Angeles, where McManigal made a sworn statement before the Grand Jury to the effect that J. B. McNamara dynamited the *Times*, while he himself had dynamited the Llewellyn Iron Works, on December 25, 1910. Indictments were returned, and the trial of James B. McNamara finally began on October 11. On December 1 the announcement was made that both McNamaras would confess, as a result of the discovery of the bribing of three of the jurors by the defense. On December 5, J. J. McNamara was sentenced to fourteen years' imprisonment and J. B. McNamara to imprisonment for life.

So far as these men are concerned this ends the case, but, so far as society is concerned, it is only really begun. Many important points are as yet undecided. In the past five years buildings and other steel structures erected by non-union workmen have been subjected to attempts at destruction by dynamite, the total number thus injured being greater than is generally supposed. It is inconceivable that all these cases have been due to the private initiative of desperate men, and the confession of the secretary of a steel-workers' union to having procured the destruction of a non-union iron works opens a field for an inquiry vitally concerning the security and safety of society as a whole. Another phase of the matter is that Mr. Clarence Darrow, a widely known and respected attorney who has been prominent in trials where the interests of laboring men are involved, who conducted the defense of the accused men, appears to have been cognizant of their guilt from the beginning, and yet was a party to the creation of a defense fund by assessing every member of labor unions throughout this country and Canada. For this insult to, or, more accurately, crime against every honest workingman, Mr. Darrow now stands discredited in the eyes of the world.

So much regarding this matter is not yet clearly understood that it is unsafe to generalize as yet. But one feature is brilliantly clear. This is not a case of labor against capital, of workingmen against corporations, it is a case of the people against enemies of the people. We have often referred to the tendency in the development of modern society toward the agglomeration of units. This is a concomitant of evolution, and is well exhibited in the physical world, where from simple one celled organisms evolution has built up the multi cellular, complex, highly specialized organisms, such as the higher types of plants and animals. Similarly men, from action as individuals have developed group action, with as beneficial results as in the development of plant and animal life. Labor unions, corporations, and the many other forms of aggregate activity are evidences of development therefore, only their activities must be properly directed so as to obtain the maximum of benefit. It is not our purpose to discuss here the advantages and disadvantages accruing from this development, other than to refer briefly to the most important of the latter. And that is the obscuring of the bad unit in the larger aggregation of units. This is recognized in the common saying that "corporations have no souls," and constitutes a real menace to society. Labor unions are both desirable and necessary to secure the interests of workingmen. Corporations are necessary and desirable in order to conduct business in accordance with modern development. But a scoundrel and thug is no less a scoundrel and thug, whether he be an officer of a corporation or labor union, or a human wreck, skulking in some dark alley. Society asserts its right to protect itself against such men. The silly talk of magazine paragraphers that these actions are evidences of a class war is wicked in its inherent folly and its appeal to unreason. Crime is crime, and universally recognized as an injury to the interests of society, whether it exhibit itself in smashing the skull of a late way-farer for the few dollars in his pockets, in dynamiting a non-union building, or in ruining a competitor by methods less obviously criminal, but no less so in fact. And society must be rid of crime, to protect itself. It is idle to say that crime is necessary to procure good ends. Men organize into political parties to advance what they conceive to be their best interests, and find it quite unnecessary to poison the opposition candidate or to blow up the convention hall. We are making but slow apparent progress in the solution of social problems because these problems are new and difficult, but we are making progress, nevertheless, though not by the use of criminal means. Crime can no more tend to good ends than grapes can be grown by the use of gunpowder. The mistake lies in allowing the criminal laborer to be identified wiith the cause of labor and the criminal capitalist with the development of big business. Unremitting watchfulness is necessary, for the unscrupulous man naturally is enabled to make himself prominent, being free from ordinary restrictions. It is perfectly safe to say that not only the majority but nearly all workingmen are naturally honest and industrious and contain just as much human nature to the square inch as the average of society. They should be the first to recognize the fact that leaders such as these are enemies of society as a whole, and of workingmen in particular. In the physical organism bad cells, if let alone, give rise to a cancer that destroys the whole. The only salvation is to use the knife freely. And that is the present need of society; cut out the rotten spots, whether they are found in Wall Street, in labor councils, or in dens of infamy.

Marysville Dredge No. 4

By Robert E. Cranston

Editorial Introduction

The Marysville Dredging Co. began operations in 1905 under the direction of R. E. Cranston, who is at present consulting engineer for the company. The property of the company joins that of the Yuba Consolidated Gold Fields on the west and comprises about 1200 acres, of which about one-half is dredging ground. The Yuba Consolidated company owns about 3000 acres of dredging ground. The gravel of both is similar in character and averages about 60 ft. in depth. The depth is due to the tailing from the extensive hydraulic mining which formerly was carried on for years along the headwaters of the Yuba and tributary streams. The hydraulic tailing on the Yuba basin ranges in depth from 10 to 40 ft., and overlies the old river gravel in which the greater part of the gold recovered is found, though the tailing also carries a small amount of gold. The bedrock of the gravel deposit is of volcanic ash, similar in character to that of the Oroville district. In some places gold was found below the bedrock when drilling prospecting holes, but usually the volcanic ash was found to rest on the true bedrock. The gold sometimes forms several pay-streaks in the lower gravel, and in dredging part of the soft bedrock, which is similar to false bedrock found in other districts, is usually dug. The gravel in the Yuba basin averages in value from 10 to 30c. per cubic yard. Both of the companies operating in the Yuba basin coöperate with the United States Débris Commission in the construction of walls to control the flow of the Yuba river near Daguerre point. Two parallel walls, 30 ft. high for a length of about two miles, and forming a channel about three-quarters of a mile wide, have already been constructed from the dredge tailing.

On the property of the Marysville Dredging Co. a small town known as Marigold was established by the company, and comprises, besides the repair shops and company offices, a number of dwellings occupied by the employees and their families. The company put two California-type dredges, having buckets of 7½-cu. ft. capacity, in commission in 1906, but both of these boats have since been shut down. A third dredge was constructed in 1909, and put in commission in August of that year. The company now has two dredges operating. The following description of the new dredge, installed this year, is furnished by R. E. Cranston.

Dredge No. 4.

Lumber for dredge No. 4 began coming in about the middle of September 1910, and work on hull construction was begun soon after. The dredge was put in commission April 1, 1911. The lumber used was Douglas fir furnished by the Eastern & Western Lumber Co. of Portland, Oregon. The dredge was designed by the engineers of the Marysville Dredging Co. The General Electric Co. furnished the electrical equipment, the Abner Doble Co. the pumps, the Robins Conveying Belt Co. the conveyor, the Boston Woven Hose & Rubber Co. the belts, and the Union Iron Works Co. of San Francisco built the main dredging machinery from the dredging company's plans and specifications. Taylor Iron & Steel Co.'s steel was used for the bucket line, Bethlehem steel for the larger and Columbia steel for the smaller castings, and Bethlehem forgings were used for the shafting. The construction of the hull and installation of the machinery was under the direction of the company's engineers.

The hull is 115 ft. long, 58 ft. wide, and 8½ ft. deep over all. Aft of the well is a 4½-ft. overhang on each side. The side planking is 6 by 8 in., the bottom 4 by 14 in. laid athwartships, and the deck planking is 4 by 6 in., laid fore and aft. The bulkheads are solid and built up of 6 by 12-in. timbers. The floor-beams are 8 by 12 in., the thwartship timbers 10 by 14 in., the clamps 10 by 14 in., and the deck-beams 8 by 10 in. All seams are calked with oakum and then filled with pitch. The inside of the hull and all timber joints were treated with hot tar. The outside is painted with mineral paint.

The four main timbers of the bow gantry are 16 by 20 in., the cross-braces 14 by 14 in., and height of the cap above deck is 37 ft. The cap is built up of two 24-in. I-beams, 100 lb. per foot. The total weight of the cap is 12,700 lb. The two upright timbers of the stern gantry are 20 by 20 in., the middle timber 14 by 20 in., the cross-timbers 14 by 18 in., and the height above deck 57 ft. The cap is a box girder built up of 6 by 6 by ½-in. angles, and ⅜-in. plates, and weighs 6430 lb. The upper chord of the main truss is 16 by 18 in., the posts and braces 16 by 16 in. Under the bucket-drive the posts are 16 by 20 in. and are capped with a heavy steel casting which carries the driving machinery. The truss rods vary from 2 to 3 in. The housing joists are 3 by 12 in., the studs 6 by 6 in., the side covering 1 by 4 in., tongued and grooved, the deck 1½ by 6 in., tongued and grooved. The first upper deck is 17 ft. above the main deck, and the second upper deck is 30 ft. above the main deck. There is a 15-ton traveling crane supported by 12 by 12-in. posts and 8 by 8-in. braces, with 12 by 12-in. caps. This crane will hoist 30 ft. above water-line and covers all the machinery of the bucket-drive.

The digging ladder is of the lattice type, is 115 ft. long, 4 ft. 7½ in. wide, and has a maximum depth of 8 ft. Its total weight is 94,400 lb., and is built up of four sections. The girder is built up of 5 by 5 by ¾-in. angles, ½ by 28-in. side plates, ½-in. bulkhead plates, 5 by 5 by ½-in. side-brace angles, 5 by 5 by ⅜-in. bottom-brace angles, 5 by 3 by ⅜-in. top-brace angles, ¼-in. apron-plate covered with ¼-in. removable liner-plates, and ½ by 8-in. chafing-plates; ⅞ and ¾-in. rivets are used. The stack ladder is also of the lattice type, is 140 ft. long, 4 ft. 4 in. wide, and 7 ft. deep. The total weight is 24,000 lb. and is built up in four sections. The girder is built up of 4 by 4 by 7/16-in. angles on top, 4 by 4 by ⅜ in. on bottom, 2½ by 2½ by ⅜-in. side-brace angles, the same for top and bottom braces, and a No. 14 steel cover-plate. The rivets are ¾-in. diameter. The stacker-belt is 283 ft. long, 32 in. wide, and 7-ply. It is driven by a 35-hp., 600-r.p.m., 440-volt motor, at a speed of 350 ft. per minute.

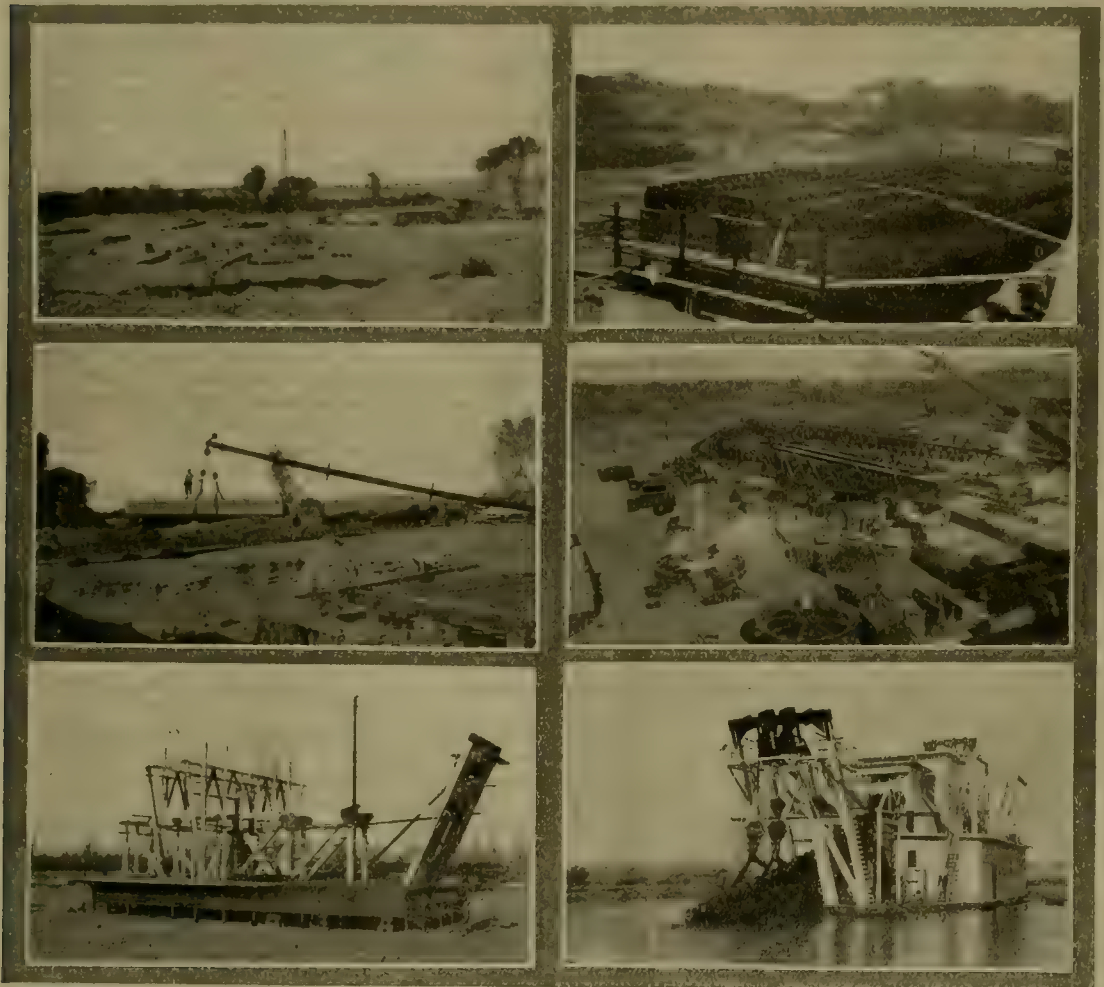
There are 84 buckets in the line, each made up of a cast steel base, pressed steel hood, manganese lip, bushings, and insert plate, and high-carbon, oil-tempered, forged steel pins. The base weighs 1527 lb., the hood 150 lb., the lip 280 lb., the insert plate 85 lb., the pin 160 lb., and the bushings 19 lb. The pitch of the buckets is 36 in.; they have two eyes in front and one hub in the back. The front eyes are each 4 in. wide, and the hub is 16¾ in. long. The pressed steel one-piece hoods are ⅜ in. thick, and the pins are 5¼ in. diameter and 25 in. long, of the L type.

The ladder rollers are made of cast chrome steel, 14 in. diameter, 2 ft. 9 in. long, with 5-in. diameter steel shafts. The weight of roller and shaft is 1140 lb. The upper tumbler, complete with wearing plates, weighs 15,500 lb. It is six-sided, each face being fitted with a removable wearing plate, cast of nickel steel. It is fitted with a 17-in. diameter, hollow, forged, nickel steel, oil-tempered, and annealed shaft, held in place by four keys, two at each side, 90° apart. The lower tumbler is cast in two halves and weighs 8320 lb. It is six-sided, has wearing-plates, and is fitted with a 12-in. hollow, forged nickel steel, oil-tempered, and annealed shaft.

The bucket line is driven through the upper tumbler by means of two gears at each end of the shaft, these gears being 12 ft. in diameter, 10-in. face, 2¾-in. pitch, and each weighing 10,200 lb. The intermediate pinions are 20 in. pitch diameter, and are fitted to a 9 in. shaft. The intermediate gears are 63 in. pitch diameter, 2½ in. pitch, and 8½ in. face. The pulley shaft pinions are 12 in. pitch diameter, and fitted to a 6 in. shaft, to which is also keyed the main drive pulley, 8 ft. in diameter and 25½ in. face. The digging motor is 200 hp., 440 volts, 600 r.p.m., variable speed type. At maximum speed it will drive the bucket line at the rate of about 22 buckets per minute. Besides driving the bucket line this motor also operates the ladder hoist, through a Moore & White clutch. The total weight of the ladder hoist is 39,000 lb. The base is built up of four 30 in., 120 lb. per foot, I-beams. The pulley shaft, which also drives the bucket line is 5⅞ in. diameter, and runs at a maximum speed of 215 r.p.m. The drum shaft is 9½ in. diameter, and the diameter of the drums is 48 inches.

The main winch weighs 23,275 lb., and is driven by a 25-hp., 600-r.p.m., 440-volt, variable-speed motor. There are seven drums, each operated by a direct-acting clutch. An electro-magnetic clutch is provided on the pulley-shaft to take up shocks. Gearing is provided for two speeds, the high speed driving the drums at 9 r.p.m., and the slow speed at 3 r.p.m. Two steel spuds are used; the total weight of each being 39,000 lb. The spuds are 61 ft. long, 3 ft. deep, and 2 ft. wide. The revolving screen is 36 ft. long and 6 ft. in diameter. The plates are ½-in. thick, and are perforated with ⅜-in. holes. It is on a grade of 2 in. to the foot, makes 7 revolutions per minute, and is driven by a 50-hp., 600-r.p.m., 440-volt motor.

The gold-saving tables are built of ⅛-in. steel, have an area of 2100 sq. ft. and a grade of from 1½ to 1⅝ in. per foot. Water is furnished by three centrifugal pumps. The high-pressure pump is direct connected to a 100 hp., 900 r.p.m., 440 volt motor. It has a capacity of 3200 gal. per min. under a head of 68 ft. The discharge pipe of this pump is 10 in. and the suction 12 in. The low pressure pump is direct connected to a 35 hp., 600 r.p.m., 440 volt motor. It has a capacity of 3900 gal. per min. under a 25 ft. head. The discharge pump is 12 in. diameter and the suction 12 in. The fire pump is direct driven with a 10 hp., 1800 r.p.m., 440 volt motor. The discharge is 2 in. and the suction 2½ in. The ladder-hoist lines are 1⅛ in. 6/19 plow-steel hoisting rope. The stacker and spud hoist lines are ¾-in. The swinging and head lines are 1 in., and the guy-wires vary according to the requirements. The ladder-line sheaves are 48 in. diameter, the spud, stacker, and swinging-line sheaves are 21 in. diameter. The buckets hold 8.6 cu. ft. of water, and the average digging capacity has been about 150,000 cu. yd. per month.



PHOTOGRAPHS SHOWING VARIOUS STAGES IN THE CONSTRUCTION OF MARYSVILLE DREDGE No. 4.

All of the coal-bearing rocks of the Appalachian field are of Carboniferous age. The Carboniferous in turn is subdivided into Pennsylvanian or Upper Carboniferous and Mississippian or Lower Carboniferous. The upper beds of the Lower Carboniferous are slightly coal-bearing in Virginia, and to a less extent in Tennessee. The main coal-bearing rocks of the Appalachian field are all of the Pennsylvanian age. Again, the Pennsylvanian may be divided into Pottsville or lower Pennsylvanian and post-Pottsville or upper Pennsylvanian.

Conservation of Investments in Gold Mines

By Morton Webber

The advance in the art of gold mining due to the practical application of modern engineering principles has been as great as in other industries, and yet there is none so discredited by the general public. That such is the case is strange, if viewed from a broad standpoint, and it is hoped that the dissecting of various causal conditions which are, with one radical exception, created and external, will enable the prudent investor to understand the fundamental necessities for successful investment. In respect to the foregoing anomaly, can those interested in the building of ships, various electrical devices, or the production of textiles, estimate with confidence the selling value of their product, even one year ahead? They can neither safely forecast the marketing of their product, nor make reliable estimate of the cost of their raw material. In point of fact, the gold industry is immune from nearly all the mutations of trade, especially competition and overproduction. In respect to mining, the majority of laymen prefer an investment in coal or copper to gold mines, although, in the last few years, phenomenal fluctuations in both have occurred. Gold being the standard, its price is $20.67 per ounce, and will remain so until another standard is chosen.

The administration of a standard mine makes paramount the existence of ore reserves that are fully blocked out and the net profit computed on the basis of past costs. The tonnage of the reserves varies from three to five years ahead of the crushing requirements of the mill, variations of reserves being largely subservient to the lateral and vertical opening up of profitable orebodies, against consumption. If a hypothetical example be taken of a mine that exhibits an ore reserve fully blocked out to the extent of four years supply, and equal in value to the past average assay, it will be seen that the profits of the future are assured without reasonable chance of loss, to the extent of that duration. The profits afterward that may be obtained from subsequent reserves may be considered; but the important point to the investor is that his capital, in event of the mine paying 20% in dividends per annum, is definitely assured, less interest, to the extent of 80%. The balance of 20% is represented by orebodies below the lowest level, and lateral possibilities; which are not computable assets. If the bottom of the mine is sound and the breast of the drifts are in good ore, the small proportion of capital so allocated may reasonably be expected to have a good return.

Ignoring the created and external disadvantages, is there any other industry that can show such an assured future, and, moreover, for such a long duration? Is there any who can say: "My capital is secured to 80%, my profits are guaranteed for four years, the selling value of the product will always be the same, and, moreover, if it is possible to reduce the cost of production, that reduction will be tantamount to extra profit, and I will not be subjected to underselling by others who likewise are able to reduce production costs?"

The foregoing, to use a stock expression, has shown the 'bull' side, as I have ignored the disadvantages which, as stated, are, with the exception of one radical demerit, purely created and external. The 'bear' side will now be treated, which, in the present condition of mining finance generally outweighs, to the layman at least, the advantages before presented.

The most important features are the methods of capitalization, and want of adequate amortization of capital, which are interdependent. Because of its destructive nature, there is no industry where the necessity for legitimate low basis of capitalization is more pronounced, and there exists no industry where the necessity is, in general, more ignored. As mining is destructive, no mine is a financial success until it has refunded its capital entire, plus interest at a rate commensurate with the risk, and when this is accomplished, the property should exhibit sound indications of future life. As this is a fundamental condition of the industry the uphill fight is obvious that even the finest mines must face when saddled with excessive capitalization; and what is habitual, being burdened with shares they are expected to pay dividends upon, when, in point of fact, they do not represent money expended in development or equipment.

For example: A mine is capitalized at $1,000,000; the company possesses a really good property, well equipped and managed, and reported on by a mine valuer of reputation. The engineer (in too many cases) reported on the mine as a mine and not as to the profit in the orebodies, against the automatic destruction of $1,000,000. The question of profits now comes up, and the mine goes on, year after year, making a clear gain of $100,000, sufficient to yield 10% over and above cash reserves. It is evident that if the regular dividing of such material profits continues for several years the company would become accredited in the mind of the public. If this regularity continued until the fifth distribution of $100,000, and at that time there were four years' ore reserve in sight, it is probable that the stock would be quoted at least at par. Four years' profits assured is a long time in the mind of the public, although from a valuation standpoint duration is unimportant; it is percentage of market valuation that is basic, and 40% is in most instances too little. Sixty per cent is too much to pay for the future of most developed mines, if the investor would be guided by experience and not be misled by exceptions, as, for example, a South African banket, and a replacement deposit where strict ore-blocking is difficult.

If the ore-shoot pinches out vertically and laterally by development in the sixth year, which is the consumption for the tenth, the position summarizes: Nine years at 10% dividend will equal $900,000 plus the market valuation of the plant, which will vary from zero up, depending on efficiency and location. Any profit derived from the extremities of the mine, together with the marketing of plant, may well be reckoned as being absorbed by fruitless subsequent prospecting and winding-up charges; it is surprising the money that has been lost in this respect on the termination of a mine. To recapitulate: The company shows a loss of $100,000, despite a nine years' period of apparent prosperity. The loss in reality is materially greater, for the accumulative interest problem must be considered, the position being only eight payments of $100,000 carrying cumulative interest from eight years down to one year as distributed, against cumulative interest on $1,000,000 for nine years *throughout*, which is from date of inception until the last dividend payment, when the calculation terminates. Taking cumulative interest at 4% in both cases, the total loss is increased to $363,036; the cumulative interest loss alone amounting to $263,036. If the company had been able to have actually refunded the total capital, just taking out of the ground as much as put in by capital, the loss through interest on $1,000,000 would be $279,636; cumulative interest on the capital for ten years being $480,240 and cumulative interest on the nine distributions of 10% amounting to $200,604. The difference in one year against the mine, to make plain, is owing to the fact that the first dividend is only paid to the shareholders at the termination of the first year. The question of cash in hand is ignored to promote facility in explanation, and is immaterial, because the conserving of finances would be automatically succeeded by dividend reduction. Very few investors appear to appreciate the magnitude of the cumulative interest problem.

If the above example be applied to a shipyard or manufacturing plant similarly capitalized, and distributing the same rate of profit, it is incontestable that the investment would be a genuine financial success and, being *constructive*, might go on indefinitely, depending on trade. But because, as a fundamental, the mining done by the company is *destructive*, a loss eventuates, owing to the capital destroyed, plus interest loss, in the removal and treatment of each ton of ore, which is greater than the net profit realized from the mining and treatment of that ton.

In dealing with capital amortization the latent disadvantage of the industry is seen, in that each unit of ore exhausted is responsible for an automatic destruction of capital. The heavier the capital and the less the total ore in a mine, the greater the destruction per unit, and conversely. An amortization rate is therefore the percentage of dividend that can be only regarded as refunded capital; and if so treated, provided that the mine has been legitimately capitalized, will, on the mine being worked out, be found to have returned the original capital plus interest. A shareholder may invest in a mine that may yield 20% for 20 years. If he spend dividends as received, on the termination of the mine he will have neither capital nor dividends. If an amortization of 25% of the dividend per year were imposed, on the twentieth year his capital, plus cumulative interest, is refunded, and he has received in addition $3 for every $1 invested.

The systematic reinvestment of capital is therefore, as an alternative, strongly advocated to stockholders, but the extra advantages derived from amortization of capital by mining companies, on their own part, are far-reaching in the extreme, and would probably remove many of the gravest demerits of the destructive industry. Every investor knows the difficulty mining securities experience in picking up after being quoted 'ex dividend.' This is owing to the removal of values that are irredeemable, the mine being impoverished to that extent, with the concurrent destruction of a proportionate unit of capital. It is evident that if mining administrations deducted an amortization rate to reinvest in stable securities to be liquidated only on shutting down and compulsorily divisible by articles of association, the share certificates would carry with them repayment of capital plus cumulative interest; the capitalization automatically decreasing by the substitution of a simultaneous representation in securities as the orebodies are removed. An intending investor would therefore be enabled to invest at any time on a legitimate basis, as his certificates would carry the destroyed capital up to date of investment. In the present conditions an investor buying after a mine has refunded its capital, in the event of the shares being at par, is, generally speaking, doomed to disappointment; as in point of fact only a small minority of gold-mining companies return two capitals.

In the case of vein mines I would suggest a basis of ten years in which to mature the amortization of capital; and in the event of a mine being sufficiently productive, to refund the capital in a proportionately shorter time. On a ten-year basis a mine capable, after providing operating cash reserve, of paying 20%, only 10% would be paid away in dividend, and the remainder of 10% would be reinvested in securities as capital amortization. On the conclusion of the tenth year the company's stock would carry the original capital plus cumulative interest, which latter would go on increasing in proportion to the life of the mine, and the administration would then be at liberty to divide profits in their entirety, and no matter what underground privation took place, the stock would always be worth at least par up to the last day of life.

If the hypothetical mine were subjected to exactly double the capitalization, but similar in other respects, no dividend could be paid for ten years, as the rate would absorb the 10%. In the latter case the conserving of dividends, which would be otherwise paid and possibly spent by the certificate holder, is in reality a blessing in disguise. A much wider advantage would really accrue, as it would teach the promoter to keep capitalization down to a basis of actual requirements and his eyes a little less on the ability of the market to absorb stock.

It may be suggested, as a compromise, that when a mine's capital has been amortized, the securities could be liquidated and the proceeds divided. The shareholders would then have control of their proportion of amortized funds, which would be free for reinvestment in other securities carrying a higher rate of interest. Superficially, the former suggestion seems preferable, especially as it is the case that on the liquidation of securities stockholders would virtually have the future of their mine for nothing, and the option of holding for future dividends or realizing at the market valuation. Numerically, the advantages are greater, but they are overshadowed by the fact that the amortization backing would be withdrawn at the most indispensable time, as a mine is always drawing nearer its exhaustion, and a subsequent holder would be then, as now, faced with the problem of diminishing capital on the one hand against incoming dividends on the other. With the exception of a South African banket, how many stockholders can with confidence say that, at the market valuation of their stock, it is financially better to let capital go and to hold for dividends? There must be few, if their deductions are based on the indefinite stereotyped information supplied by some directorates.

The subject of conservation and redemption of capital is inimical to the vested interests of a large element in the mining business, which depends on its speculative aspect. Endeavor has been made to bring the finance of gold mining down to the more temperate conditions found in the less speculative industries. To do this, the investor can not too well familiarize himself with the basic fundamental that mining is a destructive industry automatically destroying capital in the production of profits. To meet this, I advocate amortization by mining companies, and that by the articles of association, when the mine is worked out, the proceeds be divisible to certificate-holders. Until mining finance is perfected to this point, the investor should amortize his own capital for his own protection. This is only a compromise to meet conditions as they are, because while it will assist the individual, it will not benefit the industry from the broad standpoint attained by public company amortization.

Detecting Adulteration of Oils

Alex. E. Outerbridge, Jr., in the *Iron Age,* discusses the methods for detecting the presence of adulterants in oils. De-bloomed mineral oils are free from bloom (fluorescence) in bright sunlight, or ordinary diffused daylight, or the light from an ordinary electric arc, but they all become highly fluorescent when exposed to the ordinary enclosed arc; which happens to give out rays of the exact wave length needed to enormously increase the fluorescence. The light should be so inclosed that the arc burns in a partial vacuum, or at least the air is rarefied, and after burning a minute gives a faint rosy light in addition to the powerful white light. If a vessel containing any mineral oil, crude or refined, or any resin oil, be placed in the path of these rays, the most intense fluorescence appears, even in daylight; greenish in the case of mineral oil and blue in the case of resin oil; thin films glowing in the same manner. So strong is the fluorescence that 1 c.c. of crude mineral oil has been detected in 999 c.c. of non-fluorescent oil. "It is stated in some text-books that 'oleic acid' which is found in lard oil is fluorescent. On examination I find that pure, white, strained lard oil is entirely free from fluorescence under the 'ultra-violet ray, but all of the samples of so-called No. 1 or No. 2 lard oil (sold for use in machine shops) examined possess some fluorescence, and this may prove to be a novel means of rapidly determining the proportion of oleic acid in lard oil, though I only suggest it tentatively." To carry out this test systematically, it is desirable to put the standards in narrow tubular oil-test bottles, holding about 50 c.c. each; corked, labeled, and placed side by side in small wooden racks on a shelf in proximity to an enclosed arc light; beginning with a pure oil on the left hand side, then bottles with 0.1% mineral oil, 1, 2, and up to 10%. The standard with linseed oil serves to examine cottonseed, corn, China-wood, China-bean oils, or any other non-fluorescent vegetable oil. The special standard of lard oil is necessary to test adulterated lard oils.

Exports of merchandise in September last amounted in value to $195,771,000, against $168,874,000 a year ago. Imports were $125,158,000, against $117,265,000 a year ago, according to the Bureau of Statistics.

Geological Factors in Oil Production

By Dorsey Hager

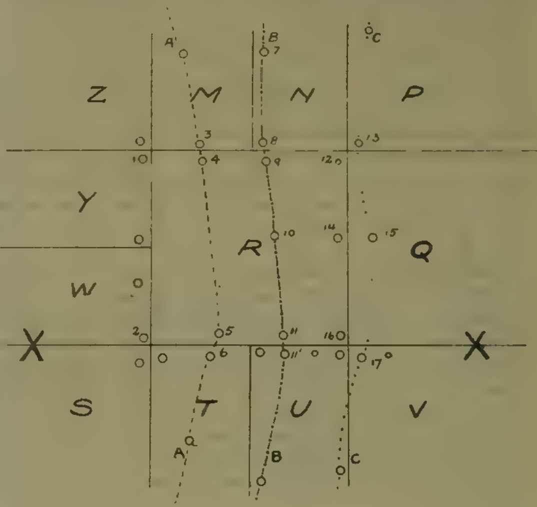
Much has been written concerning the value and use of geology to the petroleum industry. The larger number of articles discuss the general structural features of oilfields and the locating and prospecting of oil lands in accordance with structural features (anticlines, monoclines, terraces, and domes). Surprisingly little of the literature deals with the technology of petroleum mining, or with the application of geology to special problems that arise in drilling for oil, or to the problems that are met in planning a campaign to economically obtain the greatest production of oil from a property in the shortest time. This article will deal with the problems that arise in planning a production campaign. Later I hope to present some of the special problems involved in drilling and in operating wells.

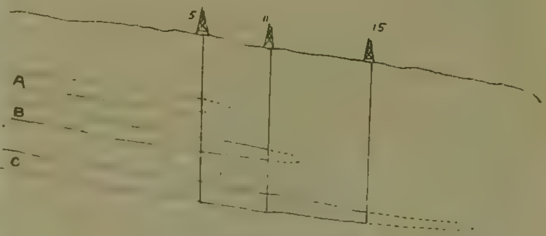
The aim of every operator is to extract the maximum of oil in the minimum of time and at a minimum cost. To accomplish this he must map out a definite production campaign. Successful operating depends upon the ability to clearly analyze and comprehend troubles two thousand feet or more underground. Such ability often saves many thousands of dollars that would otherwise be expended in futile endeavors to remedy some of the trouble that does not exist. Geological conditions two thousand feet underground may seem largely a matter of conjecture. However, an excellent idea of such conditions can be obtained by a careful study of: (1) any outcrops of the oil strata and the beds underlying and overlying them; (2) the drill-logs and borings from individual wells; (3) the cross-sections and the areal maps made from a compilation of a number of drill-logs.

From the first source of information some clue to the following may be obtained: (*a*) the hardness of the formations; (*b*) the thickness of the formations; (*c*) the dip and the strike of the oil-strata; (*d*) the size of the sand-grain of the oil-sands; (*e*) probable water sands; (*f*) evidences of faulting and minor folds that may affect the oil-strata. From the second source of information may be gained: (*a*) knowledge of the actual depths to the oil-strata; (*b*) the number of oil-strata; (*c*) the true thicknesses of the oil-strata; (*d*) the true thicknesses of the overlying beds; (*e*) the relative productivity of the oil-sands; (*f*) the character of the beds overlying the oil-strata as regards hardness, and whether they are shales or sandstones; (*g*) the relative position and number of water-sands; (*h*) the quality of the water, whether alkaline, saline, or sulphurous. The third source of information gives: (*a*) the areal limits of the several oil-sands; (*b*) the areal limits of water-sands; (*c*) the changes of oil-sands to water-sands; (*d*) the changes of coarse sands to shales; (*e*) the true dips of the oil-sands; (*f*) the thickening and thinning of the oil-strata in accordance with overlap. All of the information given above is of great value to the oil-man, who is planning a production campaign. Indeed, the time will come when no operator will begin work on a large scale without taking these factors into consideration.

Three important problems confront the operator: (1) how best to obtain the largest quantity of petroleum from his own property; (2) how best to defend his property from drainage by neighboring properties; (3) how best to drain neighboring properties. At first glance problem 3 may seem to call for illegal proceedings. Petroleum mining, however, differs from other mining in that there is no legal liability for the operator who depletes a neighboring property, while in mineral mining no operator can obtain ore from neighboring property without being responsible for the mineral so taken. The reason for this difference lies, of course, in the nature of the substance mined. Petroleum is a fluid, while the minerals are solids. Petroleum, like water, seeks its level and also tends to flow through any outlet that offers easy passage. Such being the case, it is by no means a simple matter to determine the quantity of fluid that one property may drain from specified neighboring properties. While it is possible to tell approximately how much oil has been obtained from other properties, it is not possible to tell how much oil has been drained from a certain acreage, specifying the amounts taken from each neighboring property. Because of this uncertainty no legal action can be taken against an operator, even though his oil-wells may have completely exhausted neighboring territory.

Every operator desires some idea of the amount of oil he may reasonably expect from a property. Estimates of this kind are only approximate, but are useful guides to conservative men. The following factors are necessary in computing the quantity of oil that a property may reasonably produce: (1) the number of oil-strata; (2) the thickness of the various strata; (3) the porosity of the oil-bearing formation; (4) the areas covered by each stratum. The first two factors may readily be secured from the drill-logs. The third factor can only be secured by a study of the drill cuttings and the outcrops of the oil-sands. The fourth factor requires a careful study of cross-sections and contour maps made from a compilation of many drill-logs. Assume a property covering a section of land, 640 acres, in proved territory. Three productive sands are known. Drill-holes No. 1, 2, 3, 4, and 5 show three distinct oil-sands, A, B, and C, with thicknesses averaging, respectively, 30, 30, and 50 ft., but with a gradual thinning eastward. Drill-holes No. 6, 7, 8, 9, 10, and 11 show two sands, B and C, having average thicknesses of 30 and 40 ft., respectively. Drill-holes No. 12, 13, 14, 15, and 16 show but one oil-sand 30 ft. thick. It is clear that the three strata, A, B, and C, do not all underlie the full 640 acres under consideration.





CROSS-SECTION ALONG X—X.

The average of each sand that underlies the property is a matter of approximation. Drill holes No. 4 and 5 show the three sands, A, B, and C, while No. 9, 10, and 11 show B and C. Evidently the top sand A has given out somewhere between No. 4 and 9 and No. 5 and 11. This being the case, it is safe to assume the limits of the A sand at No. 4 and 5. This gives 200 acres covered by A and possessing an average thickness of 30 ft. Sand B, as shown by the drill records, extends to No. 9, 10, and 11, which are taken as its limits. The acreage covered by B is 400 acres, with an average thickness of 25 ft. C covers the entire 640 acres, with an average of 40 ft. All told, there are 200 acres 30 ft. thick, 400 acres 25 ft. thick, and 640 acres 40 ft. thick; a total of 200 by 30, or 6000 acre-feet, plus 400 by 25, or 10,000 acre-feet, plus 640 by 40, or 25,600 acre-feet; a total of 41,600 acre-feet.

This total is a fair estimate of the total amount of oil-sand underlying the section. The porosity of oil formations differs so materially that no constant should be assumed except as an approximation. Sands show from 5 to 20% porosity, and some dolomitic limestones as high as 33%. Generally, however, 10% is accepted as the basis for estimates. The U. S. Geological Survey accepts 10% in most of its computations. One gallon per cubic foot is often taken, or nearly 1000 barrels per acre-foot. For the purpose of illustration, the latter estimate will be assumed. Thus 41,600 multiplied by 1000 equals 41,600,000 bbl. of oil underlying the property. It is safe to assume that only 50% of this oil is recoverable.

Experiments made by the U. S. Geological Survey (see Bull. 475, pp. 12 to 16) show that with Pennsylvanian and Illinois petroleum of 0.810 (43°B.) and 0.8375 (37°B.) specific gravities, respectively, fuller's earth will absorb, on an average, 40% of oil that cannot be recovered. Experiments have not yet been made to ascertain the percentage of oil retained by the coarser-grained oil-sands. With heavier-gravity oil of increased viscosity it is safe to assume fully as large a loss as that given with fuller's earth.

Added to this loss by retention due to adhesion and friction is the incomplete drainage of the oil-sands by drilled wells. This last factor is most important. There comes a time when the oil accumulates in a well so slowly that there is little economy in pumping it. When this point is reached the oil property is abandoned as of too little value to pay for operating. It is economically exhausted, though not actually so. The above losses do not take into account possible flooding, cave-ins, or drainage by neighboring properties. When all these factors are considered, 50% seems too high an estimate. However, for general purposes this figure is acceptable. There are, then, 20,800,000 bbl. of oil that may be extracted from the property under consideration. Call this figure 20,000,000 bbl. for safety.

The next step is to find the number of wells that will be needed to obtain this oil. Here again assumptions are necessary. The acreage drained by one well is variously estimated at from one to six acres. Little definite information is available as to the acreage per well that gives the best results. Four to five acres is accepted as good practice, but whether or not this is the best figure cannot be said at present. Some operators space their wells 100 to 800 ft. apart, varying the distance inversely with the richness of the 'sands'. Taking five acres as the basis, 128 wells per section would be required. I suggest below a method of determining the proper number of wells to a certain acreage. This method is submitted only as a suggestion. Obtain data covering a large number of wells, and note their ages, the thicknesses of the sands, the fineness or coarseness of the sands, and the total production of each well. From these data construct tables that show the ages of the wells and the average productions for varying thicknesses of the 'sands'. As an indication of the use of such data, take the following illustration.

The property, 640 acres, shown in Fig. 1 is underlain by three sands. The table below shows the known and computed information needed before using the tables mentioned above, prepared from a study of a large number of wells.

I. Acres underlain by sands	II. Thickness of sands under each acreage	III. No. acre feet	IV. Computed quantity of oil available in bbl.
200	95	19,000	9,000,000
200	65	13,000	6,600,000
240	40	9,600	4,400,000
640		41,600	20,000,000

TABLE A.

From the above table columns I, II, and IV are of importance in reaching a conclusion as to the number of wells needed and are used in Table B.

I. Thickness in feet of sands	II. Production for thicknesses given in I.	III. Life in years for thicknesses in I.	IV. No. of acres	V. Computed number of barrels of oil available	VI. No. wells needed	VII. No. acres per well
95	180,000	9	200	9,000,000	50	4
65	120,000	7	200	6,600,000	55	3.6
40	80,000	5	240	4,400,000	55	4.4
			640	20,000,000	160	Av. 4

TABLE B.

Columns I, IV, and V are taken from Table A and correspond to columns I, II, and IV, respectively. Columns II and III are derived from data collected from a study of a large number of wells. Column VI is obtained by dividing the figures in column V by those in II. Column VII is obtained by dividing the figures in column IV by those in column VI. These results are purely assumptive, and should in no way be considered as of value, except for the purpose of illustration. I offer this method as a probable means of securing satisfactory data, not as a carefully worked out system of proved value.

The problem of securing the greatest quantity of petroleum from a property is intimately associated with the problems of securing: (a) the greatest quantity of petroleum from neighboring properties; and (b) protecting our own property from drainage. Many other minor problems, such as water troubles (sometimes a serious menace to a whole oilfield), cave-ins, collapsed casing, leaks due to filling of dry sands, and others, will be treated after considering the main problems of well-location. Consider the problems involved in securing oil from neighboring properties. Fig. 1 shows a number of properties surrounding *R*. There are *S*, *W*, *Y*, and *Z* above *R* on the dip. There are *M*, *N*, *T*, and *U* on each side of *R*, and there are *P*, *Q*, and *V* below *R* on the dip. The three sets of properties require different treatment for offense and defense. In a new field where the gas pressure is strong, the oil generally tends to migrate upward from points on the lower dip. However, in older fields, the tendency of the oil seems to be downward, under the effect of gravity. Friction, in some cases, especially where the dip is slight, will keep the oil from traveling downward.

The usual practice of offense consists of the following elements: (1) to sink wells before one's neighbors; (2) to drill holes of larger diameter than those of the neighboring companies; (3) to drain sands unknown to the neighbors; (4) to place the wells so as to be sure of draining as much territory as possible; (5) to speed the wells as fast as possible.

It is almost a self-evident fact that the first well in a field has an advantage over all other wells, other things being equal. If one company completes a well a month ahead of another, it is but natural that the first well will take the cream of the production. But more than this is likely to happen. The first well may form channels which will effectually drain a territory, and a neighboring well or wells will suffer in consequence (see Fig. 2). This was supposedly the reason for the barrenness of the wells contiguous to the Lake View gusher. In this case the theory seems correct, as recent reports indicate that wells nearby have greatly increased in production since the great gusher has ceased flowing.

Wells that have a casing diameter of 8 in. certainly have an advantage over wells that have diameters of 4 and 6 in.[1] The larger-sized casing will stand more rows of perforations, which means a greater surface exposed to the oil. Also, the interior of the casing will give a larger collecting basin for the oil. In this latter case the ratios of the larger-sized casing to the smaller will be $8^2:6^2:4^2$ or 64:36:16. Thus the 8-in. hole will give four times the collecting basin of the 4-in. hole and nearly twice the basin of the 6-in. hole. However, the relative exterior surface exposed to the oil-sands will not bear the same ratio. Perforations vary greatly in size, from ⅜ by ¾ in., ⅜ by 2 in., ½ by 1 in., to ½ by 3 in. and larger, depending upon the different companies. Generally these perforations are in longitudinal rows and evenly spaced, one every foot or six inches. A 4-in. casing is given three rows of perforations, a 6-in. casing four rows, while an 8-in. casing carries five to six rows of machine-made slots.[2] Whether a rolling knife or casing 'splitter' is used, there is little regularity of rows. If the size of the perforations is the same and the spacing equal, the ratios are 6 to 4 to 3. The 8-in. casing exposes twice the surface of the 4-in. and 1½ times the surface of the 6-in. The advantage is certainly with the larger-sized casing.

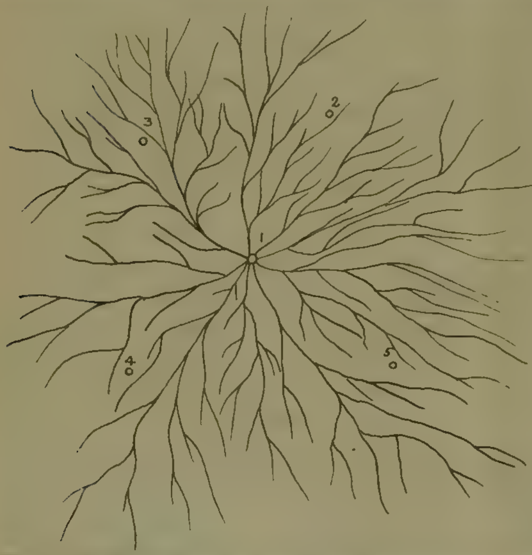


FIG. 2. SHOWING HOW A WELL MAY ESTABLISH DRAINAGE LINES AND DRAW OIL FROM SUBSEQUENT WELLS.

It may seem a rare occurrence for a company to tap oil-sands unknown to its neighbors. This, however, is not an unusual occurrence, especially where companies have failed to prospect for deeper sands. It is then discovered too late that more venturesome neighbors have tapped the lowest sands and gained a good production at the first concern's expense, having drained much of the property of the careless concern. Again, companies often wilfully hold back information regarding their prospect holes, and give misleading information as to lower sands. However, no company is under moral obligation to give information to competitors, unless prospect holes show water sands that may endanger the neighboring properties as well as their own. There are, however, cases that have been reported where concerns have deliberately flooded a field, or portions of it, to drive the oil from neighboring properties to their own, or where by destroying neighboring lands these companies have benefited by a loss of competition. Whether or not such charges are true, I do not pretend to assert. They may only be the result of perfervid imaginations.

The question of placing wells so as to drain the largest possible territory involves some interesting problems. One case in particular seems worthy of study. In one of the Oklahoma fields an independent operator held a very good oil property which he desired to develop. Upon investigation it was found that the only pipe-line in this field was owned by a Standard Oil subsidiary, which owned all the neighboring land, or rather held leases on it. The independent operator could not afford to build a pipe-line of his own, and the corporation held him up for transportation. Obviously, the only thing he could do was to keep his land. Unfortunately for him, the Standard leases were lower on the dip, and as this concern was developing its properties, the independent was forced to give up hope of getting any oil from his property. The Standard concern would not buy his land, so that in time the property was exhausted without the independent obtaining anything for his share. This is an extreme case of drainage. However, the same principle applies to nearly all oilfields where one company is favorably situated to drain oil from others. The principal elements considered in placing a well to best drain a neighboring property are: (a) the spacing of wells; (b) the degree of dip of the oil-sand.

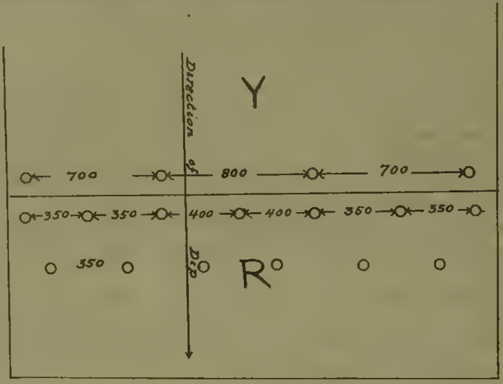


FIG. 3.

Where an opposing company has already sunk its wells, there are certain lines of procedure that may be successful. If its wells are far apart it will be of advantage to place wells at intermediate points as well as opposite the other wells. (See Fig. 3.) The wells on *Y* are spaced 700 and 800 ft. apart. Wells on *R* may then be spaced 350 and 400 ft. apart. This will force the *Y* operators to drill wells between the others. This being the case, the *R* operators have the advantage of being down the dip, and by placing back wells at points intermediate between the first row of wells (see Fig. 3), effectually cover all the line presented by *Y*, and, having more wells, should draw the oil more rapidly than the single line of wells. This condition is by no means a theoretical one. It exists in a number of places, but is often quite unnoticed.

Speeding the wells as fast as possible is one of the means of obtaining more oil than neighboring companies. But there is a decided limit to such speeding. There must first be oil enough to pay for pumping wells rapidly. In some places the oil seeps into the well basin slowly and is pumped off in a few hours. Rapid pumping is here needless and expensive. In other places there is plenty of oil, but rapid pumping produces unfavorable conditions, such as drawing large quantities of sand into the well, and consequent trouble with the well. Then, too, there is a limit to the speed that the pump rods (sucker rods) will stand without breaking, and to the effect of the speed upon the pumping jack or upon the derrick and the machinery. In some cases where the speed of the wells might readily be increased the effect upon the machinery might result in serious break-downs and accidents. A rational method of offense would combine all these elements.

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[1] Sizes rated generally at 8¼, 6½, 6⅝, and 4½ in. diameter.

[2] Four, six, and eight-inch casings are listed as 8¼, 6⅝, and 4½ inches in most oilfields. Called by even inches for convenience.

The problem of defense is next in order. The elements to be considered are much the same as those of offense. If a neighboring property is being drilled, wells must be drilled to offset the neighboring wells. If a neighbor finishes his wells with casing of large diameter, he must be met with the same size or larger. If the neighbor penetrates sands not before known to exist, then the wells must be deepened to offset the wells of the neighbor.

Often, indeed in most cases, a property may embody the principles of offense against properties higher on the dip and defense against properties lower on the dip. Thus, in Fig. 1, the properties *S*, *W*, *Y*, and *Z* are on the defensive to *R*, and *R* is on the defensive to properties *P*, *Q*, and *V*. So in Fig. 4, *Y* is on the defensive to *R*. In this latter case, when wells are drilled on *R* intermediate between those of *Y*, the operators on *Y* would have met this attack by drilling wells to offset those on *R*. When the *R* wells are pumped rapidly the *Y* wells must be speeded to meet the increased drain. Indeed, the *Y* property is at a decided disadvantage as regards attacking *R*. Such being the case, all that can be done is to keep up as vigorous a defense as is possible under the conditions. Different systems of offense and defense have been worked out, by many companies. However, the problems presented in this paper embody the essential features of such systems.

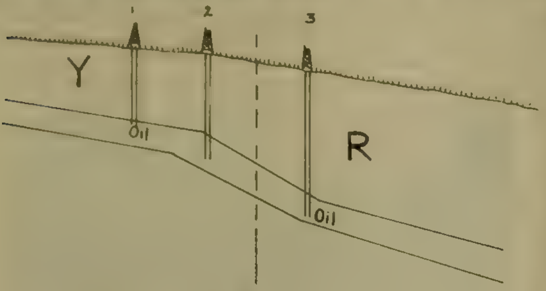

FIG. 4.

THE problems of smoke elimination have by no means all been solved. The most vexatious source of smoke in many cities is probably the railway locomotives. It yet remains for some genius to discover a method of burning soft coal in locomotive furnaces without smoke. But here more than anywhere else the care exercised by the fireman, or the lack of care, shows in the volume of smoke produced. Fifty per cent of the smoke made by a careless fireman can be obviated by the enlightenment of the fireman. When this fact is realized, our cities can at least demand of railways that they make their minimum of smoke. Furthermore, the cities would be well within their rights were they to demand that switching engines be supplied with coke or other smokeless fuel. This would certainly help to mitigate the smoke nuisance. With the smoke from factories and the railroads reduced to a minimum, the irreducible remainder, and the apparently incurable smoke from kitchen ranges and open fireplaces, would make a total so far below what most of our cities now endure that city life would be made notably cleaner and sweeter, and, in addition, living conditions would be much more healthful, especially in cities where lignite is burned.

The Golden Cycle Dry Concentrator

By T. C. LINDERFELT and J. K. STEWART

The dry concentrator of the Golden Cycle company, at the mine at Goldfield, has a daily capacity of 75 tons, and was constructed to handle low grade ore from the mine. It presents many novel features in both process and operation. The ore, containing tellurides of gold, is crushed and screened in order to obtain a large percentage of the valuable mineral in the screenings. Owing to the brittleness of the tellurides, crushing tends to separate them from the worthless rock, and they are found with the fine mesh products.

The foundations of both building and machinery are constructed entirely of reinforced concrete, while the retaining walls are of masonry, waste rock from the dump being used for construction material. The building throughout is roomy, and well lighted by windows and electric lights. The superstructure and framework are of wood, the latter being of 8 by 8 in. and 8 by 10 in. timbers, spliced with lap-joints and secured with ¾-in. bolts. The flooring is of 2-in. planking and the framework is housed with corrugated iron.

The ore is trammed in 2-ton electric dump-cars, taking power from a third rail, to a storage hopper with a capacity of about 40 tons, which feeds the crusher. From here the operation is continuous until the ore is automatically loaded into railroad cars. The power is furnished by the Pueblo & Suburban Traction & Lighting Co. The current is transformed from a main power-line carrying 12,000 volts, to 440 volts for mill power. The motors are all Westinghouse induction A. C. motors. The main shaft is connected to an 85-hp. motor driving all the machinery in the mill and also the first relay of the tailing-conveyor. In addition to this, there is one 10-hp. motor driving the second relay of the tailing-conveyor, and one 5-hp. motor driving the third relay of the tailing-conveyor.

The ore passes over grizzlies to a 13 by 24 Blake crusher, which cuts it to about 2-in. product. From the crusher and grizzlies it is fed directly to a bucket-elevator, 20 ft. between centres, thence to three 3 by 8-ft. revolving screens of 1¾-in. mesh. The oversize goes to 16 by 30-in. parallel rolls. The undersize from the screens and the entire product from the rolls are fed to a 3 by 8-ft. revolving screen of 6 mesh. The oversize goes to a relay tailing-conveyor and is carried to the dump. The undersize, or concentrate, is carried by an 18-in. belt-conveyor, 300 ft. between centres, to a hopper of 25 tons capacity, whence it is loaded by means of a bucket-elevator and an 8-in. metal tube.

The tailing-conveyor is in three relays. The first is driven by the mill power and is 75 ft. between centres; the second is driven by a 10-hp. motor and is 150 ft. between centres; the third, driven by a 5-hp. motor and 75 ft. between centres, drops the waste on the dump. These three conveyors are made of 18-in. six-ply belting. The most novel feature of this plant is the system of 'tell-tales', devised by B. A. Searle, to indicate to the operator whether or not the relays of the tailing-conveyor are in operation. Idler shaftings at the end of both the second and third relays of the conveyor are extended into the respective motor houses. A 6-in. wooden pulley, in which is imbedded a ¾ by 5-in. metal plate, is keyed to each shaft. A pair of contact brushes are fastened to a framework in such a way that the circuit is opened and closed at each revolution of the pulley. Each of these sets of brushes is connected to separate lights in order that the operator may know which relay of the conveyor has stopped.

FEW mineral products have so wide a variety of uses as lime. Nearly half the lime manufactured in the United States is used as a structural material, and the remainder, amounting to about 1,750,000 tons, valued at about $5,500,000, is used for chemical purposes.

Ore Deposits Near Lake City, Colorado

By J. D. Irving and Howland Bancroft

*The principal product of the Lake City region has been silver, but lead, gold, and copper have to some extent contributed to the value of the output. Zinc has had practically no part in the production and has been one of the most objectionable components. If divided according to gold and silver content, the veins of the region might be classed as silver-bearing veins and gold-bearing veins. The tetrahedrite-rhodochrosite group and the quartz-sphalerite-galena group would fall together in the silver-bearing class, and the telluride group in the gold-bearing class. The details of ore content can be ascertained only from oral report for many of the mines, because many workings have been abandoned and records could not be secured. Other workings now ship low-grade ores, whereas those mined in early days were of very much higher grade.

In the silver-bearing group the present ores do not average much over $6 to $10 per ton and yield a concentrate worth about $40 per ton. This includes both the high-grade masses of tetrahedrite scattered through the ore and the lower-grade ores that are also a notable feature. In the upper levels of many mines the ore has ranged from $10 per ton up to $3000 per ton and even more. Eighty-five shipments of ore of about 25 tons each from the upper levels of the Vermont mine averaged 84.53 oz. silver and 27.96% lead, or approximately $44.80 silver and $12.06 lead, a total gross value of $56.86 per ton; 63 tons mined in 1894 yielded $79 per ton; and two shipments in 1895 and 1896 yielded $22.78 and $22.67 per ton, respectively.

The average of the ore mined in the Hidden Treasure mine in 1898-9 was about $7 to $9 per ton, yielding $41.67 per ton of concentrate. The Black Crook in 1884 produced 1227 tons of ore valued at $124,447, or about $101.39 per ton. All of these rich ores have now been exhausted and the ore must be milled. Probably very little of the ore runs over $5 to $6 per ton. Of the telluride or gold-bearing veins the Golden Fleece alone has thus far been a producer. Much of the ore it yielded during its early exploitation was of unusually high grade. The assay values in the ores vary so widely that it is not possible to lay down any rule which will not have many exceptions.

The lodes of Lake City are fissure veins formed partly through the replacement of shattered and sheeted zones in the country rock and mainly through the filling of open spaces. They average between 500 and 1000 ft. in length, have a similar vertical range, and an average width of 10 in. to 5 ft. They show a wide range of strike and dip at steep angles. They consist of three closely related mineralogic types. The first contains pyrite, galena, sphalerite, and chalcopyrite with subordinate tetrahedrite, in a quartz gangue with some barite and rhodochrosite, and yield silver and lead with subordinate copper and little gold. The second contains galena, sphalerite, and tetrahedrite with subordinate chalcopyrite and pyrite, in a gangue of quartz, barite, and rhodochrosite, and yield chiefly silver and lead. The third contains petzite, tetrahedrite, and minor quantities of other sulphides, in a gangue of fine-grained quartz carrying some hinsdalite in places; this type yields silver and gold in proportion by value of 1:1, and is characterized by high assay values in both gold and silver.

The first two groups constitute the bulk of the Lake City lodes, as there is but one productive telluride vein. Their ores are low grade where unaffected by surficial alteration, the major portion of the Lake City production coming from ores enriched by secondary sulphide enrichment that has produced chiefly pyrargyrite as a secondary mineral. Oxidized ores are widely distributed. Lodes are, for the most part, separated by considerable areas within which no veins have yet been found, the Capitol City group being the only closely spaced series of veins exploited.

The Lake City lodes comprise the northeastern portion of the mineralized area which includes Rico, Telluride, Silverton, and Ouray. The lodes show great similarity to those of these areas, but were probably formed under a slightly less cover of overlying rocks.

The lodes are later than all of the rocks exposed in the region except the rhyolites and basalts of post-Potosi age, and are hence of late Miocene or early Pliocene age. They are believed to have been derived from the vapors emitted from a magma of monzonite whose apophyses as intrusions are scattered through this region in considerable numbers.

The Lake City district possibly contains unworked and undiscovered veins that are similar in mineralogical character to those already developed, and it is on these, combined with the careful mining and milling of the ore from the veins already found, that the future of the district depends. A quantity of low-grade ore is now developed, associated with which is an enormous amount of zincblende. This ore may perhaps be treated with profit if the proper kind of concentrating works are erected, and the zinc may also be sold if mechanical means can be successfully used in its separation from the commonly associated minerals.

As the geology of the region has so little apparent connection with the deposition of the ores, it is impossible to lay down any rule as to the best places to look for new bodies of mineral. The richest mines are in the andesite of the Picayune volcanic group, but veins found elsewhere in the district have the same general mineralogic content, so that no inference can be drawn from the occurrence in this particular andesite.

The fact that some of the veins can be traced on the surface for considerable distances would seem to point to the general conclusion that the extension of some of the already profitably worked veins may be found by a careful study of the topography and the relation of the veins to it, taking into consideration their dip and strike. On the other hand, as it is rather evident that the district contains mainly only the roots of veins, it would probably be more profitable to look for new discoveries rather than the extension of those already worked, as doubtless the major part of these have been eroded away, leaving only their lower parts.

An interesting feature is the date of the location of the properties which have proved to be successful producers. Without exception the veins which were profitable were located in the early days of the mining activity. A great many prospects have been abandoned which show surface croppings just as promising as those of some of the profitable properties. Much of the loss that has been sustained in mining in this district has arisen from unjustifiably excessive initial expense. There have been some startling examples of reckless expenditure in the district, which tend to weaken the confidence of the mining public and to destroy any chance of obtaining funds for judicious exploitation.

Until recently a majority of large mines used coal for the generation of power. Lately a few dams have been erected and water-power utilized for the generation of electricity for the Hidden Treasure, Moro, and Lellie mines. The first two take water from Henson and the last from Nellie creek.

The steep gradient in most of the streams makes it easy to obtain the head necessary for hydro-electric installations in a region of limited water-supply. An objection, however, to this means of generating power is the low temperature which prevails during the winter months, at which time the streams throughout the mining district are frozen over. A means of obviating this difficulty is to build a dam at such a place that quite a deep body of water may be obtained, so that when the surface freezes there will be enough water below the crust of ice to furnish the requisite flow. The Hidden Treasure dam is said to be 100 ft. in height. The natural conditions of the banks of the stream are admirable for such a dam, and a great supply of water can be maintained. The officers of the Moro mine state that sufficient water is available to operate the mine during the entire winter, although they think it is doubtful whether they can generate enough power to operate both mine and mill during the months from December to May. In all probability it would not be possible to obtain water during

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*Abstract from Bulletin 478, U. S. Geological Survey.

the winter months from any of the tributaries of Henson creek, they being frozen solid during the cold season.

The large mines using coal for the generation of power have been the Ute, Ulay, Golden Fleece, Black Crook, and until 1907 the Moro. They have obtained their fuel from Crested Butte, Colorado, when possible, and from Somerset, Colorado, when the Crested Butte coal was not to be had. Run-of mine coal sold at the time of writing (January 1909) at $2.50 to $3 per ton on the cars at the mine, and lump coal at $4.50 per ton in carload lots on the cars at Lake City. Run-of mine coal is said by some to be very satisfactory, but the lump coal is said to be about the most satisfactory in Colorado for steaming purposes.

Gasoline has been used at the Pelican property, but the foundation failed to withstand the vibrations of the engine and further use of the machine was temporarily abandoned. The company intends, however, to place the engine on a firm foundation and resume its use. Gasoline costs 16c. per gallon in barrel lots on the cars at Pueblo, Colorado, and that used by the Chicago Tunnel Site Co. is reported to have averaged 58° to 65° hydrometer test, each shipment, however, showing considerable variation. The Pelican at one time contracted with the Lake City power-plant to deliver electricity at the mine. After having erected the line, however, it was found that the company was unable to furnish enough power, and the scheme was abandoned.

The labor conditions in the Lake City district have been very uniform, and the differences between operators and laborers have been slight. When there has been great activity in the region it is understood that labor has been easy to procure. The wages paid are about the same as elsewhere in the San Juan region ranging from $3 to $5 per day according to the class of work.

GOLDEN FLEECE MILL.

The early work on most of the veins was carried on through drifts driven on the veins. The adits run at first were short and easily operated. This was very advantageous during the early stages of exploitation, when the deposits were easily accessible. As depth was gained, however, long cross-cuts became necessary for working, and these have almost invariably proved disappointing. The Vermont adit, T. C. M. adit, Lucky strike adit, Hidden Treasure adit, and many others, have been started, but so far none of them has had satisfactory results. Most of them have not gone as far as they had intended to go at the outset, as the character of the vein in depth did not seem to justify so great outlay. No deep vertical shafts are used in the mines, although several properties have developed the veins by inclined shafts following the general dip of the vein. The ore is transported from the mines by burros, wagons, or wire-rope tramways. The last named are used on the Hidden Treasure, Lellie, and Moro properties to connect the mines with the mills situated several hundred feet below the mine openings and from $\frac{1}{4}$ to $\frac{3}{4}$ mi. distant.

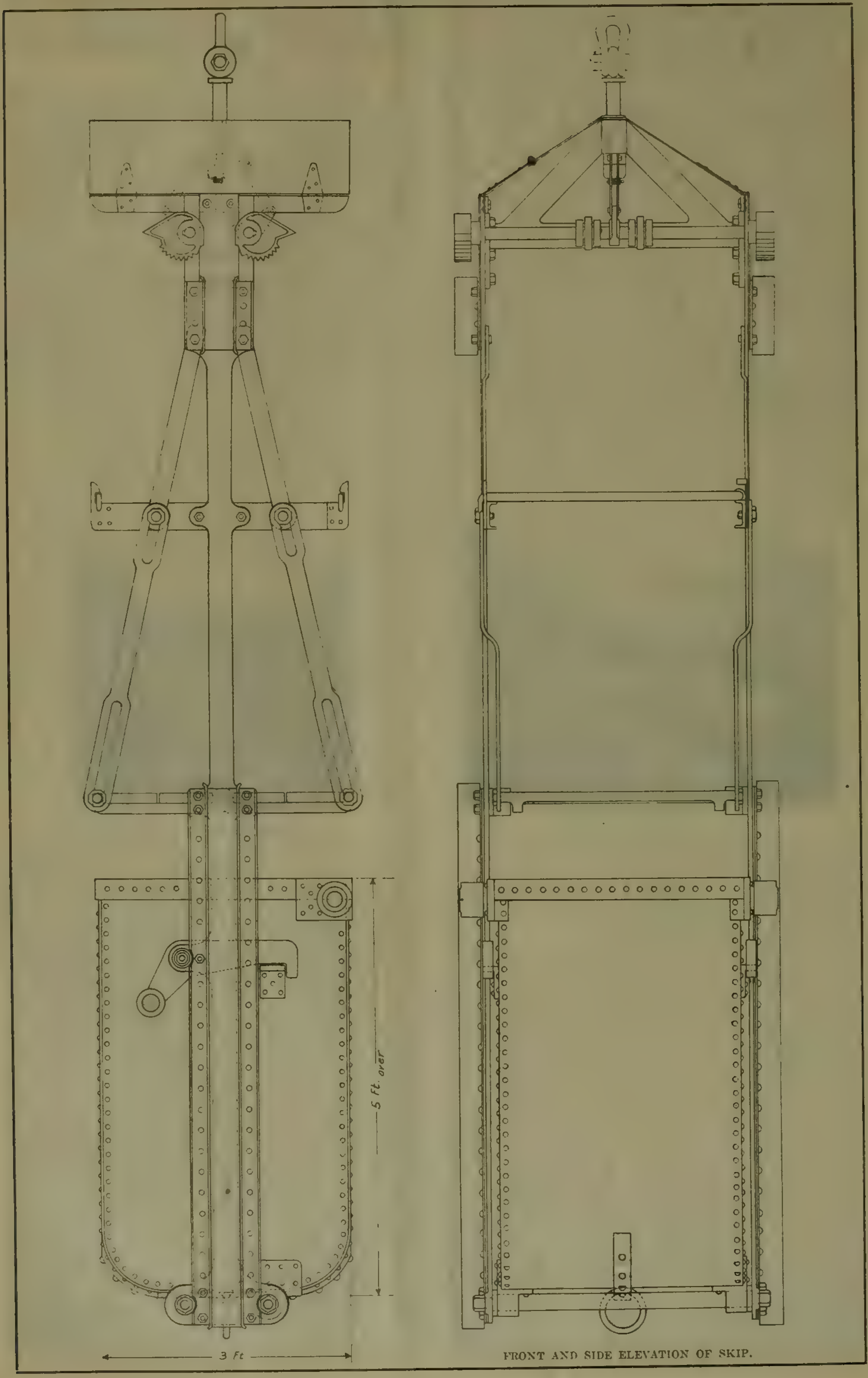
From the beginning of active mining operations in the Lake City district there have been smelters and lixiviation plants, which, between them, have treated much of the ore from the Lake City district and some from the Silverton district with doubtful success. Because of the historic interest connected with the early operations in the milling and smelting of ores from this region, a few lines will be devoted to that subject.

On October 31, 1877, the Ocean Wave smelter turned out its first lot of base bullion, about 10,000 lb. The works were equipped with two roasting furnaces and one stack and had a roasting capacity of about 15 tons per day. First charcoal and later coke from Trinidad was used for fuel. Crooke's smelter was also in operation at this time, although details of its equipment are not at hand. It is said to have shipped 300 tons, worth $48,000, during the year 1877. Its slag dump is reported to have been twice reworked with profit. The Van Gieson Lixiviation Works were in successful operation at an early day and are reported to have had an output of $35,000 in silver bars during the fall of the year 1877. The product ranged from 850 to 925 in fineness. Other smelters and other lixiviation plants existed, but descriptions of them are unnecessary.

The smelters which have received most of the ore from the Lake City district have been the Omaha and Grant smelters of Denver, Colorado, the Eilers plant at Pueblo, Colorado, and the Ohio and Colorado smelter at Salida, Colorado. At times other smelters in the State have received consignments from this area, but the majority has gone to the above-mentioned plants. The freight charges per ton would probably average from $5 to $8 to Salida and Pueblo. The treatment charges plus the cost of mining and shipping will run from $10 to $15 per ton in the Lake City district, so that under existing mining conditions it will hardly pay to work smelting ore running under $20 per ton. With concentration, however, a much lower grade of ore can be mined and milled with profit. The Hidden Treasure, for example, mined and milled $9 ore at a profit. The Golden Fleece milled $12 ore, saving 65% of the value, at a total cost for mining and milling of about $5 per ton.

ALPINE GULCH, NEAR LAKE CITY.

On the other hand, the processes employed by some of the mills have not proved to be suited to the kind of ore treated, and a large part of the valuable metals was carried into the tailing, several tailing dumps having been worked at a fair profit by various methods of lixiviation. The tetrahedrite, most of which is argentiferous, has a specific gravity of only 4.5, and when treated with galena, whose specific gravity is 7.5, it is lost by the same process which saves the lead sulphide. Galena is less brittle than tetrahedrite and does not slime so readily, so that after the ore is crushed and sent through sizers to the tables the galena is easily separated from the rest, and the gray copper, being brittle and of rather low specific gravity compared with the commonly associated minerals, is either left in close association with the gangue or lost in the slime.



FRONT AND SIDE ELEVATION OF SKIP.

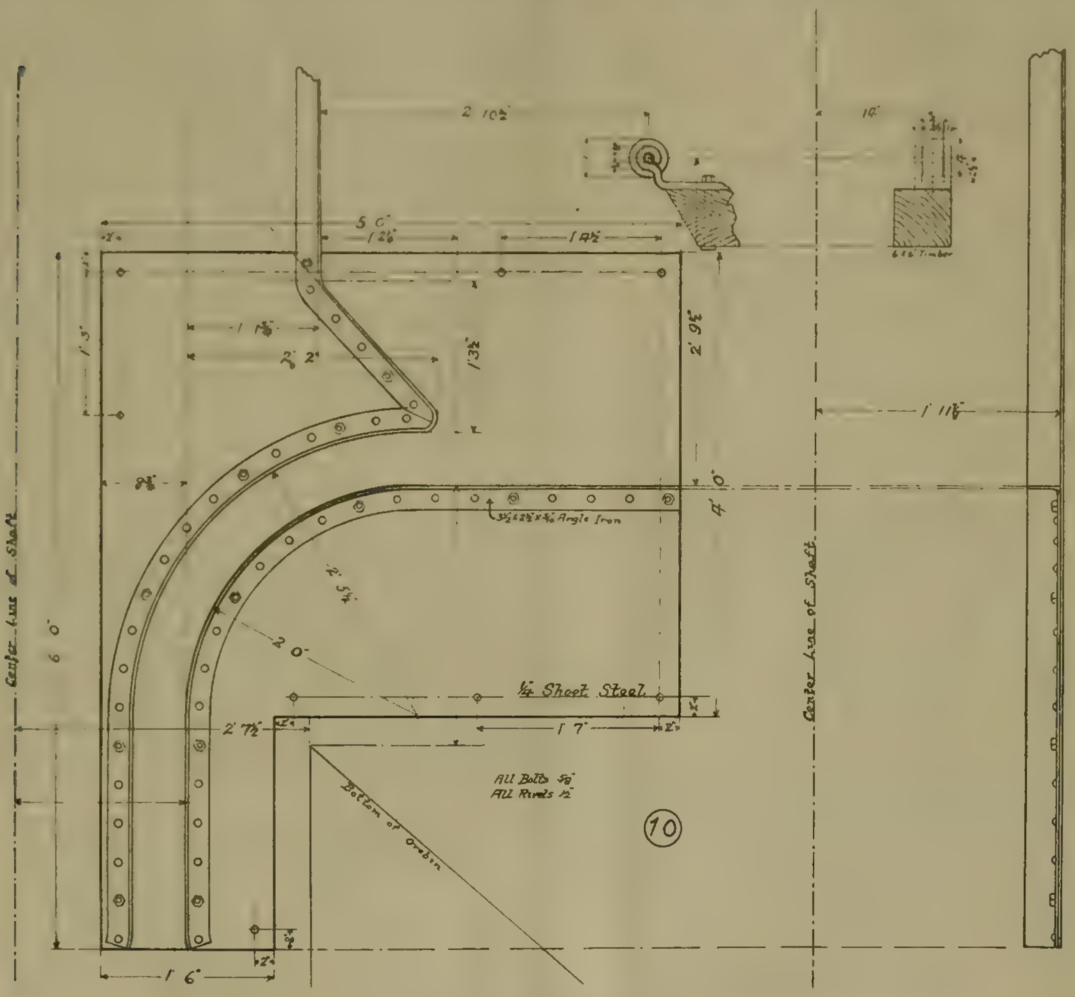
Skip for a Vertical Shaft

A novel and very satisfactory skip for vertical shafts has been designed by Willis Lawrence, formerly general manager for the Florence mine at Goldfield. Two of these skips, working in counterbalance, each having a capacity of 45 cu. ft., have now been in operation a year in the Florence shaft. Thus far no repair work has been done on them and they have required practically no attention from the master mechanic. The two skips, which weigh approximately one ton each, were built entirely at the mine. They are made up of solid forgings and riveted, so that there are no bolts to work loose.

The most novel feature of this skip is a substantial platform above the skip-body, so arranged that either half of it can be folded back out of the way when hoisting ore or waste, so that it does not interfere with loading the skip from chutes at the underground ore-pockets. This is made of 1½ by 2½-in. steel and is capable of carrying a load of two or three tons. For the lowering of men, steel, and other supplies it is of the greatest service. The details of the construction, showing how the platform folds up so as to occupy a minimum of space, yet allowing ready folding or letting down, can be seen from the front and side elevations given on the opposite page.

A second important feature is the roller which prevents the skip from descending the shaft in an inverted position after being overwound. The details of this device are shown on the drawing above, where the dimensions are also given. This roller works against a steel wearing plate, placed on the inside of the skip and either can be readily replaced when it finally becomes worn. The device is much more satisfactory than the older type of hook employed on the skips used in vertical shafts at Butte and elsewhere.

Other important features of this type of skip are the guide-shoes and the wearing plate. The guide-shoe, made from a plate with two angles bolted to it, is continuous from the platform level to the bottom of the skip, thus preventing fragments of rock or ore from becoming lodged between the guide and guide-shoe during the loading of the skip. A wearing plate is placed against the side of the skip opposite the loading chute to take up the wear resulting from the impact of the large pieces of ore and rock. Other details of the construction can be seen in the drawings.



DETAIL DRAWING OF SKIP DUMP.

In working underground it is necessary to have all openings wide enough to give sufficient elbow room to work to advantage, but the width is independent of the width of the vein. To illustrate the effect of this, if the minimum working width is 50 in., and the vein is 1 in. wide, then the proportion of ore to barren rock will be as 1 to 49. Supposing, however, the vein is 10 in. wide, this proportion will be reduced to 10 to 40, or as 1 to 4. Since the work done must be paid for by the value of the ore obtained, it thus follows that a narrow vein is worked under a very heavy handicap. If the veins are short, or pinch and swell suddenly, so that a lot of unprofitable work has to be done in finding or in following the orebodies, this gives a similar and additional handicap, so that where a vein is both narrow and irregular the chances for profitable working are but slight unless the vein is rich.

Mining Engineers in Japan

Editorial Correspondence

Since landing at Yokohama, November 3, the party of American mining engineers now visiting Japan has been made to feel in every possible way that its members are in the hands of their friends. There has been a constant round of entertainment and sight-seeing at every point. Elaborate arrangements have been made for the comfort and pleasure of the guests. At Yokohama itself the party was met at the Grand Hotel by a committee from the Chamber of Commerce, and after speeches of welcome were presented with beautiful badges, after which there was a ricksha ride to the principal points of interest in the native city. After luncheon at the hotel, given by the local committee, the party was taken to the City Hall, where the members were received by the Mayor and city officials. Following this, a band of geishas, elaborately dressed, sang the 'harvest song' in the street before the building, and, after tea, the party was taken to the waiting train. This entertainment at Yokohama was but the prelude to that at Tokio, Kioto, Nara, Miyajima, and other cities visited. At Tokio the engineers and their ladies were guests at an elaborate ball given in honor of the Emperor's birthday by Baron Uchida, the new Minister of Foreign Affairs. The official residence of the Minister had been enlarged for the occasion by the addition of a number of beautiful rooms, including a smoking room made by roofing in and surrounding a part of the garden. The effect was excellent, and in the brilliant and cosmopolitan throng attending the ball the engineers met friends from all parts of the world. Baron Uchida, as recent Minister to the United States, and the Baroness, a graduate of Vassar, were especially gracious to the Americans. The following day the party was taken through the University and art exhibition, to a crysanthemum show, and given a luncheon at Hotel Seiyoken in Uyeno Park by the City of Tokio, the day closing with an elaborate dinner at the Imperial Hotel, given by the local committee and presided over by Baron Shibusawa, with Viscount Kaneko as toastmaster. Sunday morning visits were made to the War museum and the Imperial gardens, followed by an elaborate luncheon in Japanese style, given at the Maple club in behalf of the Mining Institute of Japan by W. Watanabe, the director of the Engineering College of the University. As this was the first opportunity most of the visitors had had to see a real Japanese house and to taste Japanese fare, it was particularly appreciated. Following the luncheon a troup of geisha girls performed a number of the ancient symbolic dances. Later in the afternoon, at the Mitsui club, the Minister of Agriculture and Commerce received the party and gave an elaborate tea. In the rooms of this beautiful club an exhibit of pearls grown by careful culture was shown; an exhibition of the care and skill with which the Japanese are protecting ancient industries. There was also a ceramic exhibit, and on the lawn a group of workmen made small pieces of pottery for the visitors. Each selected a piece, which was then decorated and burned. Most of the Americans were extremely awkward in pottery decoration, but practically all the Japanese gentlemen and ladies handled the brush as well as the workmen.

Sunday evening the party left for Kioto, traveling on a special train of sleeping and dining cars, and finding the service excellent despite the unusual arrangement of the cars made necessary by the narrow gauge of the railway. As an example of the detailed care taken in handling the party it may be noted that the menus in the dining car, as elsewhere, were headed by the flags of Japan and the United States and that each menu was an artistic bit of color work. Interpreters, officials, and others were abundant, but some laughable misunderstandings occurred none the less. One young lady having ordered 'eggs over' and receiving eggs fried on one side, was disposed to insist. The waiter, doing his best to accommodate her, hunted up a knife and deftly turned the eggs in her presence. It has been hard, however, to find enough such misunderstandings to make a good story. At Kioto it was raining, so that the elaborate decorations arranged to greet the visitors were largely spoiled. The band, however, bravely persisted in playing 'Star Spangled Banner' as the rickshas came up to the hotel. For once the Americans were unable to stand and properly acknowledge the courtesy. Tuesday was a clear day and was a busy one, as visits were made to the Imperial palace, the Shogun's palace, the Golden Pavilion, various temples, and the University. At the last, as at Tokio, modern and ample equipment, and an able force of instructors were evident. Among the professors many old friends and schoolmates were recognized, and English, French, and German greetings were heard on every side. Of the Universities and their men more will be said at another time. Tuesday evening the party was entertained at dinner in the new commercial museum by the City of Kioto, the acting Mayor presiding. Aside from the excellent dinner, there was an exhibit of flower arrangement and a series of geisha dances. Here, as at Tokio, a number of Japanese ladies as well as gentlemen, were present to greet the party. Wednesday, November 8, was spent at Nara among the beautiful maples and temples, and as elsewhere a tea was given by the City to the visitors. This time the function was held in a beautiful hall in one of the parks, built and maintained for entertainment of guests of the city. After dinner at Kobe the party embarked on the *Umegaka Maru*, a steamer built by popular subscription and presented the Nation for use in time of war as a fast scout cruiser. In time of peace it performs the more prosaic duty of carrying passengers from Shimonoseki to Fusan from which service it was withdrawn and especially fitted for the use of the engineers in traveling through the Inland sea. It is a most comfortable boat on which not only excellent meals were furnished but flowers as well were distributed. Shisaka island, the seat of the Sumitomo smelting works, was reached at nine the next morning. While the ladies visited the hospital and schools, the engineers were taken through the smelter where the ore from the Besshi mine is reduced. The process was explained in detail later in the day by Keijiro Nakamura, the superintendent, who is traveling with the party. It involves pyritic smelting and stall-roasting, though pot-roasting has just been introduced. The works are modern and complete in every particular. More complete details will be reserved for a later letter. Friday was spent at Miyajima, one of the most beautiful spots in Japan, from which this letter is written. Saturday is to include a visit to the Imperial Steel Works.

Card Index System for Drawings

By P. B. McDonald

Drawings, maps, tracings, and blue-prints can be conveniently filed in a set of drawers, where each drawer is lettered and reserved for one or two subjects; thus one drawer holds underground maps, another pump data, and another plans for buildings. In each drawer the drawings are numbered from one up, thus, L-1 or M-1. Also, another number is put upon each drawing which is its chronological number, taking the drawings as a whole; thus a drawing is spoken of as 'No. 421, Index M-13.' Two sets of index cards are kept; one set is kept in the chronological order of the drawing, and each card tells the subject, the index, the date, scale, and draughtsman, of one drawing. The other set may be on differently colored cards, one color for maps and geological subjects, and one for mechanical data; the division is into subjects, such as, 'Head-frames,' 'Tram-cars,' 'Rock-drill parts,' and one card may represent several drawings referring to one subject.

If it is desired to look up a drawing made some time ago, it is usual to refer to the cards representing subjects and find the drawer and index number; if the drawing has been made lately, reference is usually had to the chronological set, where a glance at the last few cards gives the information. As soon as a drawing is started it should be given a number and index with a card in the chronological set; later it can be posted in the set of subjects.

Discussion

Readers of the Mining and Scientific Press are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Is 'Cheap' Labor Economical?

The Editor:

Sir—I read with considerable interest the editorial in your issue of November 18, headed, 'Is 'Cheap' Labor Economical?' This is a question about which all kinds of opinions are held, and I dare say that a discussion thereon will be varied. I have had experience with 'cheap' labor in different parts of the world, with the numerous tribes of southern and central Africa, with Chinese, with Indian coolies, and with peons.

It is interesting to analyze the causes for the sometimes high cost of 'cheap' labor. Take South Africa as an instance, the Rand in particular. There the Kaffir labor has never had any unrestricted chance to show its highest efficiency. Were the economic the only side of the question, and it political and social aspects did not come into the South African labor problem, there is no doubt but that Kaffir labor would make a far better showing than at the present time. The future destiny of South Africa lies in a choice between a country like India, with only a handful of white men, and a country like the United States, where the white race is growing stronger and stronger and the colored race of less importance.

It is because of this political aspect that the legislators of the Transvaal have protected white labor to a certain extent by means of stringent laws, prohibiting the Kaffirs from doing what is called the 'white man's work.' For instance, it is against the law for them to run a large hoisting engine; it is also against the law for them to carry on blasting operations. The reason for these laws in the Transvaal is, not that the Kaffir cannot be trained to do this work, but that it is necessary to protect the white race from 'cheap' labor. A few years ago there was a serious strike of the white employees on the Rand, and for some weeks the mines were run with scarcely any white men. The change was too sudden, but it demonstrated what could be done with Kaffir and Chinese labor on the Rand if there were few or no restrictions. No one wants to see a second India in South Africa, and the people there are perfectly right to protect white labor; but the fact remains that, judging from a purely economic view, 'cheap' labor in South Africa has never had the chance to show its highest efficiency.

The experience with the Chinese on the Rand shows the importance of organization and direction when 'cheap' labor was employed. The burden of responsibility of the 'cheap' labor on the manager is greater than when he has charge of skilled labor. Economically the Chinese on the Rand were a great success and proved that 'cheap' labor is satisfactory.

In central Africa I found that the very low efficiency of native labor was due as much to the carelessness of the white management as to the black men themselves. Of course, in this section of the world, 'cheap' labor suffers from the drawback of a bad climate as compared with South Africa.

When we consider the peons, we find that the chief cause of their inefficiency is their awful native drinks, *tequila* and *mezcal*. If it were possible to introduce in Spanish America the Transvaal law prohibiting the sale of intoxicating liquors to laborers, the efficiency in that part of the world could be raised very materially. By putting so-called 'cheap' labor on contract and thus giving them an incentive for extra effort, I have been able to accomplish results that could not be beaten by any 'dear' labor in the world. The problem in all mining countries today, whether using 'cheap' or 'dear' labor, is how to increase the efficiency of the labor. Possibly discussion such as this will bring out points to help in this most important problem.

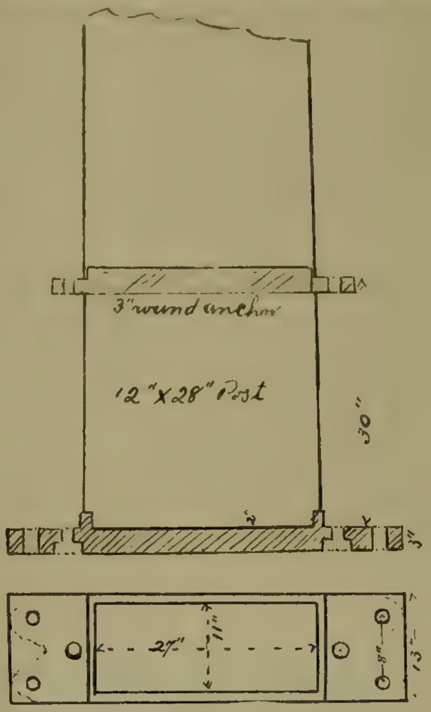
T. Lane Carter.

Chicago, November 25.

Battery-Post Shoes

The Editor:

Sir—There have been several descriptions of battery post shoes in your journal, and I wish to add a description of a shoe that has answered every requirement, and is lighter than those described, but heavy enough for the purpose. The battery posts anchored in these shoes have so little movement that the hand held at the base of the post can feel hardly any vibration. In the first set constructed here the hold-down bolts were 1¼-in. diameter and have never broken, but I decided on a stronger bolt for the next set, so ordered a 1½-in. bolt. The sole-plates are held down to the concrete with four 1½-in. bolts 3 ft. long, the lower end riveted in a cast-iron pocket washer.



A GOOD BATTERY-POST SHOE.

Algernon Del Mar.

South Pasadena, November 20.

The State Mining Bureau

The Editor:

Sir—I wish to thank you for your editorial on the State Mining Bureau, in the issue of December 2, and for the valuable suggestions therein contained. I desire to say a few words regarding this institution, and to outline briefly some of the things it is hoped to be able to accomplish. I also wish to appeal to the miners of the State to give me their hearty support, for much depends on them.

The State Mining Bureau of California was created by an act of the twenty-third legislature, passed April 16, 1880. This act also created the office of State Mineralogist. The institution existed for a period of about thirteen years under the original act. A second act was passed March 23, 1893, which was similar to the original act. The act states clearly the purposes for which the Bureau was created, and it is the purpose of the present State Mineralogist to carry out, as far as possible, the requirements of the act, both in its letter and its spirit. To my mind, the main purpose of the State Mining Bureau is, not only to collect and publish statistical data of the mineral industry of the

State, as required by law, but to aid in every possible legitimate way the development of the mineral resources of California and to invite the attention of foreign as well as local capital to the vast possibilities of the State in the development of its mines, quarries, and mineral deposits. According to the latest statistical bulletin issued by the Mining Bureau, the mineral output of California for the year 1910 was over $88,000,000. Notwithstanding the magnitude of this production, I believe it can be materially increased. The mining and preparation of structural materials; of mineral salts, and of non-metallic substances is undoubtedly capable of large augmentation, though this expansion is, to a great extent, dependent on the rate of increase of population and the general upbuilding of the State, and to a lesser extent on the exportation of such materials from California to neighboring States and foreign countries. That the production of metallic minerals is susceptible of far greater development I am sure. Not all of the profitable gold mines have been developed, nor even all of them discovered, by any means. There is still a great future for gold mining in California. There remain many promising opportunities on the great Mother Lode, as well as on the East Lode, and in that mineral belt which skirts the foot-hills a few miles west of the Mother Lode. Of the great mineral zone that traverses the region of the high Sierra comparatively little is known. That region has been almost wholly neglected for more than twenty-five years. The great advance in knowledge of mining and metallurgy during the past two decades brings within the range of commercial possibility ore deposits in that region which were in early days unprofitable. What is most needed in that field is capital in the hands of men who are accustomed to the conditions obtaining there. The California miner has been reared in the foot-hills amid orchards, meadows, and vineyards. The majestic snow-clad peaks of the Sierra Nevada "do not appeal to him" as a land of promise. To the average miner of Colorado such conditions are by no means prohibitive—he has come to expect nothing else in the region of high mountains to which he has long been accustomed. Deep snows, long winters, fierce winds, and isolation have no terrors for him, if only the veins possess the elements of commercial success. The lack of convenient transportation is at present the principal drawback to the rapid development of this mineral province, but this can and will, I believe, be overcome, and probably within a very few years.

There still exist many, doubtless a surprising number, of what may be considered most promising opportunities in the equipment, development, and operation of gravel drift mines in the ancient rivers of the State. The desert regions, too, have for the most part been only superficially explored and there still remain many valuable mineral deposits to be worked in those fields. These include copper, silver, lead, zinc, and iron, as well as the ores of gold. The saline deposits are of great value, as has already been determined, but they have only been partly explored, and without doubt many important discoveries will yet be made.

The large profits won in successful mining have rendered the mineral industry an attractive field for dishonest promotion. Unfortunately the laws of the State are not, as yet, adequate properly to protect the public from the pernicious activities of fraudulent promoters. That the stifling of dishonest mining schemes hurts legitimate mining I do not believe, and it is hoped that legislation will soon be enacted by the California legislature which will afford all the protection to the mineral industry that is given to other lines of business. In the meantime the Federal laws afford protection sufficient to reach many of the more flagrant cases that may come to the notice of the State Mining Bureau, and these existing laws will be invoked to put a stop to the sale in California of shares in 'fake' mining enterprises, whether the property be situated within the State or elsewhere. It is supposed that there is a surprisingly large number of such companies now doing business in this State, and it is proposed to put an end to the sale of shares in such concerns through the untruthful presentation of the facts. Frequently new mining enterprises involve a far greater financial risk than is found in most other new ventures. In such cases the promotion literature should state the truth, whereas, usually, quite the reverse is the practice. It is extremely interesting, for instance, to read in a handsomely printed prospectus, that a certain mining company owns property in which there is a 12-ft. vein of ore assaying $200 per ton, and stock in the enterprise is being offered at a surprisingly low figure, but it would certainly be much more interesting and important if it were true. What is the outlook for the investor in the stock of this company if it has no ore in the property that will yield a profit under any circumstances? It requires but one guess.

From time to time announcement is made in the daily press of phenomenal discoveries of valuable mineral deposits in isolated places, and the alleged discoverers send broadcast statements calculated to attract large numbers of men, and women, too, to the locality. It comes within the scope of the duties of the State Mineralogist to promptly investigate such alleged discoveries, and to publish the facts officially. In the event of the reported discoveries being authentic it is hoped that much good will result from such publication, and if they are found to be otherwise, then surely much good must result from an official statement to that effect, for it would prevent many who could ill afford the expense of such an expedition from stampeding to a worthless camp.

It will be the purpose to keep abreast of the constant advance in mining and metallurgical methods, and in construction, by the publication of bulletins on these subjects as often as the situation seems to warrant. In short, it will be the chief aim of the State Mining Bureau to collect and publish useful and accurate information on all branches of the mineral industry in California, and to give publicity to such matters as promptly as possible—principally through the medium of official bulletins, and when necessary, by means of the technical and daily press.

A great International Exposition is to be held at San Francisco in 1915. Only a little over three years remains within which to prepare for this history-making event. California has the materials for presenting a splendid mineral exhibit at the Exposition, and that such an exhibit will be made by the State goes without saying. It is hoped to make it the most complete, attractive, and representative exhibit of the kind ever made by any State at any exposition.

I have outlined briefly some of the things it seems to me desirable to undertake and to carry out, but the State Mineralogist can accomplish little without the earnest and hearty coöperation of all the mine managers, superintendents, and mine owners, and of the working miners as well. Much is expected of this administration of the State's department of mines, but in order to make the State Mining Bureau properly subserve the purposes for which it was created and is maintained, all must lend a helping hand. In conclusion I only wish to add that if the mining men of California will give me their aid it is hoped that the State Mining Bureau will become one of the most useful and most necessary of all of the institutions of its kind in the world.

William H. Storms.

State Mining Bureau,
San Francisco, December 4.

Laramie Tunnel Figures.

The following interesting figures relating to work on a 7½ by 9½-ft. tunnel in hard rock driven in Colorado, are given by D. W. Brunton in a paper read before the American Institute of Mining Engineers:

1911.	Feet completed.	No. of holes.	Lin. ft. holes.	Av. lin. ft. holes, per day.	Sticks powder.	Cars débris.
March	653	1,965	14,330	154	14,808	4,983
April	583	1,759	12.510	139	16,171	4,765
May	635	1.985	15.263	164	18,311	5,156

Concentrates

Most of these are in reply to questions received by mail Our readers are invited to ask questions and give information dealing with the practice of mining milling and smelting

AN excellent red lead cement for face joints is made of equal parts of red lead and white lead mixed with linseed oil to the proper consistence.

TO drill chilled cast iron, first draw the chill. This is done by laying the piece on the forge, covering the spot to be drilled with sulphur, and working the bellows slowly until the sulphur is burned off. Then proceed with the drilling.

LIME is burned with a number of different fuels. Coal is used extensively by plants in the United States at present, followed in order by wood, coke, producer gas, natural gas, and oil. A large variety of mixtures is also employed, such as coal and coke, coal and wood, coke and wood, coke and shavings, and shavings and manure.

NATIVE COPPER is chiefly obtained from the mines of the Lake Superior region, though the mines at Coro-Coro, in Bolivia, produce some native metal. Though native copper is found in Arizona, California, and, to a limited extent, some other American localities, it is never mined for itself alone, nor does it constitute any notable percentage of the copper output except in the Lake region.

PETROLEUM has been found in Alaska, and while there has been practically no production, it is not impossible, according to the United States Geological Survey, that commercial pools may be found. Oil seepages occur on the west shore of Cook inlet, on the east side of the Alaska Peninsula, and on Controller bay, all close to tidewater, and hence capable of cheap development.

ETCHING of names or figures upon steel articles can easily be done with the aid of a lacquer made of 2 parts of powdered asphalt, 1 part resin, 1½ parts wax, and a little tallow. The surface to be etched is first covered with a thin coating of this, and after the design has been cut through the lacquer, the etching may be done by the use of nitric, acetic, or tartaric acid.

BLASTING caps contain a charge of fulminate of mercury, one of the quickest and most powerful explosives known, extremely sensitive to heat, friction, or shock, and very poisonous. The charge in the cap can be easily exploded by scratching it with a pin or by twisting a piece of fuse around it vigorously. The explosion of a quadruple cap will blow a hole through an inch pine board or amputate several fingers from the hand that holds it. Therefore, handle caps carefully. Never under any circumstances attempt to remove the explosive, nor cut caps with a knife.

TEMPERING small taps may be done as follows: Place an iron vessel with a capacity of about one gallon in a gas-furnace and put enough lead into it to make it about three-fourths full when melted. Bring this to a suitable degree of heat and cover with charcoal to the depth of one-fourth inch, the charcoal preventing the lead from clinging to the threads. Then insert the taps to a sufficient depth to allow them to become heated a little beyond the threads and leave them in the lead only a few seconds, then remove and plunge them into the water bath. After they are hardened put them into a perforated basket and draw in an oil furnace provided with a thermometer.

RUSTING of iron is accelerated by any combination of circumstances which tends to keep the metal moist while allowing free access of air to it. For this reason, when rusting is once started it progresses rapidly, as the coating of rust has this effect. Organic matter in the soil will hasten the rusting of buried iron and steel by the organic acids resulting from its decay. Sea water rapidly corrodes steel if its temperature is below 55°F., but above that temperature is less corrosive than pure water. Rusting is best prevented by covering the surface of iron and steel with some substance which will prevent air and moisture reaching the metal.

THE United States Geological Survey formerly made field and laboratory studies of many kinds of sand and gravel in localities where Federal buildings were in course of construction. These studies have shown great variations in the quality of sand and gravel used at different places for making concrete. Some contractors contend that run-of-bank sand and gravel are the best for making concrete, but this contention is generally not sustained by practical trials and experiments. The most desirable material is that which is free from clay, loam, or dust. Mica, pyrite, or limonite also is objectionable, if present in large quantity. A coating of dust on gravel presents its proper contact with cement, so that such pebbles are easily broken out of the concrete.

GRAPHITE imported into the United States comes mainly from Ceylon and Mexico. It is significant to compare the total value of the imports in 1910, $1,872,592, with the total value of the domestic product, both natural and artificial, which was $1,322,176. The domestic demand for graphite and graphite products is undoubtedly increasing, and it is encouraging to note that this demand is being met principally by increased domestic production rather than by increased importation. Domestic flake graphite is replacing the Ceylon graphite to some extent in the manufacture of crucibles for the metal industries. There appears to be no reason why this replacement should not increase, for in Germany flake graphite similar to much of the American product has for generations been successfully used for this purpose.

PLACERS upon unsurveyed land should conform as nearly as practicable to the system of public-land surveys and the rectangular subdivisions of such surveys, by making the location as nearly as rectangular in form, compact, and with east-west and north-south bounding lines as is reasonably practicable. The Land Department considers claims satisfactory when those of one or two persons can be entirely included within a square 40-acre tract; when a claim located by three or four persons can be entirely included in two, square, 40-acre tracts placed end to end; when a claim located by five or six persons can be entirely included in three, square, 40-acre tracts; or a claim located by seven or eight persons can be entirely included in four, square, 40-acre tracts; but it is not intended that the 40-acre tracts shall necessarily have east-west and north-south boundaries.

ZINC DUST is an impalpable powder which forms in the distillation of zinc when the zinc vapor is cooled too rapidly in the condensers or is diluted by too large a volume of other gas. It may constitute a large proportion of the metallic zinc obtained in electrothermic zinc smelting, but in ordinary retort smelting it usually amounts to between 3 and 10% of the reduced zinc. The powder consists of metallic zinc, with about 10% zinc oxide, which probably exists as a film surrounding the metallic particles. These particles cannot be made to coalesce by heating unless under great pressure, but must be again vaporized and condensed. Marketable zinc dust must not contain more than 10% of zinc oxide and must pass through a screen of 100 meshes to the inch. Zinc dust differs from metallic zinc in other physical properties, such as rapid oxidation, absorption of hydrogen, and generally greater chemical activity, resulting at times in spontaneous combustion or explosion. These properties are believed by Sang to be due to conditions of stress resulting from rapid solidification, somewhat analogous to the condition in a Prince Rupert's drop.

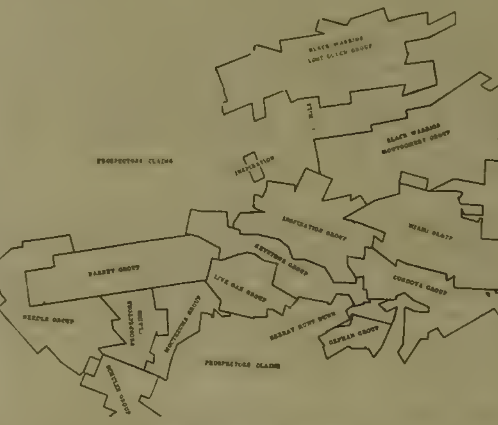
Special Correspondence

NEW YORK

European War Scare Real Cause of Copper Surplus Decrease.—Cole-Ryan Interests Enter Porphyry Field.—Lewisohns Are Leaving Mining.—Rice's 'Squawk-Book'.—General Notes.

While there is a strong effort on foot to revive interest in precious-metal mining—that is, the interest of that part of the public which makes it a rule to look for ground-floor offerings or first prices on public flotations—nevertheless, the coppers and the copper situation have held the centre of the stage, with the spot-light playing very vividly. There has been an advance in copper metal, and export shipments have run high: in many quarters the feeling was expressed that there was not a change in business conditions, either at home or abroad, that would justify a boom in copper, and there have been many queries as to what was or is the basis for such a movement. One feature, which has been pointed out repeatedly as making for improved conditions, has been the decrease in the visible supply abroad. It seems not to have occurred to those who seemed anxious to make the most of the apparent improvement, that this shrinkage in the world's visible supply of red metal was undoubtedly due to the low-hanging war cloud in Europe. The British Parliament has just listened to the Secretary of Foreign Affairs while he explained how low this cloud was really hanging during a part of the recent unpleasantness between France and Germany. That the various governments abroad were making every possible preparation for immediate war is now well known: that such preparations should have included large orders for copper for cartridges is surely a matter of course. From the recent admissions that France and Germany were on the very brink of actual hostilities, that Turkey and Italy are even now engaged in warfare, it is not hard to draw a reasonable deduction as to where the copper went, that left the much-talked-of shrinkage in accumulated stocks. This spasmodic demand is hardly such a use of copper as will serve for a foundation for the upward movement that has already taken place, to say nothing of further advances in the face of prevailing conditions. The metal was worked up to 13¼c. during the week, but looks much quieter now, and the reaction appears to be at hand. Undoubtedly the Producers' report for November will show a substantial decrease in the surplus, but it is doubtful if it will show that American buyers have come into the market to cover their needs for any length of time in the future.

Of probably more real importance as to the future of the copper market in this country is the entry of the Cole-Ryan interests into the porphyry field. In drawing comparisons and making estimates it has, for some months, been the rule to consider the Guggenheim group of low-grade milling coppers upon the one hand and the mines of the Amalgamated Copper Co. upon the other, Butte being considered the typical deep-level mining district and the greatest group of copper properties of its class. Now it seems that the group of owners whose interests centre at Butte and who include, broadly, the Standard Oil Co., the Amalgamated Copper Co., the United Metals Selling Co., the International S. & R. Co. have in a measure capitulated to the new departure in copper mines and have determined to take a hand in developing some big low-cost production. John D. Ryan, president of the Amalgamated Copper Co., is credited with having purchased a controlling interest in the Live Oak Development Co. at $30 per share, which is equivalent to about $2,500,000 for the property on a basis of the present outstanding stock. There has been quite a little discussion of merger possibilities in the Miami district recently, and the present coming in of new factors has greatly revived interest in the area. Miami, Inspiration, and Live Oak are all adjoining properties, and it is looked upon as certain that further consolidations will follow. Not long ago there were some preliminary negotiations between the Thompson-Gunn interests, which control the Inspiration, and the General Development Co., which owns a majority in the Miami, but while the two properties are one by nature, the dividing line being an arbitrary one, the owners of the two portions could not get close enough together to really 'talk trade.' It is more than likely that one of the inducements which brings Mr. Ryan into the Miami field is the recent move of the American Smelting & Refining Co. in taking over the partly completed smelter of the Ray Consolidated and erecting an immense plant at Hayden, Arizona. The present move is in part simply to keep abreast of the growing opposition. The United Metals Selling Co. has seen the Guggenheim agency growing in power, handling each year more and more copper, and the business of copper production has, in a way, been made secondary to the factors which handle the ores after they leave the concentrator. No small part of the movements which have been made in copperdom during the past two or three years, have been due to the ambition to control both the smelting industry and the business of selling the metal. The minority interests in the Live Oak deal have been protected by an offer to take all stock deposited in bank in New York by December 7, at the same price as was paid for the control, $30 per share. In sending out this notice to the shareholders, Mr. Hovland, president of the Live Oak company, states that the Miami Copper Co. endeavored to buy the Live Oak at the same price that Mr. Ryan paid, its offer being in debentures of the Miami Copper Co., however, instead of cash.



PART OF GLOBE DISTRICT.

It is hinted in some quarters that the Lewisohns—Adolf Lewisohn and his associates—who control the General Development Co. and the Canadian Silver Mines Exploration Co., the former company controlling the Miami and the New Keystone copper properties and the latter controlling the Kerr Lake and the Wettlaufer, both silver properties in the Cobalt district, are getting out of their mining investments. Adolf Lewisohn and his brother Leonard, now several years deceased, were the founders and upbuilders of the United Metals Selling Co., and make it primarily the greatest copper brokerage firm in the world. The family has always been the dominant interest in Tennessee Copper, but recently a large block of Tennessee was taken over by banking interests, and it is probably true that the Lewisohn interests in the various properties which they control is not as large as it was two or three years ago. The Canadian company took up several properties in the new gold district of Porcupine, but, so far as known, is not now identified with the district in any way.

The Thompson-Gunn interests, which are the dominant factors in Inspiration, while considering that property as the most important one in process of development under their charge, while getting ready for the 5000-ton plant on the Inspiration, have brought the Mason Valley property at Yerington, Nevada, to the point of production, and the smelter is to be blown in during the current week. Mason Valley will add about 1,000,000 lb. to the monthly output.

The problem of the First National Copper Co. has resolved itself into a study of the demand for artificial fertilizers in the West. The fume troubles in which the First National became involved in Shasta county, California, precluded the possibility of handling the property at a profit; if, however, enough demand can be found to justify the addition of a sulphuric-acid plant, it is possible that the Balaklala may yet be operated at a profit. First National was at one time a member of the family of Thomas W. Lawson, of Boston, and it must be considered as natural that the mine should encounter all kinds of trouble thereafter. Nevada Utah, at one time starred in a most spectacular advertising campaign, in which Lawson lavished his most picturesque powers of description, has just been placed in the custody of a receiver, while Bay State Gas and Trinity Copper seem unobtrusively to have slipped into history without remark in any way upon their passing.

While spread-eagle advertising has not been much in evidence in the East since the most recent rise and fall of George Graham Rice, who is now on trial for running a bucket shop and using the mails for fraudulent purposes, there is a strong advertising campaign being made by means of Sunday supplements in behalf of Porcupine. Leading properties are being written up, and some of the brightest lights of the old days of Tonopah and Goldfield are making almost superhuman efforts to flirt with the calcium. The trial of George Graham Rice, B. H. Scheftels, and some of the minor associates is enlivened by the reading of the 'squawk book', which contained the complaints of those customers who kicked because they were unable to force deliveries of stock purchased.

Fred Hellmann is at South Lorrain, near Cobalt, Ontario, at the Wettlaufer property, to superintend the starting of the new mill, which is to handle the low-grade ores of the mine. Wettlaufer ships about two cars of high-grade ore and is paying dividends at the rate of 20% upon par, $1 per share. It is a striking commentary on the way the public has become educated to look upon mining dividends, that a property such as Wettlaufer should pay dividends at such a rate, with its productive career just begun, and yet sell below par. The market for the shares is about 85c., at which price it pays nearly 25% upon the investment.

The report of the Braden Copper Co., just issued, is very interesting, especially in its estimate of copper costs. Copper costs are figured at 7.4c., with possibilities of further reduction. This figure will give Braden an important place among the low-cost producers. Yukon Gold, another of the Guggenheim properties, cut its dividend distribution from 10c. quarterly to 7½c., reducing the rate from 8 to 6 per cent.

LONDON

East Rand Proprietary Report Published.—Future Dividends to Be 25% Instead of 40%.—H. Ross Skinner May Be Consulting Engineer for Company.—More About Camborne.

At last the official report of the committee appointed to investigate the shortage of gold at the East Rand Proprietary has been published. Unfortunately it is a very long one and the committee has not seen fit to give a synopsis or a shortly expressed opinion such as would be suitable for the average shareholder or speculator on this side of the world. The committee was an excellent one, consisting of a magistrate, H. O. Buckle, the managing director of the Premier Diamond Co., P. Ross Frames, and the Government mining engineer, R. N. Kotze. The combination of an administrator, a business man, and a mining engineer was singularly appropriate. The state of affairs was pretty well known before the committee was appointed, as I said in my letter sent a fortnight ago. The committee reports that the difficulty of keeping the yield of gold up to the required level to provide a 40% dividend had been a pressing one for longer than anybody had thought. It appears that as long ago as May 1909, E. H. Johnson, the consulting metallurgist, expostulated with the joint general managers for 'excessive clean-ups,' and that in December a year ago the condition became really serious. The fact is that gold habitually has been taken from the amalgamating plates, the solutions, and the zinc boxes, that really should have been left in the interests of efficiency. This abstraction, of course, was done only as a temporary expedient, as the managers really expected that the deficiency eventually would be made good by the mine. But a bank cashier falls sometimes into the same fatal state of mind, hoping that all will come right in the end, with the inevitable result that the evil day arrives nevertheless. The minute details of the case will not interest the public, so I will merely say that the net result is that in the future the capabilities of the mine in point of yield per ton will not be exaggerated, and that the shareholders must be content with 25% instead of 40%. This will be serious to investors who have paid inflated prices for the shares, but that cannot be helped. There is another aspect of the question which deserves notice. It appears that the shortage difficulty was kept a secret in some quarters where the people connected with the company had a right to know the full details. This suppression was made possible because the company had no consulting engineer. In this group each manager has complete control and is responsible only to the board. There is no consulting engineer whose general duty would be to keep in touch with the details of policy at each mine. All the other groups on the Rand, and in fact most English financial houses, have consulting engineers, and some even a staff of such. If the Farrar group had had such an organization, the worries besetting the managers of the East Rand Proprietary would have been shared by the consulting staff, and the board would have been told plainly and bluntly that their demands for a certain minimum yield and profit were impossible. It is rumored, but with what truth I am unable to say, that H. Ross Skinner has been asked to accept the position of consulting engineer. Mr. Skinner has done good work in this capacity for the Durban-Roodepoort and the Vogelstruis estates, two companies working in the west part of the Rand, and unconnected with any of the great 'houses.' One of the ultimate sequelae of this case will be the demand on the part of the shareholders in South African mines that African companies shall be registered in England. As it is, the boards of directors are in absolute control. The meetings of shareholders are farces as such, being attended by nobody but the directors and some of the staff to make a quorum. The shares are not held to any great extent in Africa, and probably more are owned in France and Germany than in England. "The meetings of shareholders ought to be held in some place where the shareholders can meet," as Abraham Lincoln would have said with his characteristic plain common-sense.

In my letter sent last week I referred at some length to the precarious condition of the Camborne Mining School, and I asked Cornishmen in all parts of the world to consider the advisability of subscribing liberally to an endowment fund. There are two aspects of this question that I ought to have referred to at the time, and I therefore make the present addenda. In the first place, the Government Education Office, when the consolidation of the various Cornish mining schools was effected two years ago, dubbed the new institution with a ridiculously expressed name. Who expects any dignity to accrue to a school whose name contains a word enclosed in parentheses? The name is as follows: 'School of Metalliferous Mining (Cornwall).' Fancy sending your boy to a school that has the most important word in parentheses! I can understand a fond parent endowing with a few million pounds a new university with junior forming part of its title, but that was the founder's business. But a public school under the control of alleged reasonable men ought to have been treated better. 'The Cornwall School of Mining' would have been appropriate. Surely at this time of day it is not necessary to include the word 'metalliferous,' for metalliferous has been the only mining in Cornwall for two thousand or perhaps four thousand years. However, such is the slowness of English thought that perhaps it was as well to include the word. I, as an Englishman, advised those responsible for the establishment of *The Mining Magazine* not to be in too great a hurry for the practical support of the public, for I know by experience that things move slowly here, and that patience is required even for the propagation of science and common-sense. But I must say that the necessity for describing the Camborne School in the way mentioned is 'the limit.' The other point to which I want to draw attention is the cavalier way in which the new principal, W. Fischer Wilkinson is treated. Personally I thought it was a great event when his services were secured, for he is a man of distinction, with experience in all parts of the world, especially South Africa. It is therefore a matter of regret, if not of disgust, to find the governors not booming him for all he is worth. Here is the *Cornish Post*, the paper published at Camborne, containing a miserable little advertisement of the School of Metalliferous Mining (Cornwall), with never a reference to Mr. Wilkinson. It's really too bad! I am informed that those in control of the school plan making him one of the 'governors.' This is a tardy recognition of the importance of his post and influence, but it is a very incomplete sort of justice. He that is responsible for the subjects taught and the method of teaching should have more to say than is the privilege of one out of twenty governors. More must yet be done to give an 'authority' on mining some authority in the school management. The first new stroke of policy required in order to put the Camborne Mining School on its legs is a due and just recognition of the value, ability, and importance of the teaching staff.

GLOBE, ARIZONA

Miami Concentrator to Have Fifth Unit in Operation This Month.—General News of the District.

B. B. Gottsberger, manager for the Miami Copper Co., states that the long delayed line-shafting has arrived and that the fifth unit of the concentrator should start early in December, bringing the daily production up to 2500 tons. The mill is now producing about 90 tons per day of concentrate averaging 41% copper. The concentrate is shipped to Cananea. The stopes in the northwestern part of the mine are beginning to produce. There are three stopes being opened up, one of which is producing. The cross-cut to the orebody from the main shaft, on the 570-ft. level is being advanced and is now over half way to the orebody. Installation of machinery in the power-house continues and the second Nordberg compressor has been shipped.

Development of the Live Oak continues steadily under the supervision of M. E. McCarthy, manager of the property. On the 800-ft. level in No. 2 shaft, a drift is being run in a northwesterly direction in ore reported to assay 3% copper. Driving on the ore is also being done on the fourth level from No. 1 shaft. Two churn-drills are now in operation near the western end of the property in the vicinity of No. 2 shaft. The latest official report places the developed tonnage at 19,000,000 tons of ore averaging 2.11% copper.

The experimental mill of the Inspiration Copper Co. has been started under the supervision of J. M. Callow and E. J. Harrison, and some radical departures from present milling practice are being tried out. Preliminary surveying continues and H. J. Wallace, one of the chief construction engineers, has arrived. Henry Krumb, consulting engineer, who is now at the mine, says that the main features of the construction program have been decided upon, but that there remain a few minor details to be settled. He thinks that construction will begin soon after the first of the year.

Hole No. 1 of the Southwestern Miami Development Co. is 1285 ft. deep and is still in ore, having penetrated the orebody at a depth of 1110 ft., making 175 ft. of ore thus far passed through. The hole is now being enlarged with an under-reamer so that the casing may be lowered and drilling continued. Work has been delayed recently by freezing weather.

High-grade silver ore is being mined by several groups of lessees on the Copper & Silver Zone group of claims, three miles east of Globe. In the old workings in an adit on the Old Ironsides claim, lessees have opened up 2½ ft. of ore reported to carry 100 oz. of silver per ton and 2% copper, the silver occurring as a chloride, or hornsilver. On the Copper Zone claim some narrow veins of lead-silver ore are being worked, the silver occurring in galena. On the Black Crown claim, a narrow vein of ore, reported to carry 40 to 80 oz. of silver per ton and a little copper, is being opened by a shaft. The group is considered to be a promising prospect.

Three men continue to keep the water out of the Summit mine and watch the property, but no word has yet been received by the stockholders as to the plans for reorganization or the future policy of the management. A piece of float running very high in gold was picked up about three miles north of Globe last week and has stimulated prospecting in that vicinity. The gold occurred as a telluride in weathered diabase.

The Copper Reef mine, twelve miles south of San Carlos, is employing about 20 men. The inclined shaft is being sunk and is now about 800 ft. deep. Cross-cutting is in progress on the 600-ft. level, but no ore has yet been found.

DENVER, COLORADO

Cripple Creek Drainage Adit Develops Large Flow.—Colburn Mill Starts.—Camp Bird Lessees to Operate Promising Blocks.—Rate War Closes U. S. R. & R. Plant.—General Notes.

The progress of the Cripple Creek drainage adit continues to be a leading item in Colorado mining affairs. On November 24 the Fuller cross-cut developed an additional flow of between 3000 and 4000 gal. of water per minute, making the outflow at the mouth of the tunnel about 9000 gal. per minute. At the intersection of this cross-cut with the C. K. & N. veins, some of the richest orebodies ever found in the El Paso company's ground were discovered, at a depth of 1350 ft. This is nearly 400 ft. deeper than the present lowest El Paso level. Work is still being continued in the main heading and in the Fuller drift of the drainage adit. Cripple Creek operators are naturally greatly pleased with the manner in which the district is being drained by the adit. The 1500-ft. level of the Portland mine is now entirely recovered.

CAMP BIRD MINE.

The Colburn mill, on the Ajax property at Victor, started on November 17, and after a constant two weeks' run, during which time all the parts of the mill were completely adjusted, the management is able to say that the plant is an unqualified success. A modified cyanide-treatment process is used. This plant makes a higher percentage of extraction than any other mill in Cripple Creek, and the operating expenses, per ton of ore treated, are probably lower. It is claimed that eventually the treatment cost in this mill will not exceed 90c. per ton. At present 150 tons per day is treated, and the plant will soon be handling its regular capacity of 200 tons per day. Only four men per shift are required to run the mill.

The famous old Camp Bird mine at Ouray, for nine years one of the largest gold producers in Colorado, is rapidly declining in production, and it is announced by the London office of the Camp Bird, Ltd., that operations in the property on company account will probably suspend on February 1, unless additional discoveries of ore are made in the meantime, which is not held to be likely. Lessees, at that time, will be granted privileges of operating the most promising blocks of ground. In the past nine years the mine has produced about $18,000,000, and has paid its English owners profits amounting to $7,500,000. The secretary of the company reports that for every £100 invested in the Camp Bird, the Englishmen have received £175 in dividends, and the £100 investment is now worth £150. During this year the profit will be about $750,000. The mill is at present running on a reduced tonnage.

J. D. Hawkins, president and general manager of the United States R. & R. Co., of Colorado City, has issued a circular to Cripple Creek operators stating that the plant will temporarily suspend operations, because of a decrease in ore shipments from Cripple Creek, which is the only source of supply for the mill. All existing ore contracts will be taken care of by the Golden Cycle company, operating a mill in the same city. The announcement further states that the operation of the plant will not be resumed "until conditions warrant". This reveals a phase in the milling industry of Cripple Creek that is far from satisfactory to the custom mill men. The rivalry for Cripple Creek ores has been keen for many months, and rate cutting has been resorted to in order to secure tonnage. Normally, the two Colorado City mills handle 40,000 tons of ore per month; about 26,000 tons by the Golden Cycle and 14,000 tons by the United States R. & R. plant. The latter has a capacity of 750 tons per day, so that it has been running at less than two-thirds capacity. While the output of the Cripple Creek mines is now greater than ever before, in tonnage, the increased milling facilities within the district have greatly decreased, the shipments going to outside plants. As it is not likely that the tonnage to Colorado City will ever increase, there is little prospect that the closed plant will resume in the near future.

The old Hill smelter at Ouray, idle many years, has been purchased by Thomas B. Crawford and associates of Denver, who are remodeling the plant with the intention of putting it into active operation shortly after the first of the year. Mr. Crawford owns the Indiana and other mines at Ouray, in which a considerable tonnage of ore lately has been developed. This and other properties in the locality are expected to furnish a supply of ore to keep the plant constantly running at its capacity of 50 tons per day. A lead furnace will be added.

Members of the Colorado Chapter of the American Mining Congress and the Denver Chamber of Commerce, at a joint meeting held Tuesday evening, November 28, adopted resolutions petitioning Congress to grant the national Bureau of Mines sufficient funds to construct and maintain a metallurgical testing station in Colorado. The problem of efficient methods of ore treatment has been bothering many operators in the State for months, particularly in Clear Creek and San Juan districts, where large bodies of complex ore of fair value are available, but are apparently not amenable to treatment by any of the methods now in vogue in Colorado.

KALGOORLIE, WESTERN AUSTRALIA

LABOR PARTY WINS IN ELECTION. — TRANSCONTINENTAL RAILROAD TO REACH MINERAL DISTRICTS. — PHTHISIS COMMISSION CONTINUES INVESTIGATION. — MINE PRODUCTION FOR SEPTEMBER.

The most interesting topics during the month of September were the State General Elections, and the proceedings of the Miners' Phthisis Commission. In the first business the contest was bitter and keen in the extreme, between the Liberal and Labor parties. The election resulted in the complete rout of the Liberal party, which had been in power for many years. Everybody was surprised, and the position at present is Labor 31, Liberal 15, with 4 more returns to come in at the end of October. Even the Minister for Mines was beaten, and in several agricultural districts Labor men got in easily. A Labor government held office for a few months some years ago; but it was a poorly organized and indifferent party. The present lot are level headed men, and many past abuses in all departments, some of which are connected with the mining industry, are sure to be rectified.

The Federal government, which is also a Labor party, is doing splendid work, and before these notes are in print, the Transcontinental Railway bill will be passed. This line, 1060 miles in length, is from Kalgoorlie to Port Agusta in South Australia, and connects with all the system of Australia. This line should be the means of opening up mineral bearing and pastoral country.

The Phthisis Commission has taken further evidence from doctors resident in the fields, general managers, mill superintendents, miners, and others who are in a position to speak. Some interesting evidence has been given on stoping, raising, driving, filling stopes, shoveling into trucks, filling same out of chutes, the use of respirators and sponges, underground sanitary conditions and the coöperation of men in this respect, temperatures, damping the ore, and so on. The opinion of some of the doctors was somewhat curious, and apparently they have not bothered much in the past on the question. Evidence was also given on the dust in dry-crushing plants, the percentage of moisture (1%) permissible in ball milling, the superiority of dry versus wet treatment in general extraction and profitableness, and the steps taken to minimize the evil. The Commission inspected the underground workings and mills of several mines. The general manager of the Great Boulder advocated a system of compulsory insurance, the employer, employee, and State each contributing.

Only about 4 in. of rain has fallen on the goldfields this season so far, and it is quite probable that the outside areas will be short before long, to the detriment of work generally. Last year we were 11 months without rain, and the outlook seems similar.

The gold yield from the State in September was valued at $2,540,000. The 12 mines comprising the local Water Trust used 32,131,000 gal. of water in August. Many millions of this total were used in sluicing away residue, by the Associated, Great Boulder, Kalgurli, Lake View & Star, Oroya Links, and South Kalgurli.

The Ivanhoe publishes its reserves as 1,010,297 tons averaging $10.62 per ton, these being distributed in the East, Middle, New, and Boulder lodes. Results from the Horse-Shoe, Lake View, and Oroya Links have much improved to what they have been for some time, heavy plant and development expenditure cutting into profits. The mills are now in full working order with improved and interesting results.

The principal mines returned as follows, in September:

Name.	Tonnage.	Value.	Profit.
Associated	9,626	$ 61,000	*$ 4,200
Associated Northern Blocks	2,386	29,500	....
Chaffers	2,450	14,800	*9,300
Golden Horse-Shoe	24,420	186,500	33,000
Golden Ridge	2,758	32,700	14,000
Great Boulder Perseverance	21,146	143,000	35,000
Great Boulder Proprietary	17,473	240,000	127,500
Great Fingall	7,590	69,000	17,500
Hainault	5,506	34,000	1,250
Ivanhoe	20,124	202,000	90,000
Kalgurli	10,760	108,000	45,000
Lake View Consols	†8,145	88,000	2,950
Lake View & Star	15,531	94,000	12,000
Oroya Black Range	4,600	46,000	15,400
Oroya Links	9,020	56,000	8,500
Sons of Gwalia	13,725	133,500	49,000
Sons of Gwalia South	2,399	16,000	5,000
South Kalgurli	9,404	60,000	11,000

*Loss.

†From old dumps by vacuum treatment.

During the month under notice, 11 mines on the 'Golden Mile' spent $105,000 in development work, this being about the average expenditure.

General Mining News

ALASKA

Juneau

Placer discoveries near Uyak, on Kodiak island, have caused a rush for that place, according to recent despatches from Seward.

Prince William Sound

W. A. Dickey, of Landlock bay, recently shipped 175 tons of high-grade copper ore to the Tacoma smelter.

The Fidalgo Copper Co., at Fidalgo bay, is grading for a 900-ft. surface tram.

William J. Morton, of Valdez, has been named receiver for the bankrupt Night Island Con. Copper Company.

The Tanana

Miners and other citizens of Ruby City on November 10 held a 'miners' meeting' to consider the 'high cost of living.' Telegrams from the Commercial company promising an investigation were read. Although no organization was formed 'grub-prices' dropped one-third to one-half immediately after the meeting.

The Owl group of claims on Engineer creek is being opened up by E. A. Williams, one of the principal owners, says a report from Fairbanks.

Pay-ore has been found on Pearl creek, a small tributary of Fish creek, by Henry and James White, states a report from Gilmore.

ARIZONA

Gila County

John D. Ryan, for the Amalgamated Copper Co., offered on November 21 to buy all individual holdings of shareholders in the Live Oak Development Co. for $30 per share. All offers had to be made by December 7. By this arrangement shareholders were enabled to obtain the same price as was paid for the stock purchased from Hayden, Stone & Co. Mr. Ryan obtained an option on 23,050 shares before the general announcement was made November 28 by H. B. Hovland, of the Live Oak company. Payment is to be made in installments, the total sum to be paid within 90 days from November 23.

Maricopa County

(Special Correspondence.)—The Rowley Copper Mines Co. in the near future will erect a 100-hp. boiler, a compressor, and a sinking pump. The equipment has been ordered and is now on the way to the mine. The property is equipped with an 80-hp. boiler, steam hoist, and steam drill. The company has been sinking an inclined shaft on the property, which is 28 miles north of Gila Bend, 8 miles from the Southern Pacific railroad, and is employing 14 men on two shifts. A large amount of ore has been blocked out. The later development has resulted in an increased flow of water. J. O. Goodwin is manager for the company, which has its main office at Kansas City.

Gila Bend, November 29.

CALIFORNIA

Amador County

The Eagle G. M. Co., which was organized recently, is planning to start development in the near future on its holdings, comprising about 600 acres of patented land on the Belluomini ranch, says a report from Jackson. P. L. Cassinelli is president of the company. The company has an option on the property.

When miners in the Keystone mine, near Amador City, brought suit to recover wages for several months, the property was sold at sheriff's sale. W. J. McGee, of San Francisco, bought the deed from the successful bidder, W. G. Snyder. The property sold includes the Keystone mine, the Keystone Gold Quartz mine, the Geneva and Spring Hill mines, the Niagara Quartz Lode mining claim, the East Keystone claim, and all improvements, including a 60-stamp mill and machinery, a compressor, mining tools, and several buildings. The defendants in the miners' suit were the California Con. M. Co., the Amador Keystone M. Co., Jasper McDonald, the Chichizola Estate Co., and I. Lindemann.

Inyo County

The Skidoo M. Co.'s October production amounted to $22,450. Development and operating costs totaled $9124, leaving a net profit of $13,326. During the month the company treated in the mill 1266 tons of its own ore and 229 tons of ore produced by lessees. The bullion production was $17,074. The cyanide production for the first half of the month was $2240, and for the second half, estimated, $2309.

Los Angeles County

Press reports state that the Associated Oil Co. is planning to build a refinery costing about $6,000,000 near Los Angeles. Most of the oil to be refined at the new plant, work on which is to start early in the year, will come from the Lost Hills field, where the company owns about 30,000 acres of oil land. The Standard Oil Co. is rushing the erection of its large refinery at El Segundo.

Henry L. Chase, manager of the Los Angeles branch of the Palmer Union Oil Co., is quoted in the newspapers as stating that the Pacific Mail and Cunard steamship companies are negotiating for millions of barrels of fuel oil from the California fields.

THE KEYSTONE MINE, AMADOR CITY.

Nevada County

To obtain rock for street paving, the trustees of Grass Valley have let a contract for the construction of 'grizzlies' above the dump of the Pennsylvania mine. The smaller bits of waste rock will drop into bins. The bars are two inches apart.

Plumas County

W. P. Hammon recently purchased the Race Track placer claim and other property in the American valley near Quincy.

Sacramento County

Pacific dredge No. 1, belonging to the Guggenheim interests, sank, November 28, near Oroville. It was one of the newest and largest dredges in the Oroville field.

San Bernardino County

The Needles M. & S. Co. has petitioned the War Department for permission to riprap the west bank of the Colorado river to protect the smelter at Needles. It is believed the Santa Fe has joined with the Needles company in the petition, so that a large stretch of country may be relieved from danger from flood. The smelter company in the past year has endeavored to remedy matters by dumping slag along the river bank, but the water has eaten away the bank under the slag piles.

Shasta County

(Special Correspondence.)—While the Mammoth Copper M. Co. of Maine, owning the smelter near Kennett, is endeavoring to avoid a suit such as resulted in closing the Coram smelter, it is making every possible preparation for defense in case suit is brought by the ranchers, according to well-informed mining men. There is a tendency on the part of the farmers and orchardists to blame smelter fume for all their troubles. Many of the small orchardists are comparatively ignorant, and neglect to prune their trees or to thin the crop, as is done by fruit growers in other parts of the State. When the overburdened trees cannot yield heavy crops every successive season, or when the heavily laden boughs break under the weight of the unthinned crop, the orchardist blames his troubles on the smelter. An attack of croup among the children, or the depredations of a black beetle in the orchards alike may arouse the anger of the rancher against the smelter. In addition to improving the bag house so as to eliminate all trace of sulphur dioxide from the emanations from the smelter, the company has practically established a private weather bureau, it is said, and has been taking comprehensive observations of conditions, including air currents, to combat any possible charges by the ranchers. The plant has been operating three furnaces through the summer. The soil in Happy Valley, where the smelter is situated, is only a few feet deep, and the agricultural and horticultural production of the whole county is relatively insignificant compared to the mineral production.

Kennett, December 2.

It is rumored that the First National Copper Co. is planning to operate the Balaklala mine and smelter at Coram. The plan includes the manufacture of sulphuric acid at the plant. T. M. T. Raborg, treasurer of the company, is expected at Coram soon to conduct experiments.

Siskiyou County

The Siskiyou Gold Mining Co. has been organized to develop a quartz property situated near the California-Oregon line, 55 miles south of Grants Pass, Oregon. The incorporators are Andrew Frakes and D. A. Fitzgerald of Grants Pass, and R. H. Bailey of Portland. The property is still a prospect. An adit will be driven to the vein.

Trinity County

(Special Correspondence.)—The Trinity Consolidated Hydraulic M. Co., of which Henry W. Miller is president and W. A. Boland vice-president, has acquired the Union Hill mine and the Hupp mine, together with thirty partly developed and undeveloped mine and water rights near Weaverville. The Rio Plata M. Co. is the owner of two-thirds of the issued stock. The properties acquired consist of the Union Hill mine situated six miles below Weaverville, opened two years ago at a total cost of $250,000 for equipment. It is supplied with a ditch from Grass Valley creek, twelve miles long, which carries 3000 miners' inches of water and a siphon 4000 ft. long carries the water across Trinity river. The siphon is carried on a steel bridge of 236-ft. span. The water-supply lasts for about six months and is delivered to the giants under a head of 460 ft. The mine as equipped will handle about 6000 cu. yd. of gravel per day. The gravel averages 8c. per cubic yard.

The Hupp mine, situated a mile from Weaverville in the Weaverville basin, has been worked for fifty years by the Hupp family and has produced in the neighborhood of $1,500,000. It is completely equipped and supplied with a ditch eight miles long from Weaver Creek and delivers 3000 miners' inches of water under a pressure of 250 ft., for about six months in the year.

The Brown's Ranch mine situated below Weaverville and the Hupp mine in the same basin, have been equipped for work this year and will operate under a pressure of 165 ft. The Hupp mine is equipped for handling about 200,000 cu. yd. of gravel per year, which averages 25c. per cubic yard.

Henry W. Miller, president of the Trinity Consolidated Hydraulic M. Co., is also president of the Rio Plata M. Co. and of the Trinity G. M. & R. Co., which is operating the Headlight mine near Carrville. D. W. Shanks is general manager of the three above named companies. It is the intention of the owners to put in increased equipment which will increase the production of the mines at a small additional cost.

Carrville, November 29.

Tuolumne County

(Special Correspondence.)—Suit has been brought in the Superior Court against the United Mines Corporation by A. C. Maier and Bessie L. Carter. The action comes after a protest made in the United States Land Office at Sacramento against granting a patent to the United States Mines Corporation for the New Albany South quartz claim, in which protest it was alleged that some of the ground sought to be patented belonged to the Triumph claim, held by the plaintiffs. The complaint states that the defendant failed to perform the necessary assessment work upon the New Albany South claim for the year 1898; that in June 1899 the Triumph claim was duly located by A. C. Maier, and that subsequently the latter sold an undivided one-half interest to Bessie L. Carter. It is further alleged that the defendant has entered beneath the surface of the Triumph mine and extracted and converted to its own use gold-bearing ore amounting to more than $25,000. Plaintiffs ask to be declared owners of that part of the Triumph which is overlapped by the New Albany South, for an injunction restraining defendants from extracting any ore therefrom, and also for an order permitting plaintiffs and their surveyors to enter the workings of the New Albany to determine the amount of ore taken from within the Triumph claim by defendant.

The fact that experts are sampling the App mine at Quartz has given rise to the belief that the well known property may soon change hands. It is also reported that the Rawhide is included in the deal supposed to be pending. According to report, the work of sampling the App is being done under the personal direction of Peter Anderson, of Shasta county.

The development at the D. L. Mann copper mine, near Jamestown, is showing fine ore. A dam 26 ft. high has been constructed on Woods creek. Placer claims aggregating 160 acres have been located on the Tuolumne river, three miles below Jacksonville, by E. H. Shackelford, C. M. Auyale, Ruth A. Nelson, W. J. Snook, A. Sumont, William Fay, Mathew Fulman, and Ernest Cowly. The property has been named the Suction Dredge Placer Mine. The owners of the Republican mine may shortly resume operation at the property. It is reported that the company which owns the Dondero gravel mine at Yankee Hill will get a dredge and operate on a large scale.

A shaft being sunk on the Louis Page ranch, at Yankee Hill, has penetrated into a rich gravel deposit, and it is believed that a big mine will be developed. Prospecting operations have been started on the Shine ranch, two miles northwest of Sonora, to determine the value and extent of gravel deposits. The Phoenix Lake M. Co. has levied an assessment of 2c. per share, payable on or before January 1 next.

Some development work is being done at the Sunny South mine, near Tuolumne, which was the object of much litigation recently. The annual meeting of the stockholders of the Springfield Tunnel & Development Co. will be held January 6, 1912, at the company's property at Springfield. One of the purposes of the meeting is to elect directors.

Tuolumne, December 2.

(Special Correspondence.)—It is reported that the famous App mine is about to be sold, there being twelve men at present actively engaged in the work of sampling the property in charge of G. Claus, a French mining engineer. W. A. Nevills is the present owner and manager.

Quartz, November 30.

COLORADO

Boulder County

John R. Wolff and associates of the U. S. Gold Corporation, have acquired the Livingston mine and mill, at Sugar Loaf, by buying a mortgage on the property, which includes four lode-claims and two millsites. After clearing title to the property, according to recent reports from Boulder, the purchasers will turn it over to the corporation.

Clear Creek County

(Special Correspondence.)—A company is being organized to take over the Lebanon and Everett groups of 29 lode mining claims, tunnel-site, and millsite on Republican mountain. It is stated that a 100-ton concentrating plant and compressor plant will be purchased early next spring. B. C. Catren is resident agent. A vein has just been intersected by the Homestake adit on Lincoln mountain that shows a 6-in. streak of smelting ore assaying about 4.30 oz. gold per ton. A. L. Stephens is manager. A shipment of 50 tons of smelting ore is being made from the Clyde B. property. Free gold is visible and a return of $55 to $60 per ton is expected. G. Crumley is manager. Work will be resumed next week on the Ramsdell mine. The Market adit is to be driven ahead to cut the Golden Jack vein. G. W. Teagarden is manager.

Georgetown, December 2.

Edward Skahen has obtained a 99-year lease on the Empire Tunnel property from A. Harley, says a report from Georgetown.

El Paso County

The U. S. R. & R. Co., according to reports from Cripple Creek, has withdrawn from the ore field. It owns the Standard and Philadelphia chlorination plants at Colorado City and the Union mill at Florence. The Golden Cycle M. Co. mill will handle the ore covered by contract. The shutdown was caused by the low tonnage of ore coming from the Cripple Creek district, and when the conditions warrant, the U. S. plants will be reopened, according to a statement by J. D. Hawkins, general manager for the company.

ISABELLA MINE, CRIPPLE CREEK.

Ouray County

The annual report of the Tomboy G. M. Co. shows that the profit for the year ended June 30 was £63,860. The ore treated amounted to 116,222 tons and yielded $6.72 per ton. The net profit on the ore averaged $2.34 per ton. The ore reserve at the end of the fiscal year was estimated at 427,000 tons. The principal matter of interest discussed at the annual meeting, held November 16 in London, was the purchase by the company of the Virginius property last summer from the Revenue company. Arthur Butler, one of the Tomboy directors, in his report stated that the recently acquired property promised "to yield in due course substantial profits."

Teller County (Cripple Creek)

The output from the Cripple Creek district during the month of November was 77,204 tons of ore valued at $1,356,966, against an output in October of 77,717 tons valued at $1,302,704. The table of production, compiled from the reports of the mill managers, as reported in the *Cripple Creek Times*, is as follows:

Plant.	Tons.	Av. value.	Total.
Wild Horse	800	$3.20	$2,560.00
Portland	10,500	21.50	225,750.00
Stratton's Independence.	10,294	2.75	28,308.50
New Portland	11,860	3.05	36,173.00
Smelters	4,000	65.00	260,000.00
Standard Plant	13,050	21.50	280,575.00
Jo Dandy mill.........	900	4.00	3,600.00
Golden Cycle	26,000	20.00	520,000.00
Total	77,204		$1,356,966.50

The Colburn mill, now in operation, will be represented in the December report. The Blue Flag mill will start about January 1, according to current rumor.

At the fourth level of the Lee shaft of the Isabella M. Co., ore assaying as high as 20 oz. silver per ton was discovered in a vertical vein. It is believed, however, that the ore shipped from the vein, which is 6 to 8 ft. wide, will average about 5 oz. per ton.

The Anchoria-Leland mine, on Gold hill, shipped 30 cars of ore in November. The Conundrum mine, Gold hill, shipped 5 cars. Earl Howbert is superintendent of both properties.

The amount of water now flowing from the portal of the Roosevelt drainage adit is 12,000 gal. per minute, as the result of developments Wednesday of last week. Miners working in the south drift on the C. K. & N. vein from the Fuller cross-cut opened a new flow larger than the one opened a month ago. The former flow of 500 gal. per minute which came through the 1000-ft. level of the El Paso shaft has ceased, and it is believed that the water is flowing into the adit through the new water course. In November the main heading was advanced 245 ft., or at the rate of about 8 ft. per day. This feat establishes a new record for this particular undertaking. The flow during November was 8500 gal. per minute.

The Gilpin & Cripple Creek G. M. Co.'s Atlanta claim, on Bull hill, has been sold at sheriff's sale to F. W. Gale, of Colorado Springs, for $37,240. The Maria A. claim, north of the Jo Dandy, on Raven hill, was sold at sheriff's sale to Hildreth Frost for $2750.

MONTANA

Lincoln County

(Special Correspondence.)—The prospecting work so far done on the Libby Creek placer property, recently purchased by W. H. Graham, shows ore assaying $1.50 per cubic yard, the owner states, and bedrock has not yet been reached. The placers are being prospected with a steam drilling-machine, which now has a hole down 37 ft. deep. It is intended to erect a large hydraulic plant on this property, the equipment for which will be taken in over the snow this winter. It is hoped to have the plant in operation by April 1. Mr. Graham has gone to his home in California and, while away, will order the machinery and supplies. He states that when the plant is in operation, it will have a capacity of over 6000 cu. yd. per day.

Libby, December 2.

(Special Correspondence.)—Work on the three-compartment shaft at the Snowshoe mine is going ahead steadily, and 150 ft. of new work will soon be completed, giving a total depth of 617 ft. The vein has widened steadily as depth has been attained and the ore-content has increased in value. Shipments of concentrate are being made regularly to the smelter at East Helena, and E. H. Wilson, consulting engineer, who is operating the property for the Pacific Coast Smelting, Refining & Mining Co., expresses himself as being well satisfied with results.

Libby, November 29.

NEVADA

Elko County

It is rumored that George Wingfield, president of the Goldfield Con. M. Co., has acquired control of the Bluster property, in the Jarbidge district, from Ed. Benane, one of the owners. The price for controlling interest is said to have been about $500,000, or at a rate of $750,000 for the whole property. Mr. Wingfield's Success property, in the Jarbidge district, adjoins the Bluster.

Esmeralda County

(Telegraphic Correspondence.)—The November production of Goldfield Con. M. Co. is estimated at 28,628 tons of ore. The net profit for the month was about $500,000, the gross value of the production being $705,000, and the operating expenses $205,000.

Goldfield, December 6.

Exploration work will be done on the northern part of the Combination Fraction property, near the Mohawk and Combination mines of the Consolidated. For the past eight months before work was suspended last year the company failed to make a profit. The northern part of the claim has not been fully explored.

The Pittsburg Silver Peak M. Co. mill at Blair is treating about 500 tons of ore per day at a cost of $2.64 per ton, according to an interview given by Frank Knox, a director of the company. The net profit from the property is said to be $40,000 to $50,000 per month, and the gross return from the first ten months of the year was $747,000. About 200 men are employed in the mine and mill. The company has a surplus of about $1,400,000 and will pay dividends in the near future, according to Mr. Knox.

The hoist, carpenter and blacksmith shops, engine house, and assay office of the Florence Goldfield M. Co. were destroyed by fire last week, and the shaft timbers are badly burned to a depth of 30 ft. The insurance on the destroyed property is reported as $125,000.

The Goldfield Belmont M. Co. has announced its belief that the orebody recently found in the winze at the 350-ft. level is the rich vein from which it has been shipping at the 300-ft. level.

The Goldfield Vernal M. Co. has stated that in the north workings from the McKane shaft the vein has widened to $2\frac{1}{2}$ ft. and that the ore assays about $40 per ton.

Press accounts state that ore assaying as high as $1000 per ton has been shipped from the Klondike district, a few miles north of Goldfield. James Golden, operating the Original Klondike M. Co. property, is reported to have shipped as much as 300 cars of ore per month, the ore on the average assaying $25 per ton. Other companies are operating in the district.

Ore said to be rich in free gold recently caused a rush to the Wellington district, near Antelope Springs and not far from Jamestown. J. F. Vardaman and L. K. Koontz headed one party. The district is about forty miles north of Goldfield.

HUMBOLDT COUNTY

The Associated M. Co. soon will undertake extensive development on its property in American canyon, say press reports. The company will do most of its work through the Robinson shaft and hopes to develop sufficient water-power for development purposes.

C. M. McCurdy, of Spokane, and Henry Stanislawsky, of Reno, have obtained a six months option on 300 acres of placer ground at the mouth of Rochester canyon from Jones and Jennings, of Fitting, according to a report from Lovelocks.

NYE COUNTY

(Special Correspondence.)—The erection of the MacNamara mill is progressing so rapidly that the management expects to have it in commission early in January. The foundation and roofing is completed and machinery is being placed in position. The favorable weather has facilitated rapid work. The south cross-cut on the 950-ft. level of the North Star has intersected a 3-ft. vein assaying $30 to $60 per ton. The vein lies 10 ft. from the Montana-Tonopah line and appears to be the western extension of the noted Triangle vein. The shaft at the Halifax is down 515 ft. and has entered a calcite-andesite formation. A dam and pump-station have been provided on the 400-ft. level. The south cross-cut from the 500-ft. level of the West End has penetrated the orebody 10 ft. The orebody in the east stope on this level assays about $40 per ton. The west drift is being sent in a southerly direction to follow the fault and recover the vein. Stoping continues on the 400 and 500-ft. levels, and work is being done on the 300-ft. level. The mill is treating 110 tons of ore and tailing per day. It is understood 100 tons of $12.50 ore forms an average daily run, aside from the old tailing. It is rumored that the Tonopah Extension M. Co. may commence the payment of dividends next spring. However, this has not been officially confirmed. The Peak-Steen-Cicala lease on Manhattan Big Four has completed the milling of 1000 tons of ore at the War Eagle plant. The quartz averaged $33 per ton. It was extracted between the 300 and 400-ft. levels. The vein is said to be 18 ft. wide. Development is under way near the 400-ft. point. The pumps are easily handling the water. About 65 lessees are operating at Manhattan, and the custom plants continue unable to handle the large quantities of ore produced. This feature handicaps operation, but development is being done on practically all the prominent holdings.

Tonopah, December 1.

The Tonopah Belmont Dev. Co. has declared a dividend of 25c. per share, payable January 1. This will mean the distribution of $375,000, and will bring the total amount paid by the company in dividends to $2,468,000, of which $1,350,000 will have been distributed since the beginning of this year.

The Tonopah Extension M. Co. is now free from debt and has a cash balance, according to a recent statement by J. G. Kirchen, general manager for the company.

The ore-shipments for the Tonopah district last week were as follows: Tonopah M. Co., 3500 tons; Belmont, 2355 tons; Montana-Tonopah, 915 tons; Tonopah Extension, 1015 tons; West End, 500 tons of ore and 325 tons of tailing; Midway, 50 tons of ore; total, 8335 tons, valued at $298,375.

STOREY COUNTY

H. L. Slosson, Jr., was elected president of the Mexican M. Co., in San Francisco, December 5. At the regular meeting of the stockholders Mr. Slosson, John Landers, and W. C. Ralston were substituted on the board for B. F. Shaw, William Bannon, and A. F. Coffin. G. E. Arrowsmith and Herman Zadig were retained. C. D. Olney was chosen secretary, Whitman Symmes manager and resident agent for Nevada, and John Landers vice-president, at the executive session of the directors. The new directorate will start the most active development the Comstock lode has seen. It is charged that Mr. Zadig for a number of years has received a revenue of $200 per month from wrongful commissions on mine supplies, particularly powder, and $75 per month voted by himself for auditing the books of the company. Mr. Zadig maintained at the meeting that he did not consider he had done anything wrong. Of the 201,600 shares of stock, 199,000 were represented at the meeting.

The Ophir mine last week produced 426 tons of ore valued at $18,524. Mining was resumed on one shift in the Union and Mexican mines, the other two shifts being employed on the repairs to the Union shaft. The joint winze was sunk 10 ft. through porphyry and is down to a point 672 ft. below the 2000-ft. station. The Con. Virginia company continued its usual repairs. The drift on the 2550-ft. level was advanced 17 ft. through low-grade quartz. In the C. & C. shaft, after a week of pumping, the water stood 296 ft. below the measuring point at the 2350-ft. station. The roof of the raise in the Julia Con. is in vein matter. No changes were reported at Brunswick No. 1 shaft. Work in the Overman was confined to the 1200-ft. level. At the Crown Point 155 cars of ore averaging $4.78 per ton, were drawn off. The Yellow Jacket mill ran all week on dump ore, handling 1127 tons. The joint incline at the Belcher is now retimbered for 70 ft., or to the water-line.

WHITE PINE COUNTY

Exploration work soon will be done on the Butte & Ely Copper Co. property as the result of a recent visit to the place by prominent stockholders, according to rumors in the newspapers. The Giroux Con. retains a controlling interest in the property, but it is reported that there is a tacit agreement that development work to discover new orebodies shall be undertaken.

NEW MEXICO

SOCORRO COUNTY

(Special Correspondence.)—The Ernestine M. Co.'s bullion product for the second ten-day period of November amounted to 8500 oz. of gold and silver, and 10,500 lb. of dry concentrate was shipped. The past week's ore treatment was 685 tons. The erecting engineer for the De La Vergne company is on the ground assembling the oil engines. It is thought the new power plant will be ready for operation the first of the year.

One carload of parts for the De La Vergne engine installation arrived in Silver City last week and is now being taken to the Socorro mines by team. Several more cars of machinery have been shipped from factory for the new power plant. The mill continues its regular shipments of bullion and concentrate.

Mogollon, December 1.

OREGON

Josephine County

The Greenback mill soon will have 20 of the 40 stamps dropping. Some new machinery has been ordered and is on the way there, says a report from Grants Pass. New ore reserves are being mined and the property will be put again on a paying basis, according to an announcement by F. M. Leland, who is acting in an advisory capacity to the owners, Robertson & Son.

The Cougar Con. Mines, with headquarters at Galice, will equip the Barr placer mine, consisting of 16 claims, with an electric-light plant, sawmill, new flume, grizzlies, and 15-in. pipe. L. H. Medford is manager and Ned Heath superintendent for the company.

UTAH

Juab County

The Grand Central M. Co. has declared a dividend of 5c. per share, payable December 20, which will require the disbursement of $25,000 on the 500,000 shares issued. The company is capitalized at $600,000, with shares $1 at par. There is in the treasury 100,000 shares.

Newspaper reports assert that the Beck adit will cause a big revival in mining in the Tintic district. The new orebody recently found in the development trends to the south, and not to the east or southeast, as was at first feared. The fact gives rise to the belief that a second 'Colorado channel' has been discovered.

In the Yankee Con. property, Tintic district, the showing of ore in the 1900-ft. level is encouraging. Development is being done on the 1800, 1900, and 2000-ft. levels. The company is shipping an average of 12 cars of low-grade silicious ore per week, according to a statement by Lew Merriman, superintendent of the property.

The annual report of the Iron Blossom Con. M. Co., made at the meeting in Provo, December 2, shows a cash balance on hand of $138,000. During the year 55,000 tons of ore was shipped, and 6000 ft. of development work was done. Dividends paid during the year amounted to $29,000.

Salt Lake County

To avoid danger to life and property from snowslides what ordinarily would be the surface plant of the Utah M. Coalition Co. has been placed beneath the surface, and the former company village has disappeared. Only the ore-bins and the dump remain in the path of possible slides. One of the cross-cuts from the adit, near the portal, has been enlarged and utilized for the boarding-house and bunk-house. This solution of the problem presented by snowslides is said to be unique in the West.

Summit County

Assessment work is being done on the Old Glory group of claims in the Big Cottonwood district. Application for patent will be made early in the new year, and extensive development is planned.

Work has been started on what will be known as the Uintah-Treasure Hill cross-cut. This will connect the 260-ft. level of the Treasure Hill mine and the 900-ft. level of the Silver King Coalition mine. The cross-cut will be about 900 ft. long, and is designed to give an outlet for the waste of the Silver King Coalition without hoisting to the surface.

The Miller & Beggs company is building a tailing mill at Park City. The plant will be equipped with Wilfley tables and Macquisten tubes, and will have a capacity of about 40 tons per day. The concentrate to be treated, it is reported, averages about 52% zinc.

WASHINGTON

Spokane County

(Special Correspondence.)—A Spokane local of the American Institute of Mining Engineers has been formed with R. S. McCaffrey, of Moscow, Idaho, as chairman; G. A. Collins, of Spokane, vice-chairman, and L. K. Armstrong, of Spokane, secretary-treasurer. There are nearly 100 members in the Spokane local, which embraces eastern Washington, northern Idaho, northeastern Oregon, extreme northwestern Montana, and southern British Columbia east of the Cascade mountains. The following named papers were read: 'North Washington Power & Reduction Co.'s Cyanide Mill at Republic, Washington,' by H. W. Newton; 'Geology of the Silver Bell District, Arizona,' by C. A. Stewart. Four regular meetings will be held each year, with such intermediary meetings as may be decided upon by the executive committee, which is composed of the officers and two other members, who are F. A. Thompson, Pullman, Washington, and James F. McCarthy, Wallace, Idaho.

Spokane, December 1.

CANADA

British Columbia

Frederic Keffer, engineer for the British Columbia Copper Co., has confirmed the report of the bonding of that corporation of 60 claims in Voight's camp in the Similkameen mountains. The deal includes 2000 acres of land, timbered and grazing, which would supply a smelter site, should one be required.

Number One mine, a silver-lead property at Ainsworth, has been taken over on a lease and bond by the Consolidated Mining & Smelting Co. of Trail.

Jay P. Graves, of Spokane, general manager for the Granby company, predicts that 1912 will be better than this year, when the profits were $217,416. The mines at Phoenix produced and shipped 940,565 tons of ore this year, against 1,175,543 tons last year for the same period.

Negotiations have been closed by which 'Bob' Mabry, of Spokane, acquires three properties in the Ymir district. The best known is the Yankee Girl, for which he paid $100,000 to John Frazer, acting for the creditors. He paid $40,000 for the Bi-Metallic and the Lost Cabin properties.

Payne mine near Sandon, which paid $1,438,000 in dividends during its corporate existence under Canadian ownership, has been acquired by Robert E. Strahorn, of Spokane, vice-president of the Oregon-Washington Railroad & Navigation Co., and his associates, and will be incorporated in British Columbia as the Payne Mines, Ltd., with a capital of $1,500,000, of which $250,000 is to be in 6% preference debentures and the rest in common stock.

Ontario

At the Davidson mine of the Crown Chartered Co. drifts are being driven in both directions from the main shaft on pay ore-shoots. Free gold is visible in the ore from both faces. Developments at the 100-ft. level have been so favorable that the management has decided to immediately increase the capacity of the mining plant. Accommodations are being provided for an additional force of fifty men.

MEXICO

Chihuahua

The Dolores M. Co., about twenty miles from Madera, last week shipped 68 bars of gold and silver bullion, valued at $121,000, to the Banco de Sonora branch at Chihuahua.

Jalisco

The Mololoa mine, owned by the Mololoa M. Co., in the Hostotipaquillo district, is yielding unusually high-grade ore, according to reports from El Paso, Texas. A reduction plant will be built this season. The power will be supplied from the El Favor station of the Chapala hydro-electric company.

Mexico

Rich ore has been found in the Riveria mine, near Nacozari, in the adit, 600 ft. from the portal. G. J. Cole is manager of the mine.

It is rumored that a mill may be built at the Monte Visto mine, near El Tigre. The mine contains low-grade gold and silver ore.

Book Reviews

Any of the books noticed in these columns are for sale by or can be procured from, the Mining and Scientific Press

The Mineral Industry of Rhodesia. By J. P. Johnson. Pp. 90. Interleaved. Longmans, Green & Co., 1911. For sale by the *Mining and Scientific Press*. Price $3.

This little volume, by a well known writer upon African mineral resources, deals in a comprehensive way with the mineral resources of Rhodesia, and is conveniently interleaved with blank pages for the addition of notes regarding future discoveries and development.

Graphical Solution of Fault Problems. By C. F. Tolman, Jr. Pp. 43. Ill. The *Mining and Scientific Press*, San Francisco, 1911. Price $1.

The mining engineer, when called upon to map a faulted group of strata and to correctly interpret his data, is apt to find himself somewhat at a loss, since his instruction in descriptive geometry was not directed in this direction and, in addition, is perhaps largely forgotten. Mr. Tolman's little volume furnishes a ready and convenient means of making good any such deficiency and is likely to prove of much service.

Design and Construction of Mill Buildings. By H. G. Tyrrell. Pp. 490. Ill. Myron C. Clark Pub. Co., 1911. For sale by the *Mining and Scientific Press*. Price $4.

This volume deals with mill construction in the sense of the term employed by a manufacturer and only covers metallurgical mills in the larger treatment of the subject. In this it is unusually good, and is likely to become a standard work upon this topic. It will be especially serviceable to mining engineers and metallurgists, since it is written in such a way as to be easily intelligible to those who are not professional builders and architects. Such persons will be grateful for a compact volume concisely but intelligently covering all the phases of mill building construction.

Dredges and Dredging. By Charles Prelini. Pp. 279. Ill. D. Van Nostrand Co., 1911. For sale by the *Mining and Scientific Press*. Price $3.

To the civil engineer this volume will be of much interest and service, as the discussion of the various types of river and harbor dredges appears to be unusually full and complete. But to the dredging for metals only one chapter, of 16 pages, has been devoted, the author evidently drawing his information entirely from technical journals. And as the most recent information given regarding gold dredges is taken from an article which appeared in the *Mining and Scientific Press* of April 17, 1909, it is not likely that those engaged in the gold dredging industry will find much profit in its perusal.

Mining Without Timber. By R. B. Brinsmade. Pp. 307. Ill. McGraw-Hill Book Co., 1911. For sale by the *Mining and Scientific Press*. Price $3.

With the growing divergence between the increasing cost of timber and the necessarily decreasing costs of mining, the development of methods of mining which do not involve the use of timber has been greatly stimulated in the past decade. Mr. Brinsmade's book is therefore timely as well as useful, discussing, as it does, not only open-cut systems, but various methods of stoping with a minimum of timber, the different caving and slicing systems and the mining of coal seams. These are discussed by the use of examples of each of the methods, some 60 in all being cited and described in detail. Treatises descriptive of mining methods too often are lacking in practicability, and this volume will be correspondingly useful, therefore. The author's good judgment is to be commended in the omission of topics extraneous to his subject and the omission of foreign examples that appear likely to be of little service in American practice. It would have been best to have rigidly adhered to this intention, the first three chapters, on explosives, the principles of blasting, and the use of compressed air underground are unnecessary to the logical development of the main topic, and the final chapter, on the principles of mine valuation, is decidedly out of place. More careful proof reading would have eliminated such errors as "Goyebic" (Gogebic) (p. xiii), "hangwall" (p. 207) and the statement, on page 208, that raises "cost $4 to $5 per ft." But such things the reader is likely to overlook in the great interest of the subject matter.

Metallurgy. By Herbert Lang. Part I. Introductory. Pp. 255. Ill. McGraw Hill Book Co., 1911. For sale by the *Mining and Scientific Press*. Price $3.

This volume, the first of a series of three, contains so much that is admirable, as well as that which is not, that it is difficult to review it briefly. The author's long and wide experience as a metallurgist, admirably qualifies him for the task of discussing the subject from a general standpoint and, in particular, his treatment of the general question of smelter fume, in the last two chapters, is so admirable as to alone make the book worth while. Nevertheless, with much of the remainder of the volume we cannot find ourselves in agreement, and this disagreement is radical and fundamental. Metallurgy is stated, in the introductory chapter, to "overlap applied chemistry in some directions," though it is obvious, upon a moment's reflection, that metallurgy is only a single department of the larger subject of applied chemistry and, as commonly used, does not even cover all of metallurgy proper, but only the metallurgy of the precious metals and those used as materials of construction. Nor is it true, as the author contends, that the metallurgic methods applied to the individual metals are so closely similar that they can best be treated together. The smelting of iron ores (always oxides) and copper ores (generally sulphides) in furnaces of radically different design and capacity differ so markedly that they cannot be treated adequately except separately, though, as the author contends, the study of the metallurgy of an individual metal should be prefaced by a general study of metallurgical processes, in order that an adequate grasp of the underlying principles may be obtained. The author's method of classification of metallurgic processes is extremely helpful, but might be carried out with more care; for example, on page 95, the division 'Processes acting by differences in density' (density being here used in the sense of specific gravity) is immediately followed by 'Acting by amalgamation with mercury,' though plate amalgamation is simply a special case of difference in specific gravity, while the patio and related processes chiefly depend upon chemical action, which forms the next subdivision. And in the subsequent analysis of processes it would have been well to have indicated in some manner the relative importance of the processes listed, so that the little used Rozan process would not take precedence over the Parke's [*sic*] process. In spite of the author's scorn for foreign texts and publications, he has evidently been influenced by the older texts, such as Schnabel's, in the division of his subject and thus led into a lack of balance, such as devoting, on pages 98 and 99, to the treatment of matte twice the space accorded to pig iron. It is unfortunate that the author has divided his treatise into three volumes; the *raison d'etre* of a general metallurgy is the presentation in one volume of a general view of the whole subject, and once the number of volumes is multiplied the reader justly feels that a number of texts, by different authors, dealing with various phases of the subject, is likely to better meet his needs. That American textbooks and technical journals are ample to meet the needs of the well-read metallurgist is far from the truth is exhibited by the fact that there does not exist in America a metallurgical journal to be compared with *Metallurgie*, nor are metallurgists generally likely to agree that the half-dozen authors referred to in the introduction constitute an adequate metallurgical library. It is easier to criticise than commend, and there is much in this volume that is excellent, so much that metallurgists will wish to judge for themselves. T. T. R.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

POPE YEATMAN was at Ely recently.

B. KIMBALL has returned from Mexico.

EDWARD L. DUFOURCQ is at the Fairmont.

J. MALCOLM MACLAREN is in San Francisco.

W. G. ANDERSON has returned from Mexico.

GEORGE KISLINGBURY is in San Francisco from Los Angeles.

R. C. SPECHT is examining properties in Trinity county, California.

ARTHUR K. ADAMS is with the General Land Office, at Los Angeles.

MORTON WEBBER sailed for England on the *Lusitania* on November 29.

FRED L. MORRIS has gone to Mexico and will stay until after Christmas.

C. B. LAKENAN was in San Francisco early in the week and returned to Ely.

W. M. HENDERSON SCOTT is at the Wettlaufer mine, Silver Centre, Ontario, Canada.

ALGERNON DEL MAR was in San Francisco and has gone to South Pasadena for the holidays.

N. L. BURNER, superintendent of the Evening Star mine, Old Diggings, was in San Francisco this week.

E. H. SIMONDS recently returned to San Francisco from Inyo county and has left for Calaveras county on professional business.

H. W. EDMONDSON has returned to Los Angeles for an examination of the Camuchin properties in the Arteaga district, Chihuahua, Mexico.

SUMNER S. SMITH is now at Cordova, Alaska. He expects to leave Cordova for Fairbanks over the winter trail about the middle of January.

D. W. SHANKS, general manager for the Trinity Gold Mining & Milling Co., has returned to Los Angeles from an extended trip in northern California.

C. E. BODYSTON, formerly mining engineer for the Consolidated Mining Co., Jalisco, has been appointed manager for the Cubana Consolidated Copper Co. at Arizpe, Sonora.

NEWTON H. WINCHELL addressed the Geological Club of the University of Minnesota on November 23, on the work of the Minnesota Geological and Natural History Survey.

THOMAS K. CODE, general manager for the Mayflower Bullfrog Con. M. Co. and the Mayflower Leasing Co., has accepted the appointment of consulting engineer for the West Extension M. Co. at Rhyolite, Nevada.

Obituary

GEORGE A. TREADWELL, who was well known in California, died in New York City on November 12. Mr. Treadwell was at one time engaged in mining at Nevada City and later was prominently associated with W. A. Clark in the development of copper mines in Arizona and elsewhere; an association which was later marred by protracted litigation. A man of wide culture and experience and an entertaining companion, he leaves many friends.

JAMES DRUMMOND MINOR, one of California's pioneer miners, died at Nashville, Eldorado county, on December 4, at the age of 83. He arrived in San Francisco by way of the Isthmus in the spring of 1850 and engaged in mining operations in Eldorado, Placer, and Plumas counties. He left California in the sixties, and was for a number of years engaged in mining operations in Unionville, Nevada, and Bodie, California. He was Secretary of State of Nevada from 1868 to 1876.

Market Reports

LOCAL METAL PRICES.

San Francisco December 7.

Antimony	11—11¾c	Quicksilver (flask)	44.50
Electrolytic Copper	14—15½c	Tin	47—48½c
Pig Lead	4.70—5.65c	Spelter	7½—8½c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50—9.75; large $7.50—8.50

METAL PRICES.

(By wire from New York.)

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Nov. 30	Holiday.	No market.		
Dec. 1	13.08	4.45	6.47	55⅝
" 2	13.08	4.45	6.47	55⅝
" 3	Sunday.	No market.		
" 4	13.08	4.45	6.47	55⅝
" 5	13.08	4.45	6.47	55⅛
" 6	13.08	4.45	6.47	55

ANGLO-AMERICAN SHARES.

(Cabled from London.)

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

	Nov. 29. £ s. d.	Dec. 7. £ s. d.
Camp Bird	1 10 6	1 11 3
El Oro	1 2 6	1 3 0
Esperanza	1 11 3	1 10 3
Dolores	1 5 0	1 5 0
Oroville Dredging	0 5 6	0 5 6
Mexico Mines	7 13 9	7 13 9
Tomboy	1 3 9	1 4 0

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing Prices. Dec. 7.		Closing Prices. Dec. 7.
Amalgamated Copper	$ 60⅝	La Rose	$ 3⅜
A. S. & R. Co	82⅜	Mason Valley	10¼
Braden Copper	5¼	Miami Copper	22
B. C. Copper Co	4¼	Mines Co. of America	4
Butte Coalition	16¾	Nevada Con	18¼
Chino	23	Nevada Utah	⅛
Davis Daly	¾	Nipissing	7¼
Doble	⅞	Ohio Copper	1
Dolores	4	Ray Central	1⅝
First National	1⅛	Ray Con	15
Foley O'Brien	¼	South Utah	⅛
Giroux	4	Superior & Pittsburg	15
Goldfield Con	4¼	Tenn. Copper	36¼
Greene-Cananea	7¼	Trinity	4⅛
Guanajuato Con	⅜	Tuolumne Copper	3¼
Hollinger	11⅜	United Copper	1⅛
Inspiration	9⅛	Utah Copper	50
Kerr Lake	2¾	Yukon Gold	3⅜

COPPER SHARES—BOSTON.

(By courtesy of J. C. Wilson, Mills Building.)

	Closing prices, Dec. 7.		Closing Prices Dec. 7.
Adventure	1	Mohawk	$ 44
Allouez	33	North Butte	24
Calumet & Arizona	55¾	Old Dominion	45
Calumet & Hecla	395	Osceola	95
Centennial	11¼	Parrot	11¼
Copper Range	51	Shannon	8¼
Daly West	5¼	Superior & Boston	3⅝
Franklin	9	Tamarack	25
Granby	30	Trinity	4
Greene Cananea, ctf.	7⅜	Utah Con	14¼
Isle-Royale	19	Victoria	2¾
La Salle	5¼	Winona	5
Mass Copper	7	Wolverine	88

NEVADA STOCKS.

(By courtesy of San Francisco Stock Exchange.)

San Francisco, December 7.

Atlanta	$ .16	Mayflower	$ .02
Belcher	.42	Mexican	4.12
Belmont	8.05	Midway	.23
B. & B.	.18	Montana-Tonopah	.77
Booth	.06	Nevada Hills	2.25
Chollar	.10	Ophir	1.70
Combination Fraction	.18	Pittsburg Silver Peak	1.22
Con. Virgina	.63	Round Mountain	.58
Florence	.59	Sandstorm Kendall	.03
Goldfield Con.	4.50	Savage	.37
Gould & Curry	.09	Tonopah Extension	1.17
Jim Butler	.29	Tonopah of Nevada	6.75
Jumbo Extension	.22	Union	1.40
MacNamara	.26	West End	.67

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS

CONTRIBUTORY NEGLIGENCE

A miner entering a cage for the purpose of ascending the shaft under the direction of the foreman of the mine was not guilty of contributory negligence where, in attempting to ring the bell to signal the hoist, he found the bell rope wet and the bell hard to ring, and in the attempt he slipped, struck his elbow and fainted, and in falling caught his leg between the wall and the cage, resulting in the injury complained of.

Osterholm *v.* Boston & Montana Consolidated Copper & Silver Mining Co., (Montana) 107 Pacific, 499.

EVIDENCE--RECORDS OF INSPECTION

The statutes of Kentucky require the inspector of mines to keep a record of all inspections made by him and provides also that a certified copy and such inspection shall be admissible in evidence in any court. In an action between a lessor and a lessee involving the condition of a certain mine which had been inspected by the inspector of mines it was held that his reports were official public documents and a proper certified copy thereof was properly admitted in evidence.

Henderson Mining & Manufacturing Co. *v.* Nicholson, (Ky.) 126 Southwestern, 139. March 1910.

OPTION ON MINING CLAIMS

A contract to convey mining claims for a specified sum in cash and other payments to be made in one or two years, with a stipulation that the purchaser might take possession of the claims and develop them, and providing that the purchaser should abide by the terms of the agreement and in default of any of the payments, to surrender such claims to the owner and forfeit all moneys paid and expended, is nothing more than an option, and the purchaser is left to his election within the life of the agreement to purchase or a forfeiture of all sums paid or expended. But the purchaser entering under such an option and employing laborers to perform the work, can establish no indebtedness in favor of the miners against the owners, and no lien attaches to his interest in the property, as such work is not performed by virtue of any employment from the owner, and the person holding such option is neither a vendee nor an agent of the owner. In such an option, time is said to be the essence of the contract and a failure of the original purchaser or his assignee to pay the balance due on the specified debts relieves the original owner of any obligation to convey under the option agreement and all rights are forfeited.

Harper *v.* Independence Development Co., (Utah) 108 Pacific, 701.

ASSUMPTION OF RISK

A person entering voluntarily into a contract of service assumes all the risks and hazards ordinarily incident to the employment and such as are liable to arise from defects which are patent and obvious to a person of his experience and understanding, and he assumes all the ordinary risks of the employment which are known to him and which would have been known with the exercise of ordinary care; it is his duty to exercise care and diligence and observe and become cognizant of obvious defects in the machinery and the work place, and he is charged with the knowledge of such defects which would have been known to a person of reasonable care and prudence. But notwithstanding this rule, an employee does not ordinarily assume risks arising out of the negligence of his employer. This rule was applied in an action against a mine company for the death of a miner acting in the capacity of a shot-firer resulting from injuries caused by smoke, fumes, foul air, and poisonous gases by a reversal of a fan on account of its not having been suitably adjusted with reasonably necessary appliances for the purpose for which it was installed, and where it was shown that the omitted appliances were reasonably necessary in its operation for such purposes, and the omission of such suitably adjusted fan with such additional appliances was held to be the proximate cause of the injury.

Coalgate Co. *v.* Hurst, (Oklahoma) 107 Pacific, 657.

Company Reports

THE SANTA GERTRUDIS CO., LTD.

This company, formed by the Camp Bird Limited in 1909, with capital of 1,225,000 shares of £1 each, increased in January 1911 to 1,500,000 shares, of which 1,368,000 have been issued, is the holding company, the Compañia de Santa Gertrudis, S. A., being the operating company. This has a capital of ₱250,000, and the holding company has advanced it £1,019,000 for the purchase of mines and machinery and for construction, equipment, and development work. The milling company is the Compañia Beneficiadora de Pachuca, S. A., with a capital of ₱500,000, and £92,115 has been advanced this company. The report of the holding company for the year ended June 30 shows that the past eighteen months have been occupied in preparing the mine and mill for the increased scale of operations. Many improvements have been made in the shafts and their equipments, and in particular the old San Guillermo shaft has been repaired and made the main hoisting shaft, with a capacity of 1000 tons per day. An advantageous contract has been made with the Mexican Light & Power Co. for the supply of electric power. The new mill was ready for work on June 14. It consists of 60 stamps of 1550 lb. each, 10 tube-mills, 18 Pachuca vats, Merrill slime-filters, Dorr thickeners and classifiers. W. J. Cox, the consulting engineer, and Hugh Rose, the manager, report that the development has greatly added to the ore reserve, the figures now being 630,000 tons of proved ore estimated to yield a profit of $4,610,000, and 250,000 tons of probable ore estimated to yield a profit of $3,565,000, or a total of $8,175,000.

CAMP BIRD, LTD.

This company has an authorized capital of 1,350,000 shares of £1 each, of which 1,100,051 have been issued. In addition there is £500,000 of 6% debenture stock, and was floated in London in 1900 by F. W. Baker and J. H. Hammond to acquire the Camp Bird mine from T. F. Walsh. The mine is now nearing exhaustion, and the report for the year ended April 30 shows that the amount of ore discovered during the year was very small, the ore reserve standing on April 30 at 38,415 tons, as compared with 83,900 tons the year before, 79,186 tons having been extracted in the meantime and sent to the mill. The yield was $1,685,979 in gold, or $22.89 per ton, silver worth $71,435, copper worth $8408, and lead worth $46,748, a total of $1,812,571. The recovery of the gold content was just under 95%. Of the total extraction of metals, 64.32% was obtained by amalgamation, 28.81% in the concentrate, and 6.87% by cyanidation. The concentrate was sold to the American Smelting & Refining Co. The total income at the mine during the year was £372,696, or £4 14s. 1d. per ton, and the expenses £153,262, or £1 18s. 8d. per ton, leaving a profit to be carried forward to profit and loss account of £219,434, or £2 15s. 5d. per ton. The accounts are credited also with £83,691, the par value of vendors' commission shares in Santa Gertrudis, and are debited with £30,000 interest on debentures and £15,248 income tax. The dividends paid during the year have amounted to £220,002, being at the rate of 20%. The total dividends distributed to date have been £1,505,002. Since the close of the company's financial year, the debentures have been retired and preference shares substituted in their place. This company holds an interest of £1,132,096 in the Santa Gertrudis Co., Ltd.

THE Bunker Hill & Sullivan M. & C. Co. paid dividend No. 171 of $65,400 on Monday, December 4. This makes the total amount of dividends paid $13,159,650.

Recent Publications

Pioche. Published by W. O. Sutherland. Fully illustrated. Salt Lake City, Utah, 1911.

West Virginia Geological Survey, Maps, 1911. Wirt, Roane, and Calhoun Counties. 1911.

Mineralogical Notes, Series 1. By Waldemar T. Schaller. Bull. 490, U. S. Geol. Survey. Pp. 109. Ill. Washington, D. C., 1911.

Western Australia Report of the Department of Mines for the Year 1910. Pp. 266. Ill. maps, inserts. Perth, Western Australia, 1911.

Transactions of the Institution of Mining and Metallurgy. Twentieth Session, 1910-1911. Vol. XX. Pp. 572. Ill., inserts, index. London, 1911.

The Data of Geochemistry. Second Edition. By Frank Wigglesworth Clarke. Bull. 491. U. S. Geol. Survey. Pp. 782. Index. Washington, D. C., 1911.

Bibliography of North American Geology for 1910, with Subject Index. By John M. Nickles. Bull. 495, U. S. Geol. Survey. Pp. 179. Washington, D. C., 1911.

Lead in 1910, Smelter Production. By C. E. Siebenthal. Advance Chapter from Mineral Resources of the United States, 1910. U. S. Geol. Survey. Pp 43. Washington, D. C., 1911.

Geology of a Portion of Fabre Township, Pontiac County. By Robert Harvie, Jr. Province of Quebec, Canada. Mines Branch. Pp. 33. Map, insert. Quebec, 1911.

Geology and Ore Deposits Near Lake City, Colorado. By J. D. Irving and Howland Bancroft. Bull. 478, U. S. Geol. Survey. Pp. 128. Ill., inserts, index. Washington, D. C., 1911.

International Conciliation. The General Arbitration Treaties of 1911. No. 48. Pp. 37. American Association for International Conciliation. New York City, November 1911.

West Virginia Geological Survey, County Reports, 1911. Wirt, Roane, and Calhoun Counties. By Ray V. Hennen. Pp. 573. Ill., index. Morgantown, West Virginia, 1911.

The Production of Lime in 1910. By Ernest F. Burchard. Advance Chapter from Mineral Resources of the United States, 1910. U. S. Geol. Survey. Pp. 15. Washington, D. C., 1911.

Report on the Gypsum Deposits of the Maritime Provinces. By William F. Jennison. Canada Department of Mines, Mines Branch. Pp. 171. Ill., inserts, index. Ottawa, Canada, 1911.

Geology of a Portion of Fabre Township, Pontiac County. By Robert Harvie, Jr. Pp. 33. Map, insert. Department of Colonization, Mines and Fisheries, Mines Branch. Quebec, Canada, 1911.

The Production of Asphalt, Related Bitumens, and Bituminous Rock in 1910. By David T. Day. Advance Chapter from Mineral Resources of the United States, 1910. Pp. 9. Washington, D. C., 1911.

Surface Water Supply of the United States, 1909. Part IX. Colorado River Basin. By W. B. Freeman and R. H. Bolster. U. S. Geological Survey Water-Supply Paper 269. Pp. 247. Ill, map, index. Washington, 1911.

The Granites of Connecticut. By T. Nelson Dale and Herbert E. Gregory. Bull. 484. U. S. Geol. Survey. Prepared in co-operation with the Geological and Natural History Survey of Connecticut. Pp. 137. Ill., insert, index. Washington, 1911.

Physical and Chemical Properties of the Petroleums of the San Joaquin Valley of California. By Irving C. Allen and W. A. Jacobs. With a chapter on Analyses of Natural Gas from the Oil Fields of Southern California. By G. A. Burrell. Pp. 60. Index, ill. Washington, 1911.

Commercial Paragraphs

O. D. Gogue has been appointed vice-president and treasurer of the Goulds Manufacturing Co., of Illinois.

The Oliver Continuous Filter Co. reports that in the last few months it has installed the following filters in Nevada, and states that over 90% of the filters used in the State of Nevada are Olivers: Nevada Hills Mining Co., Nevada Wonder Mining Co., Mexican Gold & Silver Mining Co., Rawhide Queen Mines Co., and Farmers Mining Company.

The General Electric Co. reports having sold mining locomotives as follows: One locomotive to Asker Coal Mining Co., for Dorothy, Kentucky; one to Ben Franklin Coal Co., for Braeburn, Pennsylvania; one to Inland Steel Co., for Crosby, Minnesota; and one gathering locomotive to Davis Colliery Co., for Elkins Colliery Co., Bower, West Virginia.

The Jeffrey Manufacturing Co. of Columbus, Ohio, has recently opened another branch office at 1201 American Bank building, Seattle, Washington, to handle its business in the Northwest. Percy E. Wright is manager. The Jeffrey Manufacturing Co. is maintaining 13 branch offices in the United States, as well as nearly 100 agencies in the leading commercial centres all over the world.

The Hardinge Conical Mill Co., of New York, is building several 8-ft. pebble mills for the new sections of the Miami Copper Co.'s plant. These mills are used to grind the same material which heretofore has been fed to Chilean mills. The Hardinge company is also building additional mills for the Federal Mining & Smelting Co., and has also received an order from the Bunker Hill & Sullivan M. & C. Co., based upon the latters observation of the work done at the former company's plant.

Among recent installations of Foster superheaters reported by the Power Specialty Co. are the following: New York, New Haven & Hartford railroad, at Cos Cob and Bridgeport plants; Delaware, Lackawanna & Western railroad, at Loomis colliery; International Harvester Co., at Plano and Weber plants; Associated Pipe Lines Co.; Haskell-Barker Car Co.; J. R. Nutt plant, Fort Worth, Texas; Clark Thread Co., Indiana & Michigan Traction Co.; Wilmington & Philadelphia Traction Co.; Penn Central Light & Power Co.; and Citizens Light, Heat & Power Co., Montgomery, Alabama.

Catalogues Received

The C. O. Bartlett & Snow Co., Cleveland, Ohio. 'Triumph Drop Forged Chain.' Catalogue No. 32. Illustrated. 6 by 9 inches.

The Goulds Manufacturing Co., Seneca Falls, New York. Bulletin No. 1, 'Triplex Plunger Pumps.' 12 pages. Illustrated. 8 by 10 inches.

The Hayward Co., 50 Church street, New York. Pamphlet No. 577. 'Hayward Buckets and Digging Machinery.' Illustrated. 7¼ by 9 inches.

De Laval Steam Turbine Co., Trenton, New Jersey. 'A Steam Turbine for Driving Direct Current Generators.' 32 pages. Illustrated. 3½ by 6 inches.

Sterling Equipment Co., Peoples Gas building, Chicago. 'Heat Your Air, Save Money.' 12 pages. Illustrated. 6 by 9 in. Describing a system of reheating compressed air by means of the Sterling air economizer.

The Ludlow-Saylor Wire Co., St. Louis, Missouri. 'The "Perfect" Double Crimped Wire Cloth.' Catalogue No. 41. 78 pages. Illustrated. 4½ by 7 in. Contains valuable tables, etc., of interest to users of screens.

Ingersoll-Rand Co., 11 Broadway, New York. Bulletin No. 3211, 'Imperial Type X Duplex Steam Driven Compressors.' 20 pages. Illustrated. 6 by 9 inches. Also Bulletin No. 4003, 'Little Giant Rock Drills.' 16 pages. Illustrated. 6 by 9 inches.

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EDITORIAL

LAND has sold in New York recently at the rate of $870 per square foot. The Wyoming 'rancher' can reflect that if his great great grandfather had staked his homestead at what is now Thirty-fourth street and Broadway it would be worth $6,063,552,000.

PEACE in Mexico will not be disturbed through American coöperation, was the tone of a recent message to Congress by Mr. W. H. Taft. Prevention is better than cure, and the firm stand the Administration has taken in this matter is regarded with favor on both sides of the Rio Grande.

DELHI was truly a city of Oriental splendor upon the occasion of the crowning of George V as Emperor of India on Tuesday of this week. The coming of the King to the ancient city to be crowned should strengthen Anglo-Indian friendship, no less than his generous gifts to the cause of popular education in India.

TRULY a curious gathering to advance the cause of peace was the one in Carnegie Hall, New York City, on Tuesday evening, which ended in a call for the police reserve. The eminent gentlemen who were speakers of the evening were doubtless surprised to learn that the citizens of the metropolis are so belligerently disposed.

UNWARRANTED interference in diplomatic affairs is seen in the action of the National and State legislative assemblies in passing resolutions calling for the abrogation of the treaty between the United States and Russia because of the difficulties regarding the issuance of passports. Diplomacy is not a matter of public debate, and the efforts of legislators to engage in it are likely to produce results similar to those of the traditional bull in the china shop.

POTASH investigations by the United States Geological Survey are beginning to bear fruit, and the alunite deposits, recently discovered near Marysvale, Utah, show much promise as a source of potassium salts. Though not large enough to materially affect the importation of potash salts, the discovery is most encouraging, nevertheless. The use of fertilizers, in which potassium salts are essential constituents, is constantly growing, and it is interesting to note, in passing, that a bank in Illinois has established a loan fund, free of interest, to enable the farmers of that district to invest more freely in fertilizers and to raise correspondingly larger crops.

CRIPPLE CREEK is one of the most interesting of mining districts, and of its many valuable mines, Stratton's Independence is easily first in general interest. Much that is untrustworthy has appeared concerning this greatly discussed mine, and we are fortunate, therefore, to be able to present this week an authoritative account by Mr. T. A. Rickard of the development of the property, with which he was prominently identified. It is pleasant to record also that an ore-shoot has recently been discovered upon the 200-foot level and has been proved to persist to the surface, with a reported gold content of 2 ounces per ton, while the drainage afforded by the deep-drainage adit is lowering the water in the deeper workings so rapidly as to permit exploration for additional ore-shoots in depth.

Japan and the Mining Engineers

In this issue we print the third and concluding letter of a series describing in outline the trip made by members of the American Institute of Mining Engineers to Japan. More detailed descriptions of several of the properties visited will follow. We take this occasion, however, for a word of thanks to the Japanese hosts, on behalf of our representative and the other engineers of the party. Hospitality would seem to be the chief pleasure of the Japanese, if the experience of the American visitors affords any test. Japanese courtesies began before the party left San Francisco, the local committee sending Mr. Reiji Kanda to that city to meet and escort the Americans to his home country. A better choice could not have been made, since to his native ability Mr. Kanda has added an excellent knowledge of English and a large acquaintance among foreign mining men. Both on the *Manchuria* going over and throughout the journey in Japan, he laid the Americans under many obligations for his unfailing courtesy and thoughtfulness. The visiting party was the largest, but one, of any group of Americans that had traveled through the Empire, and the mining men of Japan regarded it as especially important. The local members of the American Institute, the Mining Institute of Japan, and the Mine Owners Association, joined in the formation of a general committee which worked indefatigably for the success of the excursion and achieved an eminent success. The chairman was Baron Shibusawa, who has, among other interests, large holdings in mines. Viscount Kaneko, well remembered in America in connection with negotiations at the time of the Japanese-Russian war, was chairman of the banquet committee. The other members of the general committee were Messrs. Takuma Dan, Rentaro Hotta, Reiji Kanda, Keisuke Kato, Benzo Katsura, Rokusaburo Kondo, Masayuki Otagawa, Kingo Nambu, Kageyoshi Noro, Wataru Watanabe, and Shigema Yamanouchi. A number of these men are already well known in America, and of the others many pages might be written without exhausting the record of their good work. In addition, local committees had been organized wherever the party was to stop, and corporations, cities, and provinces vied with each other in entertainments and giving of souvenirs. To an American, with whom gift-giving is much less common than among Japanese, there was a pleasant embarrassment in receiving a pair of gold cuff-buttons or a beautiful necklace for his wife, as a souvenir of a little dinner that was quite charming enough in itself. It is an old rule, however, that it is possible to get used to anything, and this applies even to the constant receipt of presents. Differences in custom produced less embarrassment than might have been anticipated. It is an open secret that the Japanese committee was aghast at the announcement of the large number of women who were to be in the party. There was, indeed, some question among the Americans as to the wisdom of this feature. The women, however, wanted to go, and of course they did so. As a result the Japanese made special efforts to induce their own wives to take part in the entertainment, and it is whispered that the latter, at least, greatly enjoyed the relative novelty. At any rate, both Americans and Japanese became much better acquainted and parted with much juster estimates of each other. A result of the social features of the excursion was the formation of many personal friendships and, on the American side, a greatly heightened respect, not only for the Japanese, but for their ways. Japanese have the Oriental habit of speaking deprecatingly of anything belonging to themselves and in high eulogy of that which belongs to another. It was amusing to see some of the Americans who had taken this too seriously, gradually waken to the real facts. The Japanese have, we are persuaded, a real and deep-seated gratitude to individual Americans for professional courtesies, and also to the American nation for the generally friendly attitude that it has occupied in relation to the Empire. They fully realize the effectiveness of American and European methods in education and industry. At the same time, they have a deep-rooted faith in their own resources, powers, and civilization; a faith born from the maintenance of three centuries of peace quite as much as from 2500 years of freedom from invasion, and the waging of two successful modern wars. When the Westerners broke into Japan in 1853, there was already existing a complex and cultured civilization. Japan, it is true, started then to go to school and began in the primary class, but that was nearly a half century ago, and, furthermore, Japan, while unacquainted with Western learning, was not unlearned. It was more as though graduates of early American colleges severely trained in Greek and Latin, had taken to engineering. They would have needed to begin with the elements, but would not have brought either ignorance or stupidity to the task. No visitor can go through room after room of the Nijo palace at Kyoto, built in 1603, and reflect on the state of contemporary art and architecture in America and Europe at that time, without mentally lifting his hat to native Japanese culture. Neither can any observing miner or metallurgist go through the mines, mills, and smelters of Japan without the feeling that the Japanese engineers may have learned lessons abroad, but have built well on the foundation thus laid and are now drawing heavily on native ability and inventiveness.

It is too much to expect that the various races and nations will give up their differences and become alike. If they did, life would become unbearably monotonous. Purposeless friction, however, results always in loss. Failing agreement, the best thing is understanding, and this is promoted by acquaintance. Too often nations know each other only through contact with traders; and salesmen form an important but only one part in the national economy of any people. Educational excursions are a well recognized pedagogical device, and, while mining engineers travel much and are possibly as cosmopolitan as the members of any profession, such excursions as the one just completed are stimulating and helpful both to host and guest. There has been criticism of the Institute that it was becoming too much of a publishing house with an excursion-bureau annex. While there is point to the criticism, journeys that bring together the members of the Institute and their families promote the solidarity of the profession in geometrical proportion to the number taking part. America and Japan, historically friendly nations, have seemed recently to be drifting apart. Hypercriticism has too often replaced the old friendly comment of the one on the other. This, we believe, does not reflect the real sentiments of the bulk of the citizens of either country. We return profoundly convinced that Japan wants no war that can be avoided, and will approach any international question with only the same desire for fair play and disposition to insist, as would any other self-respecting and efficient people. Japan's face, however, is toward the conquests of peace, and in her progress toward that goal all members of the recent party of visitors will gladly join in the wish expressed by the students of the Imperial University of Tokyo on the occasion of the granting of the national constitution—*Banzai! Banzai! Banbanzai!*

Two Famous Mines—I

By T. A. Rickard

The annual meetings of the shareholders in Stratton's Independence Ltd. and Camp Bird Ltd have recently been held in London, and the reading of the reports prompts me to revert to the story of these two famous mines in Colorado. The discovery that made W. S. Stratton a millionaire was the result of the desultory prospecting of a carpenter. His previous efforts in the San Juan region of Colorado had not been successful, but Stratton was a resident of Colorado Springs and therefore was near Cripple Creek when the first discoveries were announced in 1891. He was among the first to go thither. After trying several places, he found gold in the surface debris on the south slope of Battle mountain. But his pannings at first led to nothing, because he did not test the big outcrop of mineralized granite that was the one conspicuous feature of the hillside. Finally, in desperation, he broke a piece of the granite and took it with him to Colorado Springs. It assayed 19 ounces of gold per ton! That was on July 3, 1891. He returned next day and located the Independence and the Fourth of July claims. We can all write last year's almanac, but it is worthy of remark that the Independence was the only vein in the Cripple Creek district that had an outcrop, and it was so conspicuous that any experienced prospector would, it might be supposed, be quick to notice it and appreciate its mineral character. Stratton had been used to the white quartz around Silverton and allowed the evidently granitic character of the ore to divert him from recognizing its equally decided impregnation with iron oxide, from the decomposition of pyrite, leaving a vesicular quartz in which the gold lay hidden. However, in the usual haphazard way of prospectors, he had found a great bonanza. I saw it first in 1893, by which time Stratton had run a surface drift and an open cut, exhibiting a large width of medium-grade ore. It looked like the making of a big mine, and this was the view I expressed then to Thomas B. Stearns, of Denver, who was visiting Cripple Creek with me. Stratton was fortunate in securing John H. Mackenzie as his superintendent. A more experienced mine-captain he could not have found. Mr. Mackenzie stayed long enough to turn the promising prospect into a rich mine.

OUTCROP OF THE INDEPENDENCE VEIN, SHOWING A PORTION OF STRATTON'S SHAFT-HOUSE.

From 1891 to 1898 the output was worth $3,985,440, giving a profit of $2,402,164. As the mine gained in reputation Stratton received various offers of purchase. At first the enthusiasm of an owner led him to overvalue it, and by the time he had become accustomed to his wealth he felt disinclined to sell. As he said to H. H. Collbran, who built the Midland Terminal railway to Cripple Creek: "Look at this newspaper; there you are: 'The owner of the Independence'; 'W. S. Stratton, the great miner', and so on. If I sell my mine, where shall I be? and what shall I do? I don't think it is worth the $5,000,000 you offer, but if I change my mind I will let you know." That was in 1897. My own impression is that he was not in a position to appraise the mine, or any other mine of similar proportions. After Mr. Mackenzie left, he was not well advised, and I question whether his later superintendent was capable of valuing the property. Stratton really did not want to lose his prominence as the owner of a celebrated mine, and therefore did not take pains to put a price on it—not until he began to suffer in health. That was in 1898. Then he was approached by a broker of Colorado Springs, where he was living. To persistent pleading and persuasion the old man had to yield. He gave his promise to entertain a proposal, whereupon the business was presented by the broker to a financial corporation in London. Stratton arranged to go thither.

For the corporation, I made a thorough examination of the mine, taking five weeks and 1008 samples. The time and the number of samples would not now be considered unusual; in 1899 they were. My report stated that there was 70,000 tons of ore, having a gross value of $6,712,000. I stated that the mine could produce "at the rate of two million dollars of gold per annum for at least three years." But no valuation of the mine was given then, because none was asked. This was in March 1899. In April, when negotiations had been advanced, I stated, in reply to a cablegram, that the mine was worth "between five and six million dollars." A company was organized with a capital of £1,100,000 in shares of £1, of which 1,000,000 were issued. These shares were placed on the market at $10 and rose to $15. Stratton remained in control until a year later, that is, May 1900, when his interest was finally liquidated. Until then Stratton was managing director, with complete control of operations at the mine. Until he was finally bought out I had no executive authority. The conditions were anomalous and I had to make the best of them. Inclusive of dividends during the first year of the company's operations, he received exactly $10,000,000. It is an interesting fact that this sum was assumed to be equivalent to £2,000,000, on the rough-and-ready basis of $5 to the pound sterling; hence when the transaction was about to be closed, there was a scurry for the balance arising from the little difference between $5 and $4.85, amounting in this case to over £60,000.

At the time of purchase the mine was 900 feet deep; since then it has been deepened 500 feet more, but this vertical extension of the workings has only served to make the shaft a sump for the drainage of the neighborhood. No ore worthy of mention was found, except a patch followed by a winze below the 900-ft. level. It will be remembered that the workings transgress the steep contact between the granite and the overlying andesitic breccia. At the 1400-ft. level, only 250 ft. of breccia lies between the granite and the north boundary of the property. Prospecting in the granite southward has proved disappointing, although recently a little rich ore has been found on the ninth level in the granite. At the time of my examination the prospects in depth were considered negligible, and the showing on the ninth or bottom level was so poor that it was not sampled. Expectations of growth were based on lateral development, and the finding of parallel veins. This proved correct, for the output of the mine has come not from one but from a system of at least six principal veins with minor branch-veins, exhibiting a maximum enrichment between the third and fourth levels.

When Stratton ceased to control, I obtained executive authority and at once selected H. A. Shipman as manager, giving him orders to bring the assay-plans up to date. It was then ascertained that the estimates of later additions (based on data given, in the usual way, by the staff) to the ore reserves were incorrect. Into the scandal that ensued I cannot go, as it affects other persons. As regards the history of the mine, it is only necessary to say that as soon as a discrepancy was detected, by Shipman, acting under my orders, it was arranged (in October 1900) that John Hays Hammond and I should make a joint report, and that the sampling should proceed under the direction of Messrs. Shipman and A. C. Beatty, the latter then being my assistant. I went to London to attend the meeting of the company, and early in December I was actually on the steamer at Liverpool, about to return to Denver, when I was recalled by a telegram stating that Mr. Hammond had cabled an estimate. According to this estimate the mine contained only $2,300,000 in ore, from which a profit of $1,000,000 would be made. Since then the mine has yielded $12,000,000, from which dividends of $3,000,000 have been paid, not including the profit of the tributers ($1,000,000) and the money spent on the mill ($200,000). All this refers to the estimates of ore opened up in the Independence after the deal was made; it does not refer to the original report. It is true a suit was brought by the English company against the estate of Stratton (who died in 1901) on the ground that my samples had been 'salted', but no evidence for this was ever brought forward; to my knowledge and belief, it was baseless. The suit was thrown out of court.

Returning to the mine, the production between 1898 and 1904 was $11,046,947, from which $4,142,738 was paid in dividends. These dividends would have been at least 25% greater if the mine had not been gutted in an effort to force the share quotations. Under Stratton's administration and before he was paid in full—that is, in the 14 months from April 1899 to June 1900—the mine produced 48,048 tons, averaging $74.50 per ton, and paid $2,263,348 in dividends. In 1904 the mine was supposed to be exhausted, and the workings were let to tributers, who uncovered several rich orebodies and extracted $4,023,003, from which the company obtained $606,254 in dividends, from royalties received. Of the $4,023,003, at least 25% was profit to the tributers, so that the mine should be credited with paying $1,000,000 more. During these years some orebodies were found that there was good reason to believe had been hidden; the ore was extracted regardless of the safety of the mine; hence this series of operations ended in a general collapse of the workings from the surface to the fifth level. It is only this year that new levels have finally been extended through the caved ground, so that the whole of the mine is now open to further gleaning. Finally, the old workings having been gleaned, a successful effort was made to treat the dumps, which had been sampled under the direction of George A. Schroter. Subsequently, Philip Argall designed a mill, which was built in 1907-1908. This has treated 191,766 tons, yielding bullion and concentrate having a gross value of $423,050. Sufficient material remains to supply the mill for possibly a decade. Mr. Argall has been manager since 1908. At the present time the yield is at the rate of $750,000 per annum from 20,000 tons of mine ore and 200,000 tons of dump. Earnings of 20% are being made on a capital of $600,000. In 1908 the capital was reduced from £1,100,000 to £125,000. Thus the mine has yielded:

Period.	Tons.	Average per ton.	Gross Value.	Dividends.
A. ..1891-1898	41,694	$95.59	$3,985,440	$2,402,164
B. ..1899-1904	356,355	31.00	11,046,947	4,142,736
C. ..1905-1908	103,535	38.86	4,023,003	606,254
D. ..1909-1911	61,595	25.12	1,583,135	242,500
Dump	191,776	2.26	423,060	
	754,955		$21,061,585	$7,393,654

A. Stratton's ownership ....profit 60%
B. Stratton's Independence Ltd............ " 37%
C. Tributers .... " 15%
D. Tributers and dump-treatment........... " 12%

To these figures must be added the estimated profit made by the tributers or lessees, namely, $1,000,000, which raises the rate of profit during that period to 40%. Thus during the 20 years from July 4, 1891, when Stratton located his claim, to June 30, 1911, this mine has yielded 755,000 tons containing $21,000,000 worth of gold, from which a profit of $7,400,000 is recorded, but with promoters' profits, tributers' profits, and sundry other profits that would have accrued to an uninterrupted and capable owner, the amount yielded by the mine itself is fully $10,000,000. My opinion is that if Stratton had been offered $5,000,000 cash in 1899 he would have accepted it for the mine. At this price the mine could have yielded a profit of $1,000,000 per annum for 5 years, and would have yielded altogether fully $7,500,000, or 150% on $5,000,000 in 10 years. This would have represented a return on which the purchasers could undoubtedly have done well, for the shares of rich mines usually rise considerably above their intrinsic value. From a purely technical standpoint, however, I consider now that $5,000,000 would have been too much, for the purchaser of a gold mine is entitled to more than the return of his capital and 5% on it during the 10 years required for amortization. In 1899 the Independence was worth not more than $4,500,000, which, in 10 years, with efficient management, would have yielded from 160 to 170% in dividends, representing a return of the capital and 6½% per annum. This great bonanza is now practically exhausted. The details I have related constitute a small part only of a troublous history, for I have made no reference to ore stealing galore, to shooting underground, to devious litigation, to share gambling, and to other features of a story in which the romance is tawdry and the plot obscure. It suffices to quote Bret Harte, who said:

> "The ways of a man with a maid be strange, yet simple
> and tame
> To the ways of a man with a mine when buying or
> selling that same."

WHILE the salt-producing industry of the United States is important and well distributed, little or no attention has been paid heretofore to the possible occurrence of potash salts in connection with salt. There is a possibility, however, that potash deposits may exist in the eastern portions of the United States as well as in the arid region. The German deposits are in a region subject to comparatively heavy rainfall, the potash beds being, however, protected by an overlying clay. It should be noted, too, that the discovery of the Stassfurt potash beds was in the nature of an accident. The drilling which the German Government carried on for five years was intended for the development of the salt industry and the drill actually passed through a deposit of so-called 'abraumsalze,' compounds of potassium and magnesium, then considered worthless.

Stamp-Battery Cam-Shafts

By Charles T Hutchinson

The stamp-battery, like the poor, seems destined to be always with us, and, although many improvements in the various details of construction, have been made since the first description was written by Agricola in the early part of the sixteenth century, the underlying principles remain the same. There are still many features in the mechanical construction, however, that are unsatisfactory in their present form and for which no adequate solution has yet been found.

The most glaring mechanical defect lies in the weakness of the cam-shaft and the correction of this would do much to decrease the cost of milling. It is hardly necessary to go into the long list of troubles resulting from broken cam-shafts as the record can be found in every mill report but a discussion of the causes of breakage and a few suggestions as to possible remedies may prove to be of service. All of the breakages of cam-shafts are due either to crystallization or defective material, as it is a question whether anyone ever heard of a cam-shaft lasting long enough to wear out. The causes of breakage may be summed up and divided into two classes: the first group, in which a possible correction must be looked for in a change in the battery-frame construction itself; and the second group, in a change in the material that is used for making the shafts.

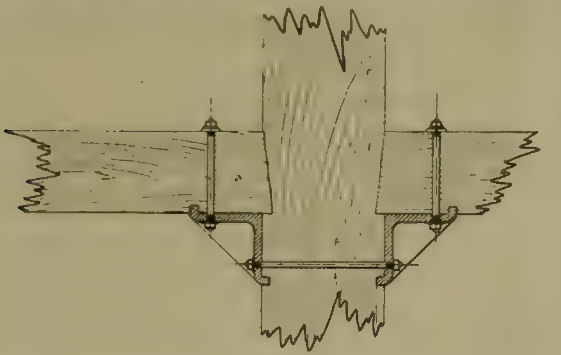

FIG. 1.

The first group therefore includes: (1) vibration of the battery-frame and foundation; (2) cam-shaft bearings out of true alignment due to the shrinking and warping of the battery-frame and the unequal settling of the foundation; (3) distortion of the battery-frame due to the defects in the ordinary back-knee frame construction, in which the ore-bin and the battery-posts are rigidly connected, so that unequal distribution of ore in the bin causes it to settle or cant to one side, pulling out of line that part of the battery-frame to which it is fastened. In the second group of causes will come: (1) vibration of the shaft due to the constant shifting of the load between the alternate lifting and dropping of the stamps and the varying order of drop; (2) shock due to the blows when the cams strike the tappets in lifting; (3) occasional hammering of the tappets on the hubs of the cams, which frequently happens when the millman neglects to shift the tappet higher on the stems to compensate for the wearing down of the shoes and dies.

To counteract vibration of the battery-frame and foundation will necessitate a change in the practice of the present day, in which wood posts are used almost invariably. Concrete has already superseded wood for mortar-blocks in spite of a great deal of opposition directed toward it when it was first introduced, and I believe it will ultimately do likewise for the battery-frame itself. The 100-stamp mill of the City Deep on the Rand has been the pioneer in concrete battery-frame construction, a detailed description of this mill having appeared before in the columns of the *Mining and Scientific Press*. It will be noted, however, that the designers of this plant have adhered to the old idea of attaching the battery-frame to the ore-bin by means of a knee-beam extending out from under the ore-bin and forming a cap on top of the battery-posts upon which the cam-shaft bearings rest. It would appear from a casual examination of this method of construction that any settling on the part of the ore-bin would most surely pull the cam-shaft boxes out of line.

Concrete is absolutely rigid and is not susceptible to alterations in form or position on account of any weather changes, and, if due care is taken in going down far enough to get bedrock upon which to set the mortar-block, there should never be any trouble due to cam-shaft bearings out of line.

The ideal form for the battery-frame of the future will be structural steel incased in concrete, the mortar-block and battery-posts being a self-contained unit and not attached in any way to the ore-bin. This type of construction will give rigidity and permanence without excessive first cost, and will undoubtedly do much to increase the life of the cam-shaft and improve the efficiency of the battery itself. It is altogether likely, however, that it will be a great many years before mill buildings adopt this method of construction, as the mining man is by nature conservative, and would look askance upon anything that looked like an innovation or change in the time-honored wooden-post construction.

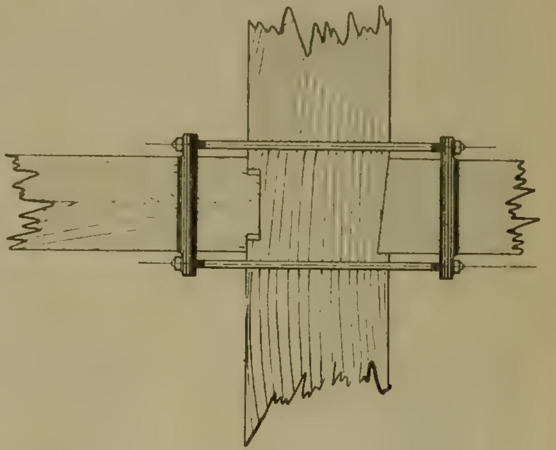

FIG. 2.

An improvement can be made, however, in the present method of fastening the knee-beam to the battery-posts. Fig. 1 shows the cast-iron angle brackets bolted to the posts and knee-beam, tying them rigidly together. Fig. 2 shows a somewhat different method of construction, which is a decided improvement over the former. As will be seen, the knee-beam is tenoned and bolted to the battery-post, the tenon having 1-in. clearance top and bottom. The anchor and tie bolts, while holding the battery-post firmly against the knee-beam, would still permit the knee-beam to settle or rise to the amount of clearance without throwing the battery-posts out of line vertically.

The three-post frame, in which the drive is on one end and the downward pull of the belt is supported on one side only, has a tendency to cause the shaft to jump in the bearing opposite the pulley. This is also one of the several causes that help to induce crystallization.

The four-post frame, however, having the pulley in the middle, and the pull of the belt therefore being supported on both sides of the pulley, obviates these objections and adds very materially to the life of the shaft.

C. O. Schmitt, in his contributed remarks on 'The Development of Heavy Gravitation Stamps', *Bulletin* No. 65 of the Institution of Mining and Metallurgy, does not approve of the four-post frame for the reason that, as he states, the torsional moment is a negligible quantity; but in my opinion the principal good feature about this type of construction is the fact that the pull of the belt is supported on both sides. There is, of course, one additional bearing, making four bearings to keep in line instead of three, but the question of keeping the cam-shaft bearings in alignment will never be satisfactorily settled until the concrete, reinforced, self-contained battery-frame construction is employed, and installed without being connected in any way to the ore-bin.

The question as to the kind of material that is best adapted for cam-shafts is a very difficult one to answer. Manufacturers do not feel inclined to do much experimenting at their own expense, and the mill buyer generally does not want to pay more for one cam-shaft than he does for another; but from my own experience I have arranged the different classes of materials that are used and might be used, as follows:

1. Heat-treated, chrome nickel steel.
2. Norway refined iron.
3. Hammered refined iron.
4. Inspected mild-steel blooms.
5. Ordinary merchant quality mild-steel blooms.

Of these five different classes, the chrome nickel steel is unquestionably the best material known to modern science for this purpose. The great strides that have been made in the automobile industry have taught the engineering world a great many things, and, as the function performed by the rear driving axle on an automobile more closely approximates the severe duty that is allotted to a cam-shaft than any other case I know of, it would appear to be good judgment and an almost sure exemption from further trouble if the same class of material could be used.

An alloy of chrome nickel steel, having a tensile strength of 200,800 lb. and an elastic limit of 144,900 lb., hardened at 1500°F. and drawn to 600°F., with an elongation of 8% and a reduction in area of 23%, should last indefinitely, and in spite of the fact that its first cost is about two and one-half times greater than for the shafts made of mild merchant quality steel, the increased service would undoubtedly compensate for the higher first cost many times over.

Norway iron is an excellent material for cam-shafts also, but the ingots obtainable in the United States are so small as to make it impossible to turn out so large a forging as a cam-shaft without a great number of welds. Nevertheless, a number of mills in Nevada are using shafts made in this way with far more satisfactory results than had been obtained heretofore when using the plain forged mild-steel shafts. Norway iron will seldom crystallize, but the great number of welds that must be made for so large a forging make it difficult to turn out a homogeneous shaft.

So-called refined iron as a material turned out commercially in merchantable quantities by the mills of this country suitable for forging into cam-shafts is practically unobtainable, as it has been almost entirely superseded by steel, and, while some small quantities of old iron shafting dismantled from mills and steamships built thirty years ago have been obtained by a few manufacturers, the supply is limited and must soon be entirely exhausted. Genuine refined iron, such as was produced by the puddlers of years ago before the advent of the steel age, is excellent material for cam-shafts, but it is hardly more common than the dodo itself, and in view of this fact one must needs be content with the alloy of steel best suited to the purpose.

Inspected mild-steel blooms forged under the hammer for cam-shafts are only fair material, and the ordinary merchant bar of mild steel should not be used under any circumstances for this purpose. Unfortunately for himself, the average buyer who is not familiar with the details, and for some occult reason does not care to pay a consulting engineer, considers nothing but price in placing his orders for machinery, and until the millennium arrives, machinery will continue to be bought on the basis of price competition, and the only possible way to eliminate this poor quality of material from the stock mill that is turned out by manufacturers today would be the consummation of an agreement between all the manufacturers themselves looking toward a standardization of stamp-mill specifications for the benefit of the user and for their own protection against many unjust claims for replacements.

The diameter of the cam-shaft for a given weight of stamp is another matter which has been determined by price competition rather than what is known by engineers to be the correct practice. A so-called 6-in. shaft (actual diameter from $5\frac{7}{8}$ to $5\frac{15}{16}$ in.) is used for a 1000-lb. stamp where ten cams are on one shaft. A $6\frac{1}{2}$-in. shaft should be used for this weight of stamp, actual diameter being from $6\frac{3}{8}$ to $6\frac{7}{16}$ in. While there is no doubt that if millmen and mill operators themselves were perfect machines, cam-shafts would last very much longer than they do, at the same time all are fallible and the cam-shaft itself should be made strong enough and heavy enough to give an ample factor of safety to provide for a certain amount of abuse and ill treatment. If mill operators who are having cam-shaft troubles—and what mill operator is not?—would substitute chrome nickel steel having physical characteristics somewhere near those mentioned above, they would undoubtedly save themselves a great deal of money and loss of time due to shut-downs. If purchasers of new mills would specify either chrome nickel steel in the same diameter as the manufacturer would specify—or, failing in this, to specify a shaft at least 10% larger in diameter than the standard manufacturers' specifications—they would take advantage of the ounce of prevention that is worth a pound of cure.

THE Cumberland plateau, which contains the coalfield of Tennessee, is a broad upland, standing about 2000 ft. above sea-level. While many of the streams flowing out to the east and west or to the south have cut ravines into this upland, still, as a rule, the ravines occupy but a narrow part of the area in contrast with the broad upland, which in many places is nearly flat, and in many others only slightly rolling. As a result of this condition, the coals have been rendered accessible at a large number of points; at the same time, they have been broadly protected, so that in many cases almost as large an area of beds remain as though they were entirely below drainage. In the northeastern part of the coalfield are many hills and mountains that rise from several hundred to a thousand feet or more above the general level of the plateau. These hills retain the higher coals that have been entirely removed from the rest of the field. They are remnants of the lands which were reduced to the general level at the time that the level of the plateau was established. But while containing these higher coals, as a rule, these higher mountains are often narrow-topped divides or ridges, so that the areas of coal they contain are relatively not as broad as those under the plateau proper. Fortunately, massive sandstones at various elevations tend to make the mountains broad shouldered, as it were, protecting larger areas of the high coals than in the corresponding mountains farther northeast, where the sandstones of that part of the section are less massive and resistant and the mountain divides are much narrower. As a rule, the level surface of the plateau has been maintained through the existence at these elevations of massive beds of sandstone. Lest it be thought that the sandstone has alone been responsible for the general flatness of the plateau, it may be noted that the plateau-level bevels a number of massive sandstones, as well as the intermediate beds of less resistant shales and shaly sandstones. This is well seen in Walden ridge, where the sandstone that protects the eastern edge of the plateau is stratigraphically 500 to 700 ft. higher than the sandstone, which protects the western edge overlooking the Sequatchie valley. At the eastern edge of the plateau there is a fairly even escarpment with a precipitous drop of about 1000 ft. At the western edge, overlooking the basin of middle Tennessee, there is a nearly similar drop, but the edge of the escarpment is not regular, but almost dendritic in shape, extending out in numerous headlands that inclose deep coves, and in a few cases the ends of these headlands have been cut off and stand out as isolated outlyers.—G. H. Ashley in *Mineral Resources of Tennessee.*

The Braden Copper Mines

By Pope Yeatman

*The mines of the Braden Copper Co. are situated in the Andes mountains, O'Higgins province, Chile, in about latitude 34° S. and 71° 20'W. The property is reached from Valparaiso, the seaport, by means of a broad gauge (5 ft. 6 in.) road as far as Rancagua, a distance of about 158 miles, and from Rancagua by the company's narrow gauge railroad, the length of which is about 43½ miles to the concentrator and smelter, and 1½ mi. farther to the mines.

The mining area consists of 101 claims covering 1214 acres. The legal status of all these claims is reported by the attorneys to be good. All titles come from the Government and are continued by the payment of the annual tax of ten pesos Chilean, per hectare (89c. per acre). Besides the mining claims, the company also owns about 35 acres of ground in the city of Rancagua, where the railroad terminal is situated, railroad right of way, right of way and water rights for the ditch line, power station, and power line.

The property had been worked by the Chileans for many years, operations being carried on in the Teniente mine and the rich hand-sorted ore either smelted nearby, transported to other Chilean smelters, or shipped abroad. Some concentration was done by means of hand-jigs on the richer grade of ore, but no attempt was made to operate on the low-grade ore found in the Fortuna mine. In April 1904 the property was purchased by an American company, and in May 1909 the present Braden Copper Co. acquired the ownership.

The mines are situated in a region of great ruggedness, on a part of the main range of the Andes mountains. All the rocks are eruptive. The country rock is andesite, surrounding a body of tuff, which represents the old crater of a volcano. This tuff, light gray in color, is no longer loose, but has been roughly cemented into a hard concrete-like rock mass. This represents material from a great volcanic outburst, which covered the old eruptive material by great thickness of volcanic ash, fragments of lava, and general ejectamenta. This is well shown in the tuff and volcanic agglomerate forming the core of the crater, made up of volcanic material of different sizes in the shape of more or less rounded boulders and shattered material, down to the finest impalpable powder, resulting from the violent ejection of material, part of which fell back into the same crater and was thrown out again and again, thus becoming abraded by contact. Solutions may have had some effect in the rounding of the different fragments, but the principal cause was abrasion. It is close to the contact, but in the andesite, that the main orebodies occur. It may be mentioned, however, that a part of the Teniente deposit occupies an old fumerole in the tuff itself.

The volcanic vent is practically circular in horizontal section; though owing to the great denudation on the north side, the outline appears to be oval rather than circular. The diameter of the vent is roughly 4000 ft. and the periphery measured along the outside is about 2½ miles. While in the main circular, there are many irregularities, due to the tuff filling breaks running out into the andesite. At numerous points around the rim of the crater, there are evidences of water sorting, giving a more or less sedimentary appearance to the tuff, and showing evidence of a probable crater-lake occupying the old volcanic basin. The slopes of the mountains are very steep; as much as 30% is often found. There is practically no vegetation, and a large part of the slopes are so steep as to be devoid of slide-rock.

The water-shed is toward Teniente creek, which joins the Coya at the smelter-site; the latter stream joining the larger Cachapoal close to the power-site, eighteen or twenty miles distant. Geologically, the mountain range is young, having supposedly been formed during Tertiary times, and while volcanic and solfataric action has long since ceased, movements of the earth's crust are still general, as indicated by the not uncommon earthquakes.

The orebodies occur around the periphery of the crater in the andesite, at its contact with the tuff. These occurrences represent andesite, which is more or less shattered and near the contact of the tuff often considerably brecciated, carrying the copper minerals in the cracks and openings. The mineral was deposited after the time of great volcanic disturbance, "during the closing stages of igneous activity and is aqueo igneous in development." The minerals making up the ore have been deposited from ascending hot solutions, mainly filling cracks or replacing some of the constituent minerals of the andesite. The richer portions are apt to be where the greatest brecciation is, except where the brecciated material has been closely filled with tuff, "originally in the form of mud forced into the interstices of the breccia as an emulsion."

In the case of the Teniente 'pipe,' which represents an old hot-spring channel, the loosely agglomerated boulders of tuff and breccia have been coated by mineral, either deposited in open channels or replacing some of the tuff itself. Denudation of the surface has been in some cases more rapid than oxidation, and the sulphide zone often reaches to the surface. In the case of the Teniente pipe, however, oxidation has been carried to a considerable depth, and hence a good deal of mineral is secondary, there being considerable chalcocite and especially cuprite and metallic copper; these latter minerals being by no means so common in the Fortuna section.

The orebodies are limited on one side by the tuff, but in the andesite the line of division is, as a rule, poorly marked; instead of being determined by distinct planes the limit is determined rather by the commercial features. In other words, on passing from the brecciated material into the fractured andesite, the content of copper becomes gradually less and fades out in the more blocky andesite country rock. The orebodies dip at about 70° toward the centre of the crater. Three so far have been worked on: first, the Fortuna; second, the Teniente; and, third, what is known as the Fortuna No. 4. All of these showed strong outcrops, stained with copper minerals. Besides these strong indications are others, one to the east of the Teniente main workings; another the Soldado, farther to the east and south; and still farther south, the Caballeria No. 1 and No. 2, and the Rejimiento, and it is where these indications are shown that future development is planned.

In order, as carefully as possible, to gather all the geological facts bearing on the ore deposits, besides a careful study in the field, numerous samples were taken and submitted for microscopic examination; C. P. Berkey of Columbia University undertaking the work. I can say that Mr. Berkey corroborated my previously expressed views concerning the orebody, in the direction of continuation of commercial ore to a considerably greater depth and to the fact that the copper content is mainly in primary minerals rather than in secondary.

Metallic minerals are iron pyrite, magnetite, chalcopyrite, bornite, and secondary chalcopyrite, a mineral said to resemble tetrahedrite and zincblende, in the sulphide zone; and in the zone of oxidation, limonite, cuprite, metallic copper, and the carbonates and silicates of copper. The principal non-metallic minerals, outside of the original constituents of the rock are, tourmaline, quartz, ankerite, calcite, chlorite, sericite, mica, epidote, and zircon.

The depth to which the profitable orebodies will reach is an important and naturally difficult question to determine with any degree of accuracy. The indications, however, point to a considerable depth, much greater than has been reached at the present time, and will be in the main limited

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*Abstract of a report to the company, September 1, 1911.

by the compactness of the rock and lack of fracturing, due to the great depth below the original surface at the time of the formation of the orebodies. The difference in elevation between the highest outcrop at Caballeria and No. 4 level, where commercial ore is found, is about 2500 feet.

The Teniente pipe, which has been followed to within 300 or 400 ft. of the level of Teniente No. 3, showed open channels and indicated great freedom in the passage of the hot solutions. No. 4 Fortuna also shows open texture. However, the few evidences seen are invariably in favor of much greater depth, and as the value of the copper is due to its being mainly in the form of primary minerals, rather than secondary, much change in grade, due to increased depth, is not expected.

It may be said that while chalcocite does occur in the Fortuna, it is limited in amount and apparently occurs as a thin coating on pyrite and chalcopyrite, increasing the grade only in a small way. The Teniente pipe represents a different condition, for here there has been considerable secondary action, and the rich bonanzas have been mainly due to secondary cuprite, metallic copper, and chalcocite. At greater depth, the lower-grade minerals, chalcopyrite and bornite, will probably be reached, and instead of the bonanza of the upper worked-out portion, there should remain ore carrying bornite and chalcopyrite, but more concentrated than in the case of the Fortuna ore.

A thorough and careful geological survey was made of the deposits in 1910 by my assistant, Robert Marsh, Jr., with a supplementary study in 1911. Operations have been conducted on three distinct orebodies, each one of which differs considerably from its neighbor, but all of which have points in common resemblance.

The Fortuna mine was originally opened in the search for rich ore, the strong copper stains of the outcrops leading the original prospectors to hope for high-grade ores similar to those found in Teniente. These prospectors opened up a considerable extent of ground, but reached no great depth, nor did they find much high-grade ore to pay for their labors. Their work, however, showed the American company what to expect, and led them to concentrate their efforts toward the development of this property.

The Fortuna orebody is typical and is represented by a body, lense-shaped in horizontal section, as far as developed, about 1500 ft. long, with a maximum width of 260 ft., and of an unknown depth, but so far developed to the No. 4 level, a distance of 1421 ft. below the upper part of this orebody. The ore lies partly in the fractured andesite and partly in the breccia. At the south end there seems to be a constricted area, where the brecciation and fracturing is less marked. It is hoped that in driving along the contact of the breccia and tuff, conditions may arise favorable to an enlarging of the constricted area into still another body. The second and third levels have been well developed by the main adits and by numerous cross-cuts and stopes. Both levels are being operated.

The ore of No. 4 Fortuna orebody occurs in a highly shattered zone of open texture with little or no fine cementing material. The copper is found mainly in the minerals bornite and chalcopyrite in well developed crystals associated with ankerite and quartz. The orebody is now being developed and has shown a length of 55 metres. The ore is being raised on and is still continuing at a height of 42 metres. The indications are good for considerable height of ore above the level, and a considerable depth.

The Teniente orebody outcrops in the crater of the old volcano and shows high-grade ore at the surface. The copper occurs in the form of malachite, azurite, chrysocolla, cuprite, metallic copper, bornite, and in the deeper workings, chalcocite. The old prospectors followed the bunches and stringers of ore in the 'pipe' and in seams running from the 'pipe' to a very considerable depth, but were finally driven out by water.

While the 'pipe' seems to have narrowed with depth, the ore is still said to continue. At the present time, however, the company has not been able to examine this below 150 ft. below the No. 1 Teniente cross-cut. Above this the rich ore has been extracted, but there is still some concentrating ore, which it did not pay the old operators to mine. This ore, however, is considerably oxidized and will make a poor product for concentration, and will besides require a good deal of hand sorting. At greater depth, however, the oxidation will decrease and more sulphides appear. The original concentration of high-grade sulphide was further enriched by secondary deposition from descending solutions.

The pipe, occurring wholly in the tuff and agglomerate, appears to be rudely shaped like an inverted cone. It has a dip of about 45° northeast from the surface to the adit level; from there steepening to 70 to 80°. The ore in the pipe so far mined has been largely secondary, and there has been considerable enrichment, due to the leaching of ore higher up and re-precipitation of the leached copper. The constitution of the material in the volcanic pipe being a loosely formed agglomerate, has allowed the free passage of solutions and has made possible oxidation at greater depth, due to descending waters, as well as easy passage for the original hot ascending solutions.

When the present company took possession of the property, the shaft below the No. 1 adit-level was full of water, and an attempt was made to unwater this, but without success. Since then, however, the shaft has been drained, probably through the approach of the No. 3 Teniente. Owing to the fact that the shaft was filled to half its depth with débris, the bottom of it has not yet been examined. It is to tap this that the No. 3 Teniente is now being driven, but that adit will also be used to look for ore in the fractured andesite to the east and north of the old workings. A raise of about 300 ft. will be necessary to connect the bottom of the shaft with the No. 3 Teniente.

For extracting the ore a modified caving system is being employed, and in preparing the mine for this work the stopes are started by the overhand method, the stopes remaining filled with broken ore on which the men work. Pillars are left between the stopes and these will afterward be caved or broken out. Previously cross-cuts were driven at distances of about 17 metres, centre to centre, and the centre line of the stope was then fixed over them. These stopes have a width of 9 metres, leaving a pillar of 8 metres between. The major axis of the stope was at right angles to the contact. Where the lens was not very wide, a stope was made, running in the direction of the length of the lens, rather than across it. The ground stands well and breaks well, and no timber is required except where box holes are made.

In the past, ore from No. 2 and No. 3 Teniente was carried down by two separate aerial tramways to the main loading station, from whence it was taken by another aerial tramway to the concentrator. No. 4, 3½, 3, and 2 Fortuna are connected by raises and all ore will be dropped down to the No. 4 level and loaded into cars, and from there transported to the ore-bins supplying No. 5 level, from which it will be carried direct by electric tramway to the concentrator. The Teniente mine will also connect through No. 3 Teniente, No. 1 cross-cut, and No. 4 Fortuna with the main ore-bin in No. 5 Fortuna.

A very careful measurement of the tonnage of ore developed and the value of the same has been made, and the following is a summary, as at July 1, 1911:

	Tons.	Per cent Cu.
Main Fortuna orebody, to 30 metres below No. 3	7,077,986	2.90
Additional ore developed by No. 3½ up to June 30, 1911	2,721,808	2.70
Fortuna No. 4 orebody	212,312	3.58
Teniente No. 3	62,510	2.38
	10,074,616	2.85
		say 2.70

In the past stoping was done mainly by hand, but it is proposed to carry this on by small hammer-drills. Driving is done by air-drills and by hand, but when in full operation, machine-drilling will be almost exclusively em ployed. No hoisting of ore will be necessary, as the orebodies can be more easily reached through adits. Ventilation will also be easy, and there should be no trouble on account of water, as all draining will be done through the different adits. Still greater depths can be reached by longer adits. For instance, an adit about 6000 ft. long driven from a point close to the mill would tap the Fortuna orebody at a depth of between 800 and 900 ft. below No. 4 adit, the deepest ore now developed.

No. 3½, to judge by development already proved on that level and levels above, should open up another two and a half million tons. No. 4 Fortuna has also shown commercial ore below No. 3½, but development has not progressed far enough to allow estimate of grade. It promises well and will add greatly to the tonnage. The grade so far encountered is commercial, though not as high as the average on account of being on the foot-wall side of the orebody. Roughly, about 1,500,000 tons may be considered as partly developed by No. 4, September 1, 1911.

In determining the results, ore running less than 2% copper was excluded. It has been figured that ore even as low as 1.5% will give a profit at 12¼c. copper. The density of the ore was determined and 12 cu. ft. in place was found to be equivalent to one ton in weight.

In determining Fortuna No. 3½, 100 ft. below the level was included. For the No. 4 Fortuna orebody, allowance for a block of ground extending 50 metres above and 15 metres below the present level was made. No ore is considered as developed in No. 1 Teniente. Teniente No. 3 is all 'probable ore.' No allowance is made for any ore in the old portion of the Teniente, although undoubtedly considerable will be recovered from the old workings. Nothing, of course, has been considered in connection with the Soldado, Capitana, Caballeria No. 1 and 2, or Rejimiento.

Careful sampling has been done by the mine management and this has been satisfactorily checked by individual engineers—namely, Harold A. Titcomb, J. A. McCaskell, and Allen H. Rogers. Sampling was done at comparatively short intervals, and these intervals, considering conditions, have proved to be sufficiently close. The ore is so homogeneous in different sections that even a poor sampler would be expected to get approximately the same results as a more expert one, and to this homogeneity of the porphyry ores has been due the close agreement as to assay values by different engineers making an examination of the porphyry properties in the State.

The future 'possibilities' for ore are most promising—first, in the direction of new orebodies, indicated in the several copper-stained outcrops around the periphery of the crater; second, in the very promising ground along the contact, close to the old Teniente workings; third, the most important of all, the continuation of the present developed orebodies, main Fortuna and No. 4 Fortuna, to considerable depth. The belief in this continuation is based, first, on the geological features to which the formation of the orebody is due, namely, the formation of the ores from ascending solutions rising from considerable depths, just after the violent volcanic disturbances; and secondly, to the fact that most of the copper minerals from which the deposits obtain their value are essentially primary, to the extent of their dating back to the original process of silicification and mineralization accompanying igneous activity. The copper minerals occur more as vein fillings than as replacements of original rocks, and are not dependent upon secondary enrichment from downward percolating solutions, which have leached out the copper minerals at higher horizons and redeposited the copper in mineral form, and thereby enriching the poorer primary ores.

It is interesting to note that the ore shown on the second level of the Fortuna is practically of the same assay value as that on the No. 3 level, though the latter is 275 ft. lower than the former; and No. 3½ averages little lower than No. 3, though 328 ft. deeper. Assays for this level so far show an average of 2.56%. No. 4 Fortuna orebody is at a much lower geological horizon, but shows even higher content, due probably more to local conditions than to anything else. The Teniente pipe will probably show a lower content in depth than in the upper portion, where there is considerable secondary enrichment, due to cuprite, metallic copper, and secondary chalcocite. Later development in No. 3½ and No. 4 Fortuna seems to show an extension of the ore toward the east, which will bring in an increased tonnage of lower grade ore. The raise from No. 4 to No. 3½ has shown a considerable area of low grade ore extending beyond the main body.

At the mine, offices, store, quarters for the foreign employees, and for the native workmen, have been erected. The native miners are mostly quartered at the different adits in large rooms, cut out of the country rock, there being no place on which to erect buildings nearby on account of the steep rocky slopes. At the No. 4 level is situated the compressor plant and electric station, operated by power from the Cachapoal power-plant, and here also are the blacksmith and repair shops.

Supplies have been brought to the mine either by wagon or by aerial tramway, and on this latter the ore is carried to the mill. Later, however, transporting will be done by electric trolley line, run from No. 5 adit to the top of the ore-bins at the concentrator, and this trolley line will be connected with the main railway by an incline at the east end of the concentrator. Water for all domestic purposes is obtained from Teniente creek, which is ample for all requirements.

Underground haulage is at present done by means of small cars, either pushed by hand or hauled by horses. Arrangements have been made, however, for electric traction, and electric locomotives and cars are on the ground, and larger electric locomotives are to be employed to transport ore from the No. 5 adit main ore-pockets to the top of the concentrator, over a line about three kilometres long.

Owing to the numerous snowslides, it was naturally felt that a surface line would be dangerous, but after looking over the ground very carefully, it is believed that the proposed line will be better than aerial trams, but snowsheds have been erected to avoid the danger from delays caused not only by slides but by drifting snow.

From a close study of the ore and from experience in the treatment of somewhat similar ore in Nevada and Utah, plans have been made for a concentrator, and the plant is now under construction. It is designed on lines somewhat similar to the Utah and Nevada plants, but with coarser preliminary crushing and with the introduction of jigs to catch the coarse mineral. The plant is designed for crushing with gyratory crushers and rolls, screening by means of shaking-screens; treating the product on roughing and cleaning jigs of the Woodbury type, regrinding the tailing in Chilean mills, classifying the finer sizes, and treating same on Wilfley tables and Frue vanners. The concentrate will be delivered either to the smelter or to the roasting plant, should leaching of the concentrate be decided on.

The coarse-ore bins will have a capacity of about 1400 tons. From the bins the ore will be carried on belts to the crushers, of which there will be two No. 7½ gyratories, two 48-in. rolls, and six rolls of 36-in. diameter by 15-in. face. From the crusher station the ore will be delivered by belts to the fine-ore bins, about 4000 tons capacity, and from these by belts to the mill itself.

The concentration will be done in two separate mills, the first of three units, each unit having a nominal daily capacity of 533 tons. The second concentrator represents an enlargement and re-design of the present concentrator. It will have a nominal daily capacity of 400 tons. These two mills will be brought up to a daily capacity of 3000 tons. The mill has been designed so as to allow for expansion at either end if plant is increased.

All power used will be electric, generated from the Cachapoal ditch and power-plant. The water-supply for operating the concentrating machinery comes from ditches taken from the Coya and Teniente creeks, at an elevation much above the millsite. In the past, flumes supplied water for milling and also for power, but the volume is not sufficient for the increased installation, and hence the necessity for the new power-plant.

It is confidently expected that an extraction in the mill better than 65% will finally be obtained, and this in spite of the fact that the extraction in the old mill was much below that amount, partly due to a less favorable design, to overcrowding of the different machines, to uneven feed, to poor classification, to a variable amount of oxide, carbonates and silicates of copper, and to possibly an attempt to make too clean a concentrate, and by so doing increasing the losses.

The re-designed mill has been put into operation. Of the new three-unit plant, the first unit is finished and almost ready for operation, and the foundations, buildings, etc., for the other two are completed. The coarse-ore bins, the crusher station, all but the erection of a few rolls and one-half the fine-ore bins, are finished. All the material is now on the ground for the completion of the entire plant. While the old mill is supplied with crushing machinery, the main crushing plant will eventually do the entire crushing. The ratio of extraction will be about nine into one. The average analysis of concentrate will be approximately as follows: silica, 24%; alumina, 12%; iron, 19%; CaO, 2%; sulphur, 22%; copper, 16%.

Smelting operations have been carried on to a limited extent and have proved that the concentrate can be easily smelted at a reasonable cost. This smelting was done under most unfavorable conditions, especially as to the size of the furnace and with a furnace of improper design. The old practice should be greatly improved. A plant has been designed, consisting of a blast-furnace, 44 by 180 in. at the tuyeres, with a 7-ft. ore-column, and a Pierce-Smith basic-lined converter for converting matte into blister. The building allows for two blast-furnaces, both of which can be larger than the one mentioned, and also for an additional converter. The smelter power-plant consists of a Nordberg blowing-engine large enough for two converters and a No. 7 and No. 9 Connersville blower for the blast-furnaces.

Experiments made during the past year have proved, with converter slag returned to the blast-furnace, the concentrate to be almost self-fluxing and requiring but little lime as a flux. The alumina in the concentrate is mainly combined with silica in feldspars and acts as a base, making a fusible slag. A briquetting plant is under construction, so that concentrate will be bricked before charging.

The plant is so designed as to make possible a great increase in capacity should it be so desired. Office buildings, assay office, machine-shop, carpenter-shop, hotel, quarters for the officials and married foreigners, and quarters for married natives have been erected. A telephone system has been put in, connecting the offices at Rancagua with the power station, concentrator and smelter, and mines, with local systems at the above-mentioned places. There is also a separate line connecting the power-plant and sub-station, and there will also be a separate line for the railroad.

It has been decided to put in a leaching plant capable of treating the concentrate from one-fifth of the daily tonnage. Numerous experiments on a working scale have been made in America on concentrate from the Braden Copper Co., which have been most successful, and should the same success be obtained in Chile, on a much larger working scale, it is estimated that the cost of production per pound of copper will be very materially reduced.

This leaching plant will consist of one Wedge furnace with acid tower and accessories, three leaching-vats, three settling-vats, nine solution-tanks, and a precipitation-plant of ten tons cathode copper capacity per day, which, should leaching not be carried out, would be used for refining a certain portion of the blister-copper from the blast-furnace. The electric precipitation-plant will probably be increased so as to handle copper either from the blast-furnace or leaching-plant. What makes the method of treating the concentrate by leaching so attractive is that it is believed the costs will be lower and extraction higher, and the basis for the low costs is the low cost of power produced by the water power installation on the Cachapoal.

The estimate of costs is based on what has already been done at the Braden Copper Co.'s mines in a small way during the more or less experimental stage, and on costs obtained at other properties of a similar character—the difference in conditions being, of course, considered. It takes in all disbursements necessary for operations and includes, in addition to all possible expenses in Chile, also New York expenses. Instead of putting in an item of 'general expense', such expenditures are included under the several headings.

In the estimate the following factors are taken as a basis from which to figure:

Average assay, 2.70% copper.
Mill extraction, 65%; smelter, 95%.
Yield of copper per ton of ore, 33.5 pounds.
Average ratio of concentration, 9 into 1.
Average price per pound of copper, 12½ cents.

	Per ton of ore.
Mining	$0.700
Transport to mill	0.100
Milling	0.500
Smelting at $5 per ton concentrate (9 into 1)	0.550
Converting at $8 per ton blister	0.134
Refining at $15 per ton blister	0.251
Freight at $12 per ton blister	0.201
Commission, etc.	0.043
Total	$2.479
Cost per pound copper	$0.074
Profit per pound copper	0.051
Profit per ton of ore	1.708

It is thought that leaching and electrolytic precipitation may reduce the cost per pound of copper by ½ to ¾c., but this will require additions to the plant, which will not, however, be recommended before a thorough working test on a large scale is made on the ground, with a plant for that purpose now in course of erection.

Allowing a production of 3000 tons per day, and 360 working days in the year, the total tonnage treated would amount to 1,080,000 tons. A yield of 33½ lb. of copper per ton of ore at a cost of 7.4c. per pound, and copper at a price of 12½c., would give an annual profit of $1,844,640. For each cent increase in the price of copper there would result an increase in the profit of about 19.6%. Until the bonds are converted into shares the profit to be divided among the shareholders is estimated as follows:

Annual profit as shown above		$1,844,640
Interest on $4,000,000 bonds at 6%	$240,000	
Interest on $3,000,000 bonds at 7%	210,000	
		450,000
Balance to be paid on shares		$1,394,640

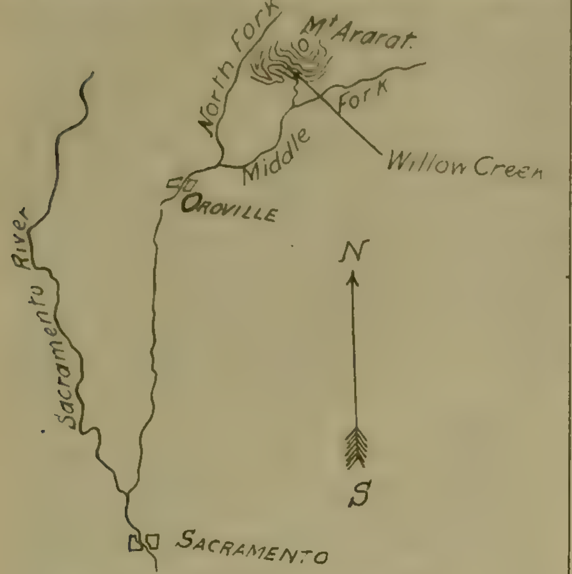
With 1,200,000 shares issued, the profits per share will amount to $1.16, or 23.2% interest on the par value. With all bonds paid off and allowing for an issued capital of 2,800,000 shares, the annual profit per share would be at the rate of $0.658, or on the par value of the stock, 13.1%. These figures allow for depreciation, which would be taken up in the costs, but not for amortization.

FIGURES compiled from official sources tend to support the contention of the United States Steel Corporation that it by no means monopolizes business in steel and iron. For instance, competing with the National Tube Co. are independent companies with a capacity of 939,000 tons. The Steel Corporation's actual output, in 1910, of tube products was 868,000 tons. Competing with the American Sheet & Tin Plate Co. in the manufacture of sheets and tin plates are 45 well known independents with a capacity of 1,286,000 tons, against the Steel Corporation's actual output in 1910 of 1,083,000 tons. Competing with the American Steel & Wire Co. are 17 independents with a capacity of 1,707,500 tons, against the Steel Corporation's actual output, in 1910, of wire rods and wire of 1,624,000 tons.

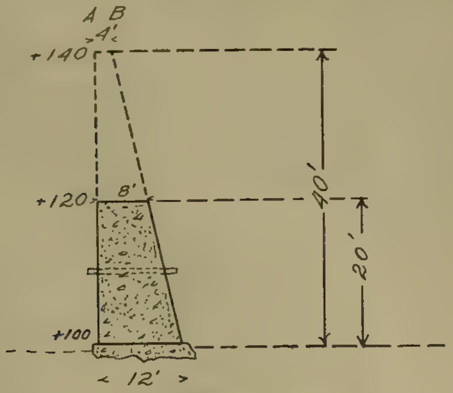
Building the Gold Mountain Dam

By F. A. Post

The concrete dam erected under my superintendence by Gold Mountain Hydraulic Co. on Willow creek, Plumas county, California, was built in compliance with the State law providing that every mining company using the hydraulic process of mining on any of the tributaries of the Sacramento or San Joaquin rivers must provide ample protection of the streams below its place of action against deposits of tailing. The California Débris Commission is the authority to prescribe or to approve the devices for the protection of the streams, and without its sanction no operation by hydraulic methods is allowed. The accompanying sketch map shows the relative position of Willow creek in the Sacramento river basin.



MAP SHOWING POSITION OF DAM.



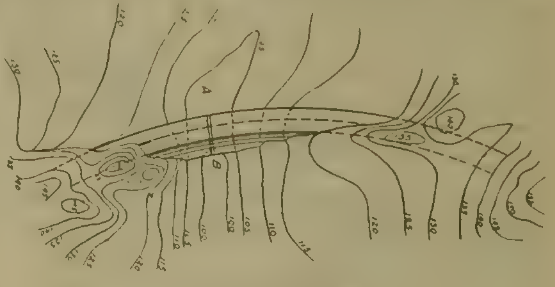
CROSS-SECTION OF DAM.

The situation of the dam, its size, plan, and cross-section were approved by the California Débris Commission in October, 1910. The elevation of the site is 5000 ft. above sea-level. The early snow and frost of the past autumn obliged the company to postpone construction till this year. The work could not be started before August, because the snow along the mountain road leading to the place thawed only in June, and during July the manager of the company was engaged with negotiations with contractors and settling with workmen. Thus the work was begun early in August.

The dam in plan is a circular arch, whose up-stream face is described by a 160 ft. radius. Its total height is 40 ft., but it was decided by the Débris Commission to require at first the immediate erection of the part of the dam up to the height of 20 ft., provided that the company in course of time and in accordance with the real amount of deposits, will gradually raise the dam to the height of 40 ft. The up-stream face of the dam is vertical, the down-stream one having 1:5 slope. The thickness of the crest of the dam is 4 ft. at the elevation of 40 ft.; thus its thickness at the bottom equals 12 ft. The amount of débris which can be stored behind the dam was figured as follows:

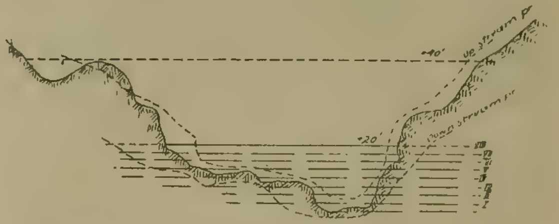
Height of dam, ft.	Capacity of reservoir, cu. yd.
20	35,000
25	95,000
30	130,000
35	300,000
40	440,000

Taking into consideration the fact that with the company's outfit it is possible to wash no more than 1000 cu. yd. per day, that only 25% of washed ground can be brought to the reservoir as a sediment, and that only during approximately 100 working days can the hydraulic process be used in this district, it can be figured that the dam has ample provision for débris, from $\frac{35{,}000}{1000 \times 0.25 \times 100} = 1\frac{1}{2}$ years, to $\frac{440{,}000}{1000 \times 0.25 \times 100} = 17\frac{1}{2}$ years; or in round figures from 2 to 20 years to come. According to the specifications, the dam should be erected of concrete, of the proportion 1:3:6, adding to that mixture during the process of construction not over 25% of hand rock. The required materials and the workmanship must be of first-class quality.



PLAN OF DAM-SITE.

It was August 10 when I arrived at the damsite. Part of the cement (in the neighborhood of 400 sacks) was already delivered. The concrete mixer and other tools had to be delivered next afternoon. The first step, the exact location and staking of the proposed dam, was made on the same day, with the assistance of a concrete-man and two carpenters. The place for building was rough and covered with numerous boulders of different sizes. Some of these boulders were more than 8 ft. diam. The ordinary method of staking would not be proper here; we were obliged to stretch a wire across the creek at an elevation of 30 ft. or so. The projection of this wire was taken as an axis of coördinates, and the perpendicular to that axis at the point of intersection with the bottom of the creek was taken as another coördinate axis. From these axes, by means of



CROSS-SECTION OF DAM-SITE.

two plumb-bobs, we could project on the ground any chords or middle ordinate of the arch of the given radius. After a few trials it was found that the best direction of the axis of the dam was about S.40°E. With this direction and at an elevation of 20 ft. the dam strikes two solid cliffs of diorite, about 70 ft. apart. The solid rock foundation was found close to the surface under the footing of the dam.

The clearing of the site from boulders, bushes, and dirt was commenced immediately after locating the dam. Shovels and axes were used to remove the dirt and bushes; picks and giant powder were used to dispose of the boulders and weathered portions of rock. By these means the footing for the foundation of the dam and for the abutments of the skewbacks of its arched parts were prepared. During the same day the question as to gravel and sand was decided. There was found above an old crib dam, which is situated 200 ft. upstream from the place of construction, a layer of mine tailing, about 3 ft. thick, over 100 ft. long, and about 50 ft. wide. This layer represented a good mixture of small stones, gravel, and sand, with about 10% of impurities; the main impurity was a fine red clay. The proportion of gravel and sand was nearly the same as required by the specifications. The flowing water of a spring running through the place made the work of washing the mixture very convenient. The first lot of cement, like all cement delivered afterward, had the brand of the Mount Diablo Co. The cement was delivered in good condition, without lumps or any impurities, of good uniform color, and finely ground. The rough test with cakes made of that cement had indicated no faults whatever in the samples taken from each lot of 100 sacks. During the first day and part of the following one a tent for twenty men, a kitchen, and a storeroom for instruments and materials were erected.

The next day, August 11, the concrete mixer, with gasoline motor, was brought to the place of construction. The arrangement of the concrete plant, the providing of the continuous water-supply, and preparation of the footing for the dam foundation occupied the whole of that day. The plant was placed 80 ft. upstream from the dam. A terrace 15 ft. above the foundation of the dam was dug in a convenient place on the west side of the canyon. It was first planned to dig out the terrace for the plant a little higher, thus allowing the delivery of the concrete mixture from the plant to the work with more ease and without the necessity of raising the scaffolding during the work; but that idea was soon abandoned. The rough leveling of the canyon above the dam had shown that the head of the spring, 600 ft. distant, was just enough to bring the water to the plant at the selected spot. The spring water was piped 600 ft. to the plant by means of steel-riveted pipes, partly laid on the ground and partly supported on light trestles made of 2-in. boards. None of the trestles was higher than 10 ft., most of them being from 2 to 4 ft. high. At the upper end of the pipe a kind of earthen diversion dam about 3 ft. high was built to force the water into the pipe, and a tappoon made from 1-in. boards was placed here. It served as a regulating gate. Another piece of board, supported by two short scantlings embedded in the body of the earthen dam, served as a waste gate. This last gate was used with success several times, and saved the earthen crest from scouring by overflowing water.

The mixer, with gasoline motor, weighed over 5000 lb., and it was not an easy task to handle it on the mountain road. It was delivered from Sacramento by the Western Pacific railroad to Quincy (the county-seat), and thence to Gold Mountain, twenty miles distant. To make this last delivery a 6-horse team was employed for two days. The capacity of the machine, with attached 6-hp. motor, was about 50 cu. yd. per day. In reality the highest output of the machine during the work never surpassed 35 cu. yd. per day. The strength of the motor allowed the mixing of no more than three wheelbarrows of concrete material at a time; that is, about 8 cubic feet.

Before the beginning of the cement work a full-sized pattern of the cross-section of the dam was prepared, and the templet for laying the curve of 160-ft. radius was cut from a 1-in. board. The length of the pattern was of 21-ft. chord, with middle ordinate of 4 in. The studs in the forms and scaffolding were made of 3 by 4-in. lumber, the sheathing of 1-in. boards, and the platform and the trestle floor of 2-in. boards. To divert the stream water, which passed along the bed of the creek, a 15-in. pipe was put on the bottom of the dam footing. This pipe, according to the project, had had another purpose, namely, to serve as a safety sluice during all the time of construction. It had to be blocked only after the final setting of the dam. The hand-rock was provided partly during the preliminary work of clearing the place, partly by blowing up the cliffs on the adjacent slopes of the creek; if, after the explosion, the blocks of stone were still too big for handling, they were broken by sledge-hammer and drill, or blasted up again by giant powder.

As stated before, the surface water was completely diverted from the foundation by a 15-in. pipe. But soon it was discovered that water was coming from several cracks in the rock, and that it was impossible, with the implements at hand, to dispose of the water unless the ground-springs were stopped. The bedrock prepared for the dam footing was so rough and irregular that the construction of the form could not be started conveniently. Therefore it was decided to fill all underwater cracks and cavities with rich cement mortar, and to level the bottom by putting on a layer of cement about one foot thick. All lumber for that work was cut on the premises of the company, and sawed by the company's sawmill, one mile from the dam. The running expenses of this small sawmill were so high that the lumber used for the dam cost $15 per 1000 feet.

On August 12 the concrete work was begun, by putting on the layer of concrete, which was designed to stop the bottom springs, to make a good connection between bedrock and dam, and to raise the level of the bottom just enough to start the erection of the form. The first five sacks of cement were used, for the preparation of a rich concrete mortar, 1:2; the next ten, 1:4; and the last fifteen, 1:6. All these mixtures were put dry one after another, and evenly spread in the standing water covering the bedrock from several inches to a foot and a half deep. Only with the last portions of the mortar were a few cubic feet of hand-stone thrown in the wall. This work was accomplished in three hours in the forenoon. Altogether there were placed 175 cu. ft. of concrete, and the top of the work reached the 7-in. mark above the datum. In the afternoon carpenters started the erection of the forms, while all concrete-men were set to work on the construction of the water-line. Beginning with August 13, the concrete work was going every day, Sunday included; and on August 22, twelve days from the beginning, the work was finished. Work was usually begun at 7 a.m. and lasted up to 5 p.m., except one hour for dinner. Thus the length of a working day was 9 hours.

Very often the concreting was stopped for half an hour or so by some kind of fault in the gasoline motor; two or three times by some defect in water piping, and twice for a couple of hours by the necessity of raising the 75-ft. unloading-platform which was supported by the trestles. In general, the order of the work was as follows: 3 men were digging the gravel and loading it on wagons; 2 four-horse teams carried this gravel to the platform, where washing and mixing were operated by 3 men, who also loaded the washed sand on wheelbarrows, and unloaded from the wheelbarrows to the receiver of the mixing machine; 4 men carried the prepared concrete and placed it in the form; 2 men were busy with procuring the hand-stone and with bringing it to the work; 1 man was always with a shovel on top of the concrete wall, spreading the concrete and placing the stones in the best possible manner; one machinist attended to the work of the mixer and gasoline motor; 2 carpenters worked on the preparation of the forms and raising the trestles. Thus 16 men and 2 four-horse teams were employed on the work. Besides that, 2 men were working at the sawmill and 2 four-horse teams were delivering the cement from Quincy. One Japanese cook was hired to board the men. The cost of the work of these 5 men and 2 teams was included in delivery and boarding expenses.

The loading, unloading, and washing of the gravel was done with ordinary miners' shovels, having pointed ends and long handle. Picks, axes, bars, drills, and sledge-hammers were used for the cleaning of the ground and breaking the stones. As to the water supply, it was carried to the platform by steel riveted pipes, 7 in. diam. These pipes were made of No. 14 sheet iron, their length 16 ft each. The pipe line was carried by inserting the taper of one pipe about 5 in. deep into the butt of another by heavy strokes of a maul. The wheelbarrows used for measurement and for hauling the gravel from the platform to the mixer had a capacity of $2\frac{2}{3}$ cu. ft. each. Usually one sack of cement (the volume of the loose cement in one sack being 1.15 cu. ft.) was mixed with three wheelbarrows of sand-gravel mixture. The proportion of concrete mixture was $\frac{1.15}{3 \cdot 8} = 1:7$. This proportion corresponds quite closely to the proportion required by the specifications, namely, one part of cement, three parts of sand, and six parts of gravel. The experiment made with sieved sand and screened cement showed that 3 cu. ft. of sand and 6 cu. ft. of gravel, being thoroughly mixed, had the volume of a little more than $6\frac{3}{4}$ cu. ft. The wheelbarrows in which the mixed concrete was hauled were of a different type, and their capacity was 2 cubic feet.

During eleven days 8601 cu. ft., or 319 cu. yd., of concrete work was laid. That is, 29 yd. per day in average, including 23% of hand-stone.

The cost data from which the following estimate has been computed, were procured from Mr. Fagg, the manager for the Gold Mountain Company.

Lumber for forms, scaffolding, platform, kitchen, and storehouse, 12,000 bd. ft., at $15 per M, total, $180.

The sand and gravel mixture was included in the cost of labor.

Cement, 984 sacks, at $2 per sack (including delivery), $1968.

Three steel pipes imbedded in the body of the dam; one 15 in., 17 ft. long, at $15; two 9 in. (by 17 ft. long) 34 ft., at $18.

Six hundred feet of 7-in. pipe was taken temporarily from other work and has to be returned. The cost of its delivery was included in the cost of labor.

Bolts, nails, and wire fastening the forms, and for other work, $15.

Total cost of materials, $2196.

The cost of one sack of cement, as shown in the table, is extremely high, because it includes railroad transportation from Sacramento to Quincy, and twenty miles of hauling from Quincy to the Gold Mountain mine. The hauling of 40 sacks of cement from Quincy required a four-horse team, and a team cannot make the trip from Quincy to the mine in less than three days. The cost of a four-horse team is $12.50 per day; therefore the delivery of 40 sacks cost $37.50, or nearly $1 per sack.

THE COST OF LABOR

Two 4-horse teams, $12.50 per day, 12 days	$300
Lease of mixer, $10 per day, 12 days	120
Delivery of mixer and return to Sacramento on the Western Pacific railroad	60
One 6-horse team, from Quincy to gold mine and return, $15 per day, 4 days	60
Machinist, $6 per day, 12 days	72
15 men (cement-men and carpenters), $2.50 per day, 12 days	450
The boarding of 20 men, $1 per day, for 12 days	240
Total cost of labor	$1,302
Total cost of materials and labor	3,398

The total volume of the concrete work placed in the wall was 8601 cu. ft., or 318 cu. yd. Therefore, the average cost of construction was $10.70 per cubic yard.

THE world's production of lead in 1910 was 1,211,411 short tons, and the consumption 1,196,842 tons.

With the Engineers in Japan

On the morning of November 11 the party arrived at Moji and soon reached the Imperial Steel Works at Yawata. The works were gaily decorated, and tea, with light refreshments, was served to the women at the company office while the men went through the plant. This was built about ten years ago along German lines, though an excellent American rolling mill has since been added. The story of the works was told in the *Mining and Scientific Press* of February 18, 1911. It will be sufficient here to note a few of the more striking features. The output is not large, there being only blast furnaces, each with an average capacity of 150 tons of pig per day and a maximum of 200. An additional stack is now being built. Both bessemer and open hearth steel is made, as are plates, wire, bars, rails, structural steel, projectiles, and a wide variety of products. The problem of steel-making in Japan is not unlike that on the Pacific Coast; there is a demand for many different things, but not enough of any one is used to keep a large plant busy. In 1910 the total steel manufactured in Japan, with over 46,000,000 population, was 79,676 metric tons. In addition, 425,758 tons was imported. Private works in Hokkaido, operated by English and Japanese in partnership, and the Sumitomo works at Osaka, furnish local competition to the Imperial Works in certain lines. The latter, however, must make an effort to satisfy, as far as possible, all the national needs in other lines. As a result the plant is unusually complex. There are a great many small plants in the works, and the visitor can see at the same time an unusually large number of distinct processes under way. This makes for interest, but increases cost. The ore used comes from China, Korea, and Japan in about the proportions of 50 to 40 to 10. The Chinese ore is from the Ta-yeh mines, near Hankow, and is of high grade, analyzing up to 64% Fe. The Korean ore is lower, 52 to 54%, and the local ore still leaner. Some 50 to 52% ore is brought from Hokkaido. The coke is made at the works in Semet-Solvay ovens, the coal being 20% Miike, and 80% local washed coal. The Miike coal is strongly coking, the local coal is not, but the mixture gives a satisfactory product at reasonable cost. About 1000 tons of coal per day is used to produce 600 tons of coke. The ratio of pig to coke is 1 to 1.2. As the flux used is magnesian, the slag is not available for making cement, but instead is granulated and made into building brick. In general, the works are well kept and well run. The furnaces and convertors are not driven as fast as is usual in the United States and have therefore a relatively low capacity. The rolling mill, however, was being operated and the quality of the products throughout is excellent. The works were able to show a profit for the first time in 1910, when there was a surplus of $50,000. It should be remembered, though, that the loss on manufacturing in other years was more than balanced by the lower price of steel products, besides which the works accomplish the main purpose, that of giving the Empire an independent source of supply. The works are under the direction of Lieutenant General Baron Yujiro Nakamura, assisted by a large staff of engineers.

THE AMERICAN ENGINEERS IN JAPAN ACCORDING TO W. L. SAUNDERS.

Following the inspection of the plant the local committee visited the steamer, and healths and felicitations were exchanged.

At Moji the party broke up temporarily into smaller sections, a few going to the south of Kyushu to visit the Hasami gold mine, others to see the Miike collieries, and still others to visit points of interest along the line from Shimonoseki to Tokyo. It was at Moji that news was received to the effect that R. W. Raymond and George F. Kunz were among those decorated by the Emperor on the occasion of his birthday. This naturally gave much satisfaction, and the event was duly celebrated.

The Hasami mine is one of the gold mines of Japan that enjoys the benefit of a modern plant. There are 100 Allis-Chalmers 1050-lb. stamps, of which 20 had just been added at the time of the visit. The crushed ore is classified into sand and slime and treated in vats, using Dorr thickeners, a Butters filter, and precipitation in zinc-boxes. The plant is designed to handle 500 tons per day, and the ore is said to assay $7 to $10, the value contained being mainly gold, though there is a little silver. The ore is a breccia in veins crossing Tertiary sediments, and related to intrusives of which some fragments appear in the breccia. There are several veins, of which the one mainly worked will average perhaps 22 ft. wide. At 500 ft. in depth, sulphides become abundant, but it is reported that this does not influence the recovery. The ore-shoot is long and there is seemingly a large tonnage available. One of the difficulties met in operation is the inadequacy of the dumping room, since below the mine are valuable ricefields. Waste must therefore be hauled away by an aerial tram. The mine seems to offer possibilities for large production.

The Miike colliery, which belongs to the Mitsui family, was among the most interesting plants visited by any members of the party. The wealth of detailed information available precludes any adequate condensation, and a description must be postponed for a later special article. The visit will ever remain in memory as one of the pleasantest and most instructive made in Japan.

Moji, where the main party remained, ranks now as the most important coaling station in the Far East. The average yearly export of coal is from three to four million tons. Fifteen years ago the place was a sleepy little seaside village, but development of the important Chiku-Ho coalfield, and the making of the port the northern terminus of the Kyushu railway, has changed all this. With cheap fuel, abundant rail and water transportation, Moji is becoming the centre of an important manufacturing and shipping district. Sugar refineries, portland cement mills, and other plants line the shore of the straits, across which at Shimonoseki may be seen the tea house within which Prince Ito and Li Hung Chang signed the treaty that closed the Sino-Japanese war, and within sound of which the battle of the Japan Sea was fought. The visiting engineers and their ladies were entertained here at dinner in the evening by the Chiku-Ho Coal Miners' Association. The city, which is an important coal-shipping port, had been elaborately decorated for the visit of the Emperor on his way to the autumn maneuvers, and was most beautiful. The dinner was no less satisfactory from any point of view. The address of welcome, delivered by Takichi Aso, president of the Association, is given below. In its tone of friendliness it is characteristic of those delivered wherever the party stopped:

"Ladies and Gentlemen: As president of the Chiku-Ho Coal Mining Association, I thank you sincerely for your kind presence here today. We are highly gratified by your extending your visit to this part of the country. I am sure you will not regret it, for we may assure you without offending our sense of modesty, that northern Kyushu is not behind any other part of the Empire in its industrial progress, and occupies a unique position in regard to coal mining.

"The development of the coal mining industry in northern Kyushu is, indeed, remarkable. In 1886 the whole output of coal did not much exceed three hundred thousand tons, but by 1910 the amount leaped up to the respectable figure of over eight million tons; in other words, an increase of 275% in twenty-five years. Northern Kyushu contributes more than half of the whole production of coal in Japan. Northern Kyushu's pre-eminence as coal producing centre is, indeed, such, that Moji and Wakamatsu are now the premier coal markets of the whole Far East.

"I do not mention these facts in any spirit of local self-glorification. I do so, because our guests hail from that great country which, more than any other Occidental State, has laid us under lasting obligation in connection with the development of our coal-mining industry. It is from the United States, especially from your Institute, that we have received most inspiration and help in the improvement of the method of mining.

"It, therefore, affords us particular pleasure and satisfaction to welcome you, the members of the American Institute of Mining Engineers and their friends. We wish to take this opportunity of thanking you and through you the coal-mining concerns and experts of America for all the suggestions and assistance that have been so freely given us.

"I propose the health of our distinguished guests."

From Moji the engineers went by special train to Kobe, arriving Sunday afternoon. Monday morning was spent seeing the famous castle and other points of interest at Osaka, 'The Chicago of Japan,' followed by an elaborate luncheon tendered by Baron Fujita, head of the great firm that owns, among others, the Kosaka copper mine. It was a matter of much regret that this interesting property, where open-cut as well as underground work is carried on, and where one of the furnaces is 64½ ft. long, could not be visited because of the distance. A few of the engineers remained, after the main party left for San Francisco, in order to see it. At Osaka, among other souvenirs, each member of the party was given a beautiful silver medal struck at the Imperial Mint in commemoration of the visit. In the afternoon the whole party rendezvoused at Suma, the country villa of Baron Sumitomo, head of the firm owning the Besshi and other mines. The broad lawn had been decorated, and, following an exhibition of native methods of fishing in the Inland Sea, on which the garden faces, an elaborate tea was served. Baron Sumitomo expressed his pleasure in welcoming the guests, and asked them to consider the hospitality that had been offered the engineers as but a slight token of the deep appreciation felt by all Japanese of the courtesies that had been extended to visiting Japanese engineers and students in America. He hoped that the same friendly coöperation would continue to prevail. R. W. Hunt replied in one of the brief happy speeches with which he responded so frequently on behalf of the party throughout the trip. After spending the night at Kobe the engineers resumed their journey the next day, reaching Tokyo late in the evening.

Wednesday, November 15, was spent in the capital city, there being numerous private lunching and shopping parties. In the afternoon the guests were taken to a garden party given by the Empress at the East Palace. In their autumn dress the maples of this garden gave a rarely beautiful setting for the royal chrysanthemums, to which the Empress and her suite came for their annual view. After the garden party the engineers were received by the Tokyo Chamber of Commerce, where an elaborate tea was served following an unusually interesting series of addresses. It may be noted in passing that in Japan the Chamber of Commerce is a State institution and its directors are elected by the taxpayers. Incidentally, and characteristic of the unexpectedness of things in Japan, women vote in these elections.

In the evening there was an elaborate theatre party and dinner tendered by Baron Iwasaki of the Mitsu Bishi Co., Baron Mitsui, and Mr. Toranosuke Furukawa. The entire Imperial theatre had been taken for the evening, and visitors' money was worthless at the bar, café, and even the souvenir stands. Three short plays were presented, two classical and one modern. It speaks volumes for the skill of the actors that plays written before Shakespeare died and presented in Japanese, were by their art made to appeal to the Westerners. Certain of the comedy scenes, however, required no interpreter, since, fortunately, "one can play in any language."

Thursday the party went to Nikko, the famed beauty spot about 100 miles from Tokyo. Nikko is at the same time the site of the copper refinery of the Furukawa company, which operates the Ashio mine. This mine was described in the *Mining and Scientific Press*, October 14, by T. T. Read, and no redescription will be attempted here. Certain special features will be discussed in a later article. It may be noted, however, that here, as at Shisaka, Miike, and elsewhere, the visitors found much of technical as well as human interest, and were impressed with the fact that whatever may have been true in the past, Japanese mining engineers have long passed the period of adaptation and are now busy inventing. It was at the Ashio that M. Otagawa, wishing to use a copper converter and having as a guide only the halftone reproduction of a view of the outside of one, proceeded to re-invent and build it. An excellent converter was the result. To that has now been added the Kojima double-settling cone, the Asano method of neutralizing not only the SO_2 but the SO_3 in smelter fume, the Watanabe-Asano method of preventing freezing in blast-furnaces by feeding coal through the tuyeres, the S. Watanabe briquetting machine, an improved casting machine, and a number of other useful devices and methods which caused the visitors to fill their notebooks and ask for blueprints, all of which were freely given. At the refinery a bridge built of copper bars, one day's work, had been erected over a copper-sulphate river, and in a nearby tent an elaborate luncheon was provided. The Furukawa company makes about 1000 tons of copper wire per month, for which purpose 600 tons of copper is produced from its own mines, mainly at Ashio. At the latter, visited by one section of the party, the main street had been decorated with lanterns and flowers for a mile or more, and fireworks announced the coming of the guests. At the company clubhouse in the evening a dinner and an especially enjoyable geisha dance was tendered by the general manager, K. Inouye, and his staff. Saturday morning was spent visiting the mine and mill, while Sunday and Monday were passed at Kamakura, Miyanoshita, Tokyo, and Yokohama by various sections of the party. Tuesday all the members came together at Yokohama and gave a farewell luncheon "to their Japanese friends." Responding to the toast to the Emperor, Baron Shibusawa expressed pleasure at the visit of the engineers and the hope that they had found in the natural beauty of the country, the many things that had been developed in the last half century, and the sincerity of the Japanese welcome, some recompense for the voyage. He insisted that the occasional rumors of war had no basis in the sentiment of the Japanese people, whose feeling for America was rather one of gratitude. Lasting friendships between nations, he said, must rest on personal friendships between individual citizens of the nations, and he was glad to feel that between those present and themselves there was complete understanding. He hoped that the visitors would communicate this to their friends at home and that closer business ties between the two countries might result. Response was made to the toast to the President by Charles Page Bryan, the newly accredited American Ambassador. Following him, J. W. Richards, vice-president of the Institute, spoke, after which W. Watanabe, director of the Engineering College of the Imperial University of Tokyo, referred approvingly to the 'open-door policy' that Japanese mining engineers had always met in America, especially commending James Douglas and R. W. Raymond for their help to foreigners. He regretted that he had been unable to accompany the party through Japan, and wished the visitors *bon voyage*. Kahe Otani, the president of the Yokohama Chamber of Commerce, Thomas Sammons, the American Consul General, and R. W. Raymond followed in turn. As Dr. Raymond's address marked the close of the excursion to Japan, it is given in full below:

"I count it a great privilege to speak for my sisters and brothers of the visiting party of the American Institute of Mining Engineers this final parting word

"You have entertained us in a manner far surpassing our utmost expectations. The abundance of your courtesy has been excelled only by its exquisite grace and artistic ingenuity. At every step you have surprised as well as delighted us. We looked upon you before with admiration and respect; but our admiration has become astonishment, and our respect, personal affection.

"I must be permitted to make special acknowledgment of the favors shown to me during my stay in Tokyo, and particularly of the great honor of the Decoration of the Rising Sun bestowed upon me by His Majesty the Emperor of Japan, and of my presentation to Her Gracious Majesty, the Empress. These high distinctions were accorded to me, as the official notification declares, in recognition of my services to the mining industry of Japan. I will not, in excess of modesty, deny that I have been able, during the last twenty-five or thirty years, to give to Japanese students and engineers in the United States, important help. But my individual services would have had little value, had they not been reinforced by members of the Institute, who cordially responded to my letters of introduction with the open door of knowledge and the open hand of fraternal aid. I wear my honors, therefore, as their representative.

"We wish we could present to you, at this hour, some worthy symbol of our appreciation of all that you have done for us. You have laid upon us the obligation of debt which can never be repaid -which can never be forgotten; and the token of this obligation now offered is only a token.

"The specimen of native, crystallized American gold is a small thing; yet it is, like your reception of us, unique, and therefore priceless. Let it indicate our recognition of the native gold of your generous hearts, which has crystallized for us in forms of delicate beauty and enduring strength.

"I have carried it in my pocket over sea and land 'for luck', but the unbroken good fortune which we have experienced here came from no amulet; and we need no such charm to protect us on our homeward way from disaster or disappointment. We shall be guarded by the memory of a happy dream—no, not a dream, but a real sojourn in Paradise.

"I deliver this token to the Japanese Reception Committee, requesting them to place it in the collection of the Imperial University of Tokyo, with this label: 'Presented by Dr. R. W. Raymond, Secretary Emeritus of the American Institute of Mining Engineers, in recognition of the generous and graceful courtesy extended to the visiting party of members and guests of the Institute through the Empire of Japan.'"

[Thanks by W. Watanabe, after which Dr. Raymond resumed.]

"And now comes the hardest part of all!

"My knowledge of the Japanese tongue has been confined to two words, 'O-hio', for friendly greeting, and 'Banzai', for enthusiastic praise. It is needless to say that these two words have been on my lips and in my heart continually since I landed on these shores. But today I have had to learn another—'Saionara', for farewell—the sad sweet melody of which lingers like the deep tone of a temple bell.

"Saionara! Dear old friends, and new that shall be old!
Saionara, fair Nippon!
O Land of ancient story, long concealed,
In this new age to wondering eyes revealed:
O Land of youth renewed, and flag unfurled,
To greet the banners of a friendly world;
O Land of heroes, strong to do or die,
Yet stronger still for peaceful victory;
O Land of templed hills and shadowy bowers,
Of fruitful fields, and gardens gay with flowers,
Give us thy love, as we have given ours!
Saionara!"

Revised Atomic Weights

The International Committee on Atomic Weights has issued its annual report on the atomic weights to be used in 1912. The committee has investigated researches that have been made on the atomic weights of nitrogen, sulphur, chlorine, iodine, sodium, calcium, mercury, vanadium, tantalum, tellurium, iron, uranium, scandium, neodymium, erbium, argon, and niton, the last previously known as radium emanation. Many of the researches simply confirm existing atomic weights. In the cases of calcium, mercury, vanadium, tantalum, iron, and erbium the researches have been so positive that the committee has deemed it advisable to make changes, which, however, except in the cases of mercury and vanadium, are only slight.

The changes that have been made are based on the following researches. Calcium. From analyses of the chloride and bromide (*Jour. Amer. Chem. Soc.*, 32: 1577, 1910 and 33: 28, 1911), Richards and Honigschmid obtained the figures 40.07 and 40.074, respectively. The figure 40.07 has been adopted. Iron. From analysis of ferrous bromide (*Jour. Amer. Chem. Soc.*, 33: 319, 1911), Baxter, Thorvaldson, and Cobb obtained the figure 55.838, while Baxter and Thorvaldson (the same, p. 337), starting from meteoric iron, found the value to be 55.836. The figure 55.84 has been adopted. Mercury. As suggested as likely in the review of last year's report, Eastley, from further researches on the analysis of chloride (*Jour. Amer. Chem. Soc.*, 32:1117, 1910), confirms his previous conclusion that the atomic weight of mercury was altogether too low. He finds that it should be 200.63, instead of the old figure, 200. The committee has adopted the value 200.6. Vanadium. By heating sodium vanadate in a stream of hydrochloric-acid gas and converting the sodium into chloride (*Jour. Amer. Chem. Soc.*, 32: 1603, 1910), McAdam obtained 51 as the atomic weight of vanadium. This figure has been adopted. Tantalum. By hydrolysis of the penta chloride (*Jour. Amer. Chem. Soc.*, 32: 1127, 1910). Balke has determined the ratio $2TaCl_5 : Ta_2O_5$ and obtained the figure 181.52 as the atomic weight of tantalum. The rounded-off value of 181.5 has been adopted. Erbium. From analysis and synthesis of the sulphate of neoerbium (*Berichte*, 43: 2635, 1910) Hoffmann obtained the figure 167.68 as the atomic weight of erbium. The value of 167.7 has been adopted. Niton. By the aid of a microbalance (*Proc. Roy. Soc.*, A, 84: 536, 1910), Gray and Ramsay have determined the density of the emanation from radium, which they have named niton. Niton, with an atomic value of 222.4, is the only new element to find a place in the table this year.

To recapitulate, then, the new atomic weights adopted by the International Committee are: calcium, 40.07; erbium, 167.7; iron, 55.84; mercury, 200.6; niton, 222.4; tantalum, 181.5; and vanadium, 51.0.

An Improved Rail Clamp for Holding Steam-Shovels in Position

A new rail clamp invented by W. H. Bates, superintendent of steam-shovel repairs at Panama, is described in *The Canal Record*. After a six months' trial, 350 of these clamps have been put in service on the canal work. The function of this clamp is to act as a stop when a shovel is moving forward, to prevent its running off the end of the track; also to 'block' the truck wheels securely in place when the shovel is working.

The clamp used heretofore was attached to the rail by means of a key driven under the base of the rail, consequently it was necessary to place the clamp between ties. When the track is in mud and water up to the rails, the annoyance and delay incident to attaching the clamp are considerable; furthermore, the ties often interfere with placing the clamp where desired. The new clamp is fastened to the rail by means of a tapered key of steel passing crosswise over the rail and thus permits the clamp to be set directly over a tie, or any place desired. The key being above the rail, avoids the mud and water. The principle on which the clamp works is similar to that of a pair of ice tongs. It consists of two steel castings which form the hooks and body, as well as a convenient handle. These castings are fastened together by means of a heavy rivet which acts as a hinge-pin. The hooks bear on the under side of the rail-head when the wedge is driven above the rail, and below the hinge-pin; thus giving a secure grip on the rail. The cost of the new clamp is considerably less than that of the old style.

Mining in Panama

The mining regions of Panama so far developed are in the provinces of Darien and Veraguas, the development to date being mainly in the former province. Thirteen new claims were denounced in 1910 throughout the Republic. There is urgent need of revision of the mining laws, which permit the denouncement of claims under conditions which do not insure their working. Either a tax should be put on such property sufficient to prevent its being held for purely speculative purposes, or some requirement as to an amount of work or investment necessary to hold the title should be adopted. Of 125 mines held under valid concessions granted since the year 1904, very few are being worked on any scale, and some 40 have been abandoned altogether.

The Darien Gold Mining Co. employs about 400 natives and some 20 white foremen, superintendents, and skilled laborers. In this district is the San Antonio gold mine, near the banks of the river Congo, an affluent of the river Tuira, and the forest in that locality abounds with mahogany, cocobolo, cedar, and many other woods.

A company recently formed under the laws of Arizona, with capital of $3,000,000, is to operate gold and copper properties in the province of Los Santos, owning eight gold and three copper mines in the district of Las Minas, covering an area of some 4000 acres. Machinery has been purchased and shipped for a mill to treat 25 tons of ore per day. One of the mines, El Gallo, has gold ore estimated at 200,000 tons, running from $2.50 to $4.13 per ton. The copper mines, which are to receive preferential attention, show ore running from 7½ to 30% copper, 7 oz. silver, and $3 to $6 gold per ton. J. Gabriel Duque, managing director of the Panama *Star and Herald*, is president of the company, with other well known names figuring on the board.

On the river Marroquin, in the province of Los Santos, and in the vicinity of the Miopos mountains, there is a gold mine which has not been worked for a long time. Near the headwaters of the Rio Cocle, in the province of the same name, there is a mine called Santa Catalina, which, judging from the implements and tools left, must have been worked by the Spaniards, and the mineral now taken out assays well.

Many gold mines were formerly worked along the mountain range in the vicinity of the Cocle, Belen, and Indian rivers, in the Cocle province, the most noted being the San Antonio mine, which once had an output of about $40,000 gold, but all were abandoned before the advent of modern machinery, because of the high cost of working.

The mines and gold croppings within the territory of the Isthmus have always enjoyed renown, owing to their richness, and the first Spanish settlers called this territory Castillo de Oro (Gold Castle). The Cana mines were also called Potosí to qualify the abundance and richness of the gold ores taken out. After being abandoned for many years, the mines of Cana are now worked by an English company, which reopened the road to the mines and for upward of twenty years these mines have yielded a fair output from their rich lodes.—*Peru Today.*

San Francisco imported $199,001 and exported $4,796,550 gold coin and bullion, and imported $135,299 and exported $794,912 silver coin and bullion in seven months of this year.

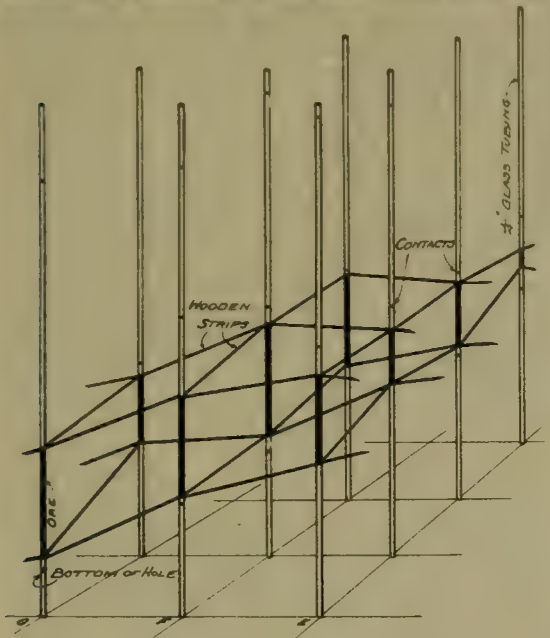
The National Railways of Mexico have recently borrowed through New York bankers $13,000,000 with which to retire an old London loan and to build new mileage.

A Satisfactory Mine Model

By W. St. J. Miller

The following description of a mine model constructed by the engineering department of the Live Oak mine, Miami, Arizona, after several attempts to design and construct the most satisfactory model showing the shape and extent of an orebody developed by churn-drilling, may be of interest. First of all it must be understood that this is not a working mine model, but is made from data obtained by churn-drilling only. The drill-holes were put down at the intersection of coordinates 200 ft. apart, there being some 86 holes drilled and in process of drilling at present.

A map of the property, showing claims and underground workings, was mounted on a table made with a top 2¾ in. thick, resting securely on trestles, and 1¼ in. holes, 1 in. deep, were drilled at every drill-hole location. To insure the verticality of these holes a block of wood about 4 in. each way was nailed to a flat base-plate about a foot long with a ¼-in. hole down the centre to guide the bit. The drill-holes are represented by ¼-in. specially selected glass tubing 30 in. long. The elevations at top and bottom of the holes and at the contacts are marked with a black ring, and the geological formations passed through painted in various colors. Tube oil-paints were found to give by far the best effect for this work. A little 'Japan drier' should be added. The commercial grade of ore is painted a solid black. After all the painting was finished and dried, the tubes were placed in their respective holes on the table. A very thin strip of lead foil was wrapped around the bottom of the tube, forced into the hole, and snugly calked with a tool similar to that used by dentists. Plumb-bobs were hung on the walls as a guide to keep the tubes absolutely vertical while calking.



LIVE OAK MINE MODEL.

As the illustration shows, the top and bottom of the orebody was outlined with thin black strips of wood from hole to hole. At first it was difficult to find some suitable material for these strips, and eventually the idea of the ordinary Chinese bamboo 'punks' was thought of, so the left-overs from Fourth of July were bought up. After being scraped clean and painted, these answered the purpose admirably. On the drill-holes at top and bottom of the ore, small rubber bands cut from tubing were placed, on which to rest the strips, the latter being glued together. Each drill-hole has a tag fastened to the top of the glass tube on which its number is printed. The scale used is 50 ft. to the inch, both vertically on the drill-holes and horizontally on the table. The datum plane of the table is 2650 ft., and the top of the glass tubes 4100 ft. above sea level, representing, respectively, the assumed bottom of the deepest hole likely to be drilled and the highest surface elevation on this property.

This is, I believe, an original method of constructing a model showing both the drill-holes and the orebody, and should prove useful in planning a system for future mining operations, also for the quick selection of shaft and mill-sites, as the thickness and area of the ore at any particular place is at once visible. The top and bottom contours of the orebody show up distinctly in this model, as do also the different thicknesses of the capping, and the various formations drilled through, although the depths of these latter are not joined together with strips on account of the confusion this would cause. The Live Oak orebody is of the so-called low-grade 'porphyry' class, and its shape, comparatively slight dip, and the large area over which it extends adapt it especially to this style of model.

Drilling Under Difficulties

The accompanying photograph shows a core-drill at work at the El Refugio mine, about 15 miles from Salinas, State of San Luis Potosi, in a peculiarly difficult situation. The district, like many others in Mexico, has been subject to great disturbance. Large faults have occurred in many districts, distorting the veins and sometimes occasioning much difficulty in discovering in depth the ore proved in the upper levels. The drill is shown in position on the side of a deep ravine, the result of a great vertical fault. In this case the walls stand perpendicularly and are two or three feet apart.

The dip of the strata is 45°E., so in order to cut the strata at right angles to the inclination, thus securing a core of the greatest possible number of layers, with the shortest possible length of hole, the drill is tilted at an angle of 45° to the west. This hole was drilled to a depth of 400 ft. The drill, a Sullivan Class E, is operated by steam, from a portable boiler. The transportation and installation of this boiler involved no mean engineering difficulties, as the mountain passes are very rugged and steep, and unceasing caution was required to prevent the outfit from capsizing into one of the deep gulches along the trail, and during the last 500 yd. of this journey the boiler had to be carried on skids.—*Mine and Quarry.*

Discussion

Readers of the Mining and Scientific Press are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Foreign Words in English Writing

The Editor:

Sir—When will the average Anglo-Saxon writer cease to mutilate the Spanish language? If he is not a good Spanish scholar, why not consult a dictionary before writing a word erroneously? Some correspondents seem to take a delight in going out of the way to use Spanish words, to show the extent to which they are acquainted with the language and impressing the profane, and then do not get them right, even where they are in constant use. Why not use the English word and be done with it? These thoughts are suggested by reading articles that have appeared from time to time in the *Mining and Scientific Press*. Nothing destroys the effect of an otherwise well written article so much as to see ordinary Spanish words erroneously written. It conveys the impression of a certain carelessness which detracts from the rest of the subject-matter. Your publication is doing good work in pointing out the necessity of employing clear and specific language in dealing with technical subjects. It is not too much to ask that where foreign words are brought in, especially where they are unnecessarily made use of to the exclusion of the English equivalent, care should be taken to see they are correctly written.

Anglo-Mexican.

Mexico City, November 23.

Conservation of Investments in Gold Mines

The Editor:

Sir—In your issue of December 9, Morton Webber, in 'Conservation of Investments in Gold Mines,' advocates that companies set aside certain portions of the net proceeds, even to the exclusion of dividends, until there is in the treasury a sum sufficient to repay the par value of the shares. Mr. Webber contends that the conserving of dividends that otherwise might possibly be spent by the shareholder is really "a blessing in disguise." Certainly one cannot eat his cake and have it, too. The average purchaser of mining shares is presumed to have some intelligence, though ofttimes he exhibits a great lack of any, and, in the latter case, the assumption of a, so to speak, paternal control of his financial welfare, handling any profits that might accrue to his interests, might well be to his best advantage. However, the law already makes provision for the appointment of guardians for the care of those who are mentally incompetent, and it is not the special province of a mining directorate to usurp this power. Possibly the appointment of an alienist board to pass upon all applicants for an allotment of shares might solve this question. The retaining by the management of any profits in excess of a sufficient and advisable reserve, while pleasing to those in actual control, is hardly a policy that will appeal to the average shareholder. Aside from such reserve, I believe that any balance of profit should be distributed to the shareholder, to do with as he pleases. If he spends it riotously, or hoards it miserly, it is his business.

The tendency in these theoretical discussions on mining is to assume a hypothetical set of facts and to draw conclusions therefrom. It is an easy step from this to the assumption that in actual practice the future of the property can clearly be foreseen, and that in the initial stages of the career of a mine, accurate estimates can be made providing for amortization of capital and a regular rate of dividend. As a matter of fact, the sane investor in mining does not ask for this. He knows he is engaging in a speculation, and what he really asks is a frank statement of the facts as they are ascertained and an honest and capable administration of the property. Mr. Webber asks us to repose a blind confidence in the integrity of the directors, permitting them to conserve our investment instead of allowing the investor to take his profit as it accumulates. If anything goes wrong, it is found out at the wind-up of the corporation, when it is too late to act. A more rational substitute for Mr. Webber's plan would be a comprehensive corporation act providing that the directors disclose to the shareholders, at stated periods, the financial position of the company and the physical conditions of its properties, also that from time to time independent engineers be engaged to check these data. It is unnecessary to go into details of the necessary characteristics of a report on a mining property, as the Mining and Metallurgical Society has already done this, and also suggested by whom it should be made.

One of the purposes in the organization of stock companies is to provide that the interests of the various shareholders be allotted in such a way as to be liquid; that is, the owner is at any time able to go into the open market and realize on his shares. The issuance of shares at far less than the par value is often justified by the prospective stage of the property and the highly speculative risk. The shares first issued by many of the Rand companies were issued at par and the money used to prospect the property. When sufficient ore was assured to yield a reasonably certain profit, the remaining shares were issued at prices far in excess of par in order to supply equipment. Those receiving the first allotment are engaging in a highly speculative investment, those receiving the second allotment are engaging in a more conservative investment.

In this country it is often customary to issue shares at a price far below par, because of the speculative nature of the investment, but really the case is somewhat parallel to that of the Rand companies.

The purchaser knows (or should know) that he is taking a highly speculative chance, and there is no reason why he should wait until the shares reach par before taking—if the opportunity offers—a profit on his investment.

Of course, for 'wild-cats' unaccompanied by reports of competent mining engineers, organized and floated by irresponsible promoters, even a moment's consideration is unnecessary. In regard to such cases the law should make provision to compel promoters to publish all contracts, and preliminary profits and reports, and should hold them responsible for all statements issued in the prospectus, in a manner similar to that provided for in the British Companies Act.

Charles Janin.

San Francisco, December 11.

Determination of Copper, Nickel, and Cobalt

Take 2 to 5 gm. of pyrrhotite, 0.5 to 2.5 gm. of nickel matte, and 10 to 20 gm. of slags. After dissolving in concentrated HNO_3, concentrated H_2SO_4 is added and the solution evaporated till fumes of SO_3 are evolved; water is added and the evaporation repeated. The residue is filtered off and the iron precipitated three times with ammonia, after which it is titrated. Sulphuric acid is added to the filtrate from the $Fe(OH)_3$, and after reducing the volume to 150 c.c. the copper is determined electrolytically. Then the solution is neutralized with ammonia and 20 c.c. of the concentrated reagent added in excess, and then the cobalt and nickel are determined electrolytically. The nickel and cobalt are dissolved by boiling with 40 c.c. of concentrated nitric acid, the solution evaporated to dryness, 1 c.c. concentrated nitric acid added, and the solution again evaporated on the water bath to remove all HNO_3. This residue is treated with a few drops of diluted HCl, dissolved in 150 c.c. water and the nickel precipitated with 20 c.c. of 1% dimethylglyoxime in alcohol. The precipitate is filtered on a Gooch crucible, washed six times with hot water, dried 2 hours, and weighed; it contains 20.3% nickel.—H. Pedersen in *Metallurgie*.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

A PERCH of masonry should actually contain $24\frac{3}{4}$ cu. ft., being $16\frac{1}{2}$ by $1\frac{1}{2}$ by 1 ft. But it is frequently taken at 25 cu. ft. and sometimes at 22 cu. ft. Fortunately it is gradually falling into disuse.

MINIUM is the naturally occurring red oxide of lead, containing 90.6% Pb. It occurs as a vivid red powder, or loosely compacted mass of a dull or greasy lustre. It is of no importance as an ore of lead.

RETAINING walls should be sloped backward on the inside for 3 or 4 ft. below the top, when constructed where deep freezing occurs. The surfaces should be made quite smooth, to loosen the hold of the frost and prevent displacement.

MARBLE, as well as other building stone, may be located as placer claims upon surveyed or unsurveyed public land, but not upon school or State lands. Upon surveyed land building stone may also be located under the provisions of the Timber and Stone Act, as well as by placer location.

WROUGHT-IRON pipes have the advantage of lightness, toughness, and pliability, as compared with those made of cast iron. The lightness makes them cheaper per foot, though costing more per ton. As they are made longer than cast-iron pipes (15 to 18 ft. instead of 12) fewer joints are required per mile.

GOLD is extensively used in the arts, the annual consumption for gilding and electroplating, decorating pottery, bookbinding, sign manufacturing, and a host of other uses is great, and the amount lost in such forms annually is not inconsiderable. Coins and jewelry are its principal uses. It was estimated some years ago that 100 oz. daily was consumed in England in the form of gold leaf.

SPATHIC ore is the old name for siderite, the carbonate of iron (48.3% Fe). It occurs in granular masses of a gray or brown color, and often resembles dolomite, from which it may be distinguished by its greater weight and by becoming magnetic on heating. Some varieties resemble sphalerite. It was formerly important as an ore of iron, but, in America, has largely lost its place, furnishing only about 1% of the total iron ore.

WHEN testing electric fuses they should always be placed in such a position that if one of them should happen to detonate accidentally, no one will be injured. Placing them around the corner of a stone wall is an easy and safe way, or, if there be but a few of them, they can be buried under a foot of dry sand. If there are many, so that the total amount to fulminate is considerable, the particles of sand themselves would become projectiles capable of injuring any one nearby.

MORE than $21,000,000 worth of sand and gravel was dug for sale in the United States in 1910. This is a figure not many million dollars removed from the present annual production of silver. According to a report by Ernest F. Burchard, just issued by the United States Geological Survey, the production of glass sand, other sand, and gravel in 1910, was 69,410,436 short tons, valued at $21,037,630, against 59,565,552 short tons, valued at $18,336,990, for 1909.

ELEVATION of the outer rail on curves is theoretically equal to the square of the velocity in feet per second multiplied by the radius in inches divided by the radius of the curve in feet multiplied by 32.2. The product is expressed in inches. Experience shows that ½ in. for each degree of deflection angle (100 ft. chords) does very well for standard gauge up to 40 mi. per hour. At 60 mi. per hour use 1 in. per degree. In approaching the curve raise the rail at the rate of 1 inch in 60 or 80 feet.

TIRE punctures may be sealed by the use of a mixture made of 4 oz. of pumice (pulverized), 2 oz. of dextrin, and 10 oz. of water. Force the paste into the tube through the valve, after the insides have been withdrawn, by means of a small metal filler. It is claimed that this paste will close a good sized hole and enable the machine to proceed for many miles without detaching the tire; in fact, in one case a tire so repaired is said to have remained fully inflated for a week. When the tube is patched care should be used to see that all of the paste is removed from it.

SALT DEPOSITS and salt springs are covered by an act of Congress, which provides that all unoccupied public lands of the United States containing salt springs, or deposits of salt in any form, and chiefly valuable therefor, are hereby declared to be subject to location and purchase under the provisions of the law relating to placer-mining claims; provided, that the same person shall not locate or enter more than one claim hereunder. This act is operative in all the public lands of the United States, and not in the mining-law States alone. It is only by the production of salt through the usual processes that a saline spring or deposit becomes subject to placer location, and the use of a salt spring as a bathing resort instead does not tend to validate a placer location.

TOWNSITES upon public lands of a mineral character are provided for by the statutes. Because of somewhat conflicting acts and decisions, and the variety of conditions met, the law is not entirely clear, but the following are the general principles. The law contemplates giving titles to lots of land occupied for business or residence purposes, but with the right to mine paramount to other occupation or use of the land. Consequently, the law purposes that mining claims valid by reason of a mineral discovery prior to occupation of the land for townsite purposes, are to be reserved from townsite patent; likewise, but to a lesser extent, a valid location made after townsite occupation, but prior to the issuance of townsite patent, will be protected. The status of locations made after issuing of townsite patent and upon ground known to be valuable for mineral before the issuance of patent is more doubtful, but generally they can be sustained and perfected to mineral patent. Locations made and based on a mineral discovery made after the issuing of townsite patent and upon ground not known as mineral ground in a convincing way at time of issuing such patent, cannot be sustained.

OIL-MIXED concrete will commonly be most useful in the form of an application of the material over structures built of ordinary concrete, and to act as a waterproofing material. It is also worthy of note that many colloids will emulsify mineral oils in the same way as portland cement. At the Second International Road Congress, held in Brussels in 1910, a material, known as sand-clay asphalt, was exploited by Mr. Tardres, Engineer of Bridges and Roads at Algiers, some of it being laid on the exhibition grounds as a road surface. It is produced, according to the inventor, by mixing 12 parts of clay with a sufficient quantity of water (about 2 to 6 parts), and adding, while mixing, 12 parts of tar and 100 parts of hard sand. The clay paste emulsified the bituminous material with the same ease as the portland cement paste emulsifies the oil, and it was eventually found that the clay could be replaced by any other colloid matter mixed with water, such as dextrin. Such a mixture forms a plastic mass, and can be readily spread or floated into place. It dries out rather slowly, but eventually becomes quite hard. The inventor claimed that it could be used economically for binding together broken-stone roads, for walks, for cellars and stables, and for similar purposes.

Special Correspondence

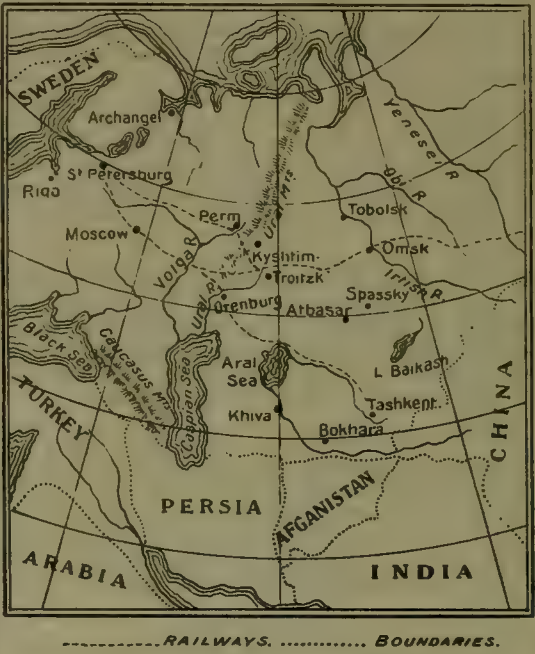
LONDON

'TITTLEBATIAN THEORY' FINDS COUNTERPART IN TRANSVAAL. —TOMBOY'S PROSPEROUS CONDITION INTERESTS LONDON.—BAD WEATHER DELAYS ENLARGEMENT OF CAUCASUS COPPER CO.'S CONCENTRATOR.—MESSRS. WEISS AND ELLIOTT OF CALIFORNIA ON ANCOBRA COMPANY'S STAFF.

A scientific event of similar importance to Mr. Pickwick's and Jonathan Oldbuck's antiquarian discoveries has recently engaged the attention of the geologists and petrographers in South Africa. Some months ago the diamond sorters at the Dutoitspan mine, belonging to the De Beers company, found a new mineral substance among the products of the pulsators, and after due deliberation forwarded specimens of it to the Cape Town University for determination by the mineralogical experts. On analysis the mineral was found to contain 71.3% iron, 20.03% silica, and 8.41% carbon. Its composition and appearance suggested an igneous origin, and its presence in the diamondiferous rock was a source of great delight to the scientists, who hoped that it would afford some argument or information to help in the discussion of the genesis of the diamond. A practically-minded man, however, suggested that the substance looked remarkably like one of the residual products left in the manufacture of acetylene, so a comparison was made with lumps and pellets extracted from the plant used for making this gas in the University laboratories. The physical characteristics, such as hardness, color, fracture, etc., were found to be similar. Chemical examination showed that the substance varied in composition from iron carbide attacked by dilute acids, to iron silico-carbide attacked by hydrofluoric but not by hydrochloric or sulphuric acid. Inquiry at the De Beers showed that acetylene had been manufactured and used at the mines for several years. The conclusion was therefore inevitable that the substance was not a constituent of the diamondiferous rock, but had accidentally found access to the workings. All this goes to show that there are many things in a mine in addition to the mineral for which search is being made, just in the same way as there are, in the words of the song about the seaside, "many things there besides the fresh air."

The Tomboy company, operating in Savage basin above Telluride, Colorado, has been one of the most interesting English ventures in the United States, though the magnitude of its operations has been somewhat eclipsed by the doings of its neighbor over the divide in Imogene basin, the celebrated Camp Bird. The company was formed by the Exploration Company in 1899 to acquire the Tomboy group, and in 1903, as the deposit showed unsatisfactory signs, the Argentine group lower down was purchased. The latter is still doing well, and the ore reserves are well maintained, but it has been deemed prudent to keep an eye open for other investments. About a year ago, the Exploration Company had a chance of purchasing the property of the Revenue Tunnel Company, whose mill is farther north over the divide near Sneffels, and the offer was made to the Tomboy. The directors, however, considered it too big an undertaking, and decided, on questions relating to transport, to confine their future operations to properties on their side of the divide. Subsequently a second proposition was made to sell that part of the Revenue Tunnel property on the Tomboy side of the divide, and accordingly negotiations were reopened. Eventually, in July last, it was decided to purchase this group of claims for £80,000 cash, of which £50,000 was paid from reserve fund and the remainder borrowed from the Exploration Company. This group of claims had never been actively mined, though a good deal of development work had been done, because the cost of tramming to the Revenue mill was considerable. The Ophir adit gives access to the workings from the Savage basin side, so that the ore can be easily delivered to the Tomboy mill. A tramway has been built for this purpose, and should be at work by now. The ore is of similar characteristics to that of the Argentine, and is, indeed, contained in a continuation of the same lode. Its content in gold is about $9 per ton. It seems, therefore, as if the Tomboy company had obtained a new lease of life for the second time.

From time to time I have mentioned the case of the Caucasus Copper Co., Ltd., that unfortunate Anglo-American venture in the south of Russia. Information about the property is scarce and publicity is not courted. The company was formed eleven years ago. The ore is plentiful, but difficult to concentrate, and its beneficiation has given a great deal of trouble. At first, direct smelting was tried, but had to be abandoned, as too much flux was required. Then magnetic separation was given a chance, with equally disappointing results. Finally, three years ago, James Colquhoun, who used to be manager of the Arizona Copper Co., was asked to join the board, and to advise as to treatment. Under his direction, water concentration has been tried once more, and sufficiently good results have been obtained. The plant can treat 500 tons per day, and the smelter capacity is 200 tons of copper per month. The concentration plant is to be increased so as to bring the daily amount of ore to 750 tons. This scheme would have been completed before now, but for the severity of the weather during last winter, when snowstorms and landslides cut off communications and wrecked the pipe-line through which the oil-fuel is delivered to the mine and smelter. The yearly production of copper is now nearly 2000 tons, having increased 100% during the past three years, but it is still 500 tons less than should be possible with the present unextended concentration plant. Unfortunately, the finances have not improved and the indebtedness has increased during the past year by over £100,000. The sums of money involved are enormous; the capital of the company is £500,000, and there are £635,600 debentures, £534,900 loans, and £42,740 accrued interest on debentures and loans. A number of high-class mercantile firms in London are financially interested, and the American interest is represented by the J. P. Morgan group. W. R. Van Liew, late of Montana, is now general manager, having previously been chief metallurgist.



MAP OF CENTRAL RUSSIA.

An English gold-dredging venture that will be of interest to Americans is the Ancobra Exploration & Dredging Co., which operates in West Africa; the reason for the American interest being that S. V. Weiss, of California, is in charge of operations, while Mr. Elliott, the expert driller, was one of the Hammon staff. In early days the operations were not successful, and it is Mr. Weiss, who has put things on a more satisfactory basis. The rights include the bed of the Ancobra river from Prestea to the sea, a distance of 70 miles, and also some adjoining flats. There are three small dredges at work, and a fourth has just been scrapped. Recently the yield of gold from the river bed has improved, and during the first week in November the three dredges produced 230 oz. gold. A more important feature of the work done by Mr. Weiss is the discovery that the flats containing the old river bed are more profitable to work than the present bed. Not only is the deposit richer, but its content can be more exactly ascertained. In addition, it will be easier to work because the vegetation and floods will not interfere so much. Mr. Elliott is now engaged in drilling these flats, and if the results come up to expectations a new dredge capable of handling 65,000 cu. yd. per month will be built.

TORONTO, CANADA

Railroad for Elk Lake District.—Winter Road Will Make Cripple Creek Mines Accessible.—Placer Activities.—Porcupine and Cobalt Notes.

The Ontario Government, in view, no doubt, of the general elections which take place next week, has at last proved responsive to the appeals of the mining men interested in the Elk Lake and Gowganda regions, and has announced its intention of building a branch of the Temiskaming & Northern Ontario railway into the Elk Lake district. The branch will be about thirty miles long and will probably be a continuation of the short line already constructed to Charlton. It is stated that the work is to be proceeded with as early as possible in the spring. This should enable a number of mines, which it was found impossible to develop profitably on account of transportation difficulties and high freights, to resume operations. A winter road is also to be constructed from Timmins Landing on the Mattagami river into the Cripple Creek country to the west. This will open up that section, which has been much retarded owing to its inaccessibility. It is stated that recently a number of options taken on properties there and in Bristol township have been dropped. The latest rush of prospectors to new territory is to the Grassy River, or Kapiskong, region, lying to the south of the Porcupine district. The Grassy river is a tributary of the Mattagami and runs from the chain of lakes known as the Kapiskong, through the townships of Musgrove, Fripp, Price, and Ogden. It is asserted to be a placer area, and a large number of placer claims have already been taken up in the bed of the river and Kapiskong lake. For over three months men have been in the district washing out sands, but it is only quite recently that it attracted prospectors in any considerable number.

Good news from Porcupine district does not seem to have much effect on the stock market, where the general lack of interest, which has prevailed for some time, has been intensified by the dullness which usually sets in in advance of the holiday season. At the Pearl Lake the diamond-drills have reached the lowest depth attained in the district, 1200 ft., with satisfactory results. Assays of six samples taken out between 1162 and 1182 ft. give gold contents ranging between 40c. and $20, and some sludge samples taken between 1170 and 1200 ft. run from $3.60 to $8.40. The McIntyre has found rich ore on the 200-ft. level in a crosscut driven in 35 ft. from No. 1 shaft. The Standard has obtained good results from diamond-drilling, and the management has decided to obtain a 12-drill electrically-driven compressor and equipment. Its camp buildings are almost completed. The Martin location lying to the south of the Dome, lately owned by D. K. Martin and A. J. Young, has been taken over by the Martin Porcupine Mines, Ltd., capitalized at $2,000,000, and will be actively developed. At the American Goldfields, where a 2-ft. vein has been traced for 200 ft., two diamond-drills will be put to work immediately. The machinery of the Little Pet, comprising a 6 drill compressor plant and two boilers, is being erected. The main shaft near the west line is down 45 ft. and the vein has widened and carries free gold. A shaft is being put down on the Pike Lake in the Swastika district, where rich ore was found a little below the surface. The illustration below shows the famous 'golden stairway' recently uncovered by trenching at the Dome mine. The gold content is so high as to give the vein the appearance of a metallic band.

Heavy shipments are being made from Cobalt and bid fair to continue to the close of the year. The La Rose is getting rich ore from the Lawson property, where six tons taken from the new shoot on vein No. 8 is stated to average 9100 oz. per ton. The Kerr Lake is sending out no more ore than is absolutely necessary to enable it to pay dividends, keeping back its output until the tramway to the Nova Scotia is completed and the ore can be shipped in the form of bullion. The Trethewey mill is treating an average of 100 tons per day, which yields about 2000 oz. of silver.

'GOLDEN STAIRWAY,' DOME MINE.

Some important new orebodies have recently been opened up. Charles O'Connell, the manager, estimates that there is now developed underground a three years' supply of milling ore, in addition to a year's supply on the dump. The company reports its financial position, November 10, as $104,695 in cash in bank, due from smelters and value of ore in hand. The net production of the Nipissing during November was $225,907, and the month's shipments totalled $248,980, of which $99,407 was ore and $158,573 bullion. Sir Henry Pellatt, of Toronto, has taken a 3 months' option on the Dominion Silver, North Cobalt, where operations will at once be begun under Mr. Gordon, manager of the Cobalt Lake. A fatal accident, from a very common cause, occurred at the Buffalo, December 6. The drill struck a hole containing an unexploded charge, with the result that one man was killed and three injured. The Canadian Gowganda is shipping a carload of high-grade ore amounting to 50,000 lb. by teaming it to the railway at Charlton. The Powerful, situated between Elk Lake and Gowganda, has found two rich veins in drifting at the 115-ft. level. It has shipped 2 tons of high-grade ore.

BUTTE, MONTANA

Appointment of C. F. Kelley as Vice-President of Anaconda Is Praised.—Tuolumne Surface Plant to Be Ready Shortly.—Other Notes.

The selection of C. F. Kelley, chief counsel of the Amalgamated Copper Co., for vice-president and director of the Anaconda Copper M. Co. in succession to F. P. Addicks, is generally regarded as an unusually wise choice. Although born in Nevada, Mr. Kelley was brought to this city by his parents when an infant and was raised, educated, and achieved his fame as a lawyer and a man of affairs here.

The High Ore mine will not be placed in commission for a couple of weeks, or possibly more, as the shaft repairs are not completed. The fact that the other mines are supplying all the ore required does not make it necessary to hurry the repair work, and when the mine does start up again it will be in first-class condition. The equipping of the engine with the new cylinders for operation by comair have been completed.

The official announcement that the Anaconda Copper M. Co. had secured control of the Southern Cross mine in the Georgetown district and had decided to extend the Butte, Anaconda & Pacific railroad into that district for a distance of about twenty-two miles, did not come as much of a surprise to the people of this district as it has been known that the company has had experts making an examination of the property and having the ore tested for the past several months.

Inside of three weeks the new surface plant of the Tuolumne company will be in operation unless something unforseen occurs to delay the work. By the first of the year the company will be in a position to increase its output and advance with more vigor the development work which has been going on for some time. The station on the 1800-ft. level has been completed and the sinking of the shaft to a depth of 2000 ft. has been resumed.

While negotiations between W. A. Clark and the Butte & Superior company for a merger of interests in the handling of the zinc ores of the two interests were broken off two weeks ago, among persons close to the company and to Mr. Clark there is a strong belief that it will not be long before the parties will come together again and an agreement will be reached.

The official figures of the production of the mines in this district for the past month do not differ materially from those of October, nor will there be any material difference in the production this month as compared with several previous months. It is intended to keep the output around 21,300,000 lb. until such time as the market conditions fully justify an increase. If the surplus continues to decrease and the price continues to increase, it will not be many months before the mines of the district bring the production once more back to the figures maintained before the 15% curtailment went into effect.

Efforts to learn something concerning the object of F. Augustus Heinze in redeeming the Basin Reduction Works property so far have failed. The State Savings Bank officials who had possession of the works through a claim for money loaned, will not say anything beyond the fact that the money to redeem the property was put up by interests connected with Mr. Heinze and that it is now again in the name of the La France company, an organization controlled by him. There is an impression that the money was advanced by W. A. Clark, but, for reasons best known to himself, he does not want the fact known that he is going to take over the works for some time to come, in the hope that he may reach an agreement with the Butte & Superior company.

The new dust-chamber which has been under construction by the East Butte company for the past few months will be completed in about three weeks. The slag walls are nearing completion and in the course of a week the steel roof will be placed in position. Over this will be poured a thin coating of slag in order that the gases may not escape but be carried to the stack. The stack is well under way. It is of sheet steel, 25 ft. diam. at the base and 15 ft. diam. at the top, while it will be 150 ft. high from the base, giving a total height of about 175 ft. The next important improvement will be the building of another blast-furnace. The material is all on hand and it is intended to have it ready for operation in the spring. This additional blast-furnace will increase the capacity of the smelter about 750 tons per day.

The movement started a short time ago by the business men to offset the movement in the East against the silver industry is making some headway, and replies have been received from Chambers of Commerce and various commercial bodies on the coast offering assistance to create a greater demand for the white metal. A formal protest against the refusal of the Government to pay the express charges on its silver to the West is being drawn up, and this will be forwarded to the President, Senators, and Congressmen with a demand that immediate action be taken to grant the relief sought. It is contended that the Government can well afford to pay the charges demanded and still make a profit and that by so doing it would be giving a great impetus to a Western industry. In Montana alone there are a hundred silver mines which could be operated to advantage with a little encouragement in this direction.

NEW YORK

Finlay Reiterates Views.—Arizona Copper Merger Centre of Interest.—Copper Producers Report Analyzed.—China and India Influencing Silver Market.—General Notes.

J. R. Finlay, whose work for the Michigan State Board of Equalization created such a storm of criticism in Boston, appears to be inclined to stand to his guns in his position on mining stocks. Speaking this week before the Engineering Society of New York, he said, in part: "It is perfectly evident that the copper shares are too high. The railroad dividends are a real profit on a stable investment. The mining dividends are a return of capital as well as interest. The railroads are a better property year by year; the copper mines are sure to play out.

"The function of science in prolonging the life of the mining business really lies in widening the field in which fresh deposits can be found.

"It would be utterly impossible for any sane engineer to make a serious report on the valuation of copper mines which would not be disappointing to the average stockholder.

"It is generally supposed in this country that gold mining is a much more risky and generally less productive venture than copper mining. This idea has some foundation so far as the United States is concerned, but as a general proposition it is a great mistake.

"It is preposterous to buy mining shares at a price that will give you a bare interest when every unknown factor turns out favorably. You should pay only a price that will yield a big profit, if all works well, for such would be only a fair compensation for taking the risk of loss if the unknown factors do not turn out well. For these reasons, I think it is generally conceded that a mining stock does not look interesting at all unless it will pay 10%. If you would reject all that do not pay that amount and investigate those which pay more, and do not buy any unless you know something about them, you will stand some chance of making money.

"I do not wish to be understood as being a pessimist on the mining business. My sole point is that the public is led in too many cases to pay extravagant prices for good profitable mines. The very copper mines that I have spoken of as selling too high are all bonanzas. They pay dividends equal to 30 or 40% on the capital legitimately invested."

Miami, Live Oak, and Inspiration; Inspiration, Miami, and Live Oak; Live Oak, Miami, and Inspiration; priority depending upon the particular group of interests represented; around these three has centred most of the copper news of the week. It is pretty well understood now that all three of the properties will eventually be consolidated and the reduction of the ores handled all at one plant. For the moment, negotiations are at a standstill, awaiting the reports of the various engineers who are to bring figures down to date as to developed tonnage and percentage of copper content. The engineers are Henry Krumb and W. H Aldridge, in behalf of the Inspiration, J. Parke Channing, of the General Development Co., for the Miami; L. D. Ricketts, of the Greene-Cananea, for the newly acquired Live Oak. From the estimates which have already been given out, it is figured that the combined properties will represent about 75,000,000 tons of developed ore, with an average content of about 2% copper.

The consolidation of these important coming producers has not had any perceptible effect upon the share market, although Miami is listed upon the New York Stock Exchange, and Live Oak upon the Boston Exchange, while Inspiration finds its market upon the New York Curb. This is probably due in part to a marked easing off in the metal market. The boom which was hurrahed into a semblance of activity last month has not developed any sturdiness of character, and, while the statement of the Producers' Association shows some falling off in the surplus, consumers still feel that they can save money by buying their copper as they need it, and that without taking any chances of becoming involved in a 'runaway market.'

Despatches state that the famous Camp Bird property, in Colorado, will close down, in February next, unless some new orebodies should be discovered in the meantime. The career of the Camp Bird has been so successful and so profitable that its close must be viewed with regret. The shareholders in Camp Bird are looking forward to a continuance of prosperity and dividends from the operation of the Santa Gertrudis mine in Mexico, recently purchased. The development up to the present time on this property is said to be wholly pleasing, and it is not anticipated that the final closing of the Camp Bird mill and mine will cause any cessation in revenue.

The traders in the New York market had braced themselves to stand the shock of a cut in the dividend of Goldfield Consolidated, and, having made up their minds to see the rate dropped, were somewhat surprised by the action of the board in declaring the customary distribution of 50c. per share. Nothing could mark the apathy prevailing in New York markets for mining shares more clearly than the indifference toward this issue, which was at one time, and for a long time, a market leader with a large public following that did many millions of dollars of real trading in the shares and created a market against which there was a great deal of high-class arbitrage. It is true that the issue has removed from the outside or curb market to the floor of the New York Stock Exchange, where the atmosphere is most hostile for all mining issues, but in the meantime the New York Curb has so far degenerated as to be left almost without friends or supporters either among its own members or with the public. In fact, it may be said to no longer have a public and to have lost all usefulness as a distributing market for new issues.

The report of the Copper Producers' Association covering the month of November is looked upon as exceedingly encouraging, as the refinery output shows a decrease, and both domestic deliveries and exports an increase, with the result that there is a gratifying shrinkage in the surplus. Production reported for the month was 111,876,601 lb., easily ten million pounds below normal and the smallest output for any one month since February 1911, when it was 109,828,297 lb. Domestic deliveries were 68,039,776 lb.; more copper than has been taken in any one month on this side of the water since January 1910, when home requirements took up 78,158,387 lb., a record which the last month does not crowd very closely. Export demand required 67,049,279 lb., which, while exceeding the figure for the two months preceding, is not above normal. The shrinkage in the total accumulated stocks is 23,212,454 lb., and the present surplus is 111,785,188 lb., a smaller burden than the metal market has had to bear at any time since in January and February 1910, when the figures for the surplus stocks were respectively 98,463,339 and 107,187,992 lb. While it is most encouraging for the copper metal market to see the bugaboo of accumulated stocks so materially decreased, and the technical position of the market is greatly strengthened thereby, it is to be borne in mind that, nevertheless, none of the factors which have made for the prevailing conditions have been actually eliminated. The decreased refinery output accounts for one-half of the surplus decrease, actual domestic consumption can hardly be said to have increased in view of the continued depression in general business, which is the main topic of discussion now throughout the East, at least, in the press and in every utterance by the men who have the public attention.

The Hedley G. M. Co., which operates the Nickel Plate mine in British Columbia, and in which a large number of the United States Steel officials are interested, has declared a 10% quarterly dividend, being a 3% regular quarterly distribution and 7% by way of extra disbursement.

The situation existing in the silver market is causing a good deal of discussion. The rebellion in China and the depletion of the silver reserve of the Indian Government have been the chief market factors against which some heavy pools have speculated. When the disturbance in China became acute it was found necessary to "resume specie payment," and Chinese bankers were forced to call for all London reserves of spot silver, giving the operators on the long side of the silver market a chance to reap some large profits. It has been expected that the Indian Government would soon be forced to come into the open market for silver for coinage purposes, and the same bull pools have been speculating against this demand. It will probably require from 50,000,000 to 75,000,000 oz. to complete the requirements of the Indian Government, if it finally comes into the market. If silver should be worked to the higher figures, around 65c., as hoped for by some of the market operators, they would not be the only ones to rejoice. Some of the Mexican mining camps with immense bodies of low-grade ore are in much the same position as some of the high-cost coppers, so-called, and would blossom out with a marked degree of prosperity, if any permanent market for silver could be established around 65c. While Cobalt is still a heavy silver producer, it seems to be admitted upon all sides that it has passed, or at least is now passing, the climax of its greatness. The present market for silver, between 55 and 56c., while showing a wide margin of profit for the Cobalt mines, still leaves many Mexican mine owners without a really safe margin upon which to operate. There are many districts, like Guanajuato, that have an immense assured tonnage, and, on 65c. silver, would become centres of great activity and expansion.

NICKEL PLATE MINE, BRITISH COLUMBIA.

The Arizona Copper Co. is submitting its scheme of reconstruction to the stockholders. Its No. 3 and 4 mills are to be dismantled and the No. 6 mill at Morenci is to be enlarged, a new power plant erected, and production attained of 43,500,000 lb. per annum. Copper recoverable from the mines is estimated at 400,000,000 lb. New financing will consist of the issuance of debentures to the amount of £500,000, which already have been underwritten. Mr. Ricketts will be a busy engineer, if he is to oversee the new construction work on the Arizona Copper, look after the development of the Live Oak, and continue to give attention also to the plant of the Greene-Cananea.

General Mining News

ALASKA

JUNEAU

The report of the Alaska Treadwell G. M. Co. for October states that 78,316 tons of ore was crushed and 1501 tons of concentrate saved. The estimated value of the free gold was $108,727; of concentrate, $89,730; the total production being valued at $198,457, with a realizable value of $196,473. The estimated net profit was $103,509.

PRINCE WILLIAM SOUND

The Valdez Bonanza M. Co. is said to be developing a 7-in. vein, on its Mineral creek property, which assays about $300 per ton.

THE TANANA

Remarkably rich ore, according to recent press reports, has been found on the Spaulding property on upper Dome creek. A hoist will be purchased for the mine.

SEWARD PENINSULA

The waters of Bering sea are reported to be lower than for years, and free from ice. Many 'beach-rockers' are getting good returns.

ARIZONA

According to the regular annual report of the Governor of Arizona Territory, to the Secretary of the Interior, for 1910, the mine production was slightly less than that of the year before. The gross production, as shown by returns made to the territorial auditor, was as follows: copper, 295,275,527 lb.; gold, 142,252,803 oz.; silver, 2,092,738,461 oz.; lead, 1,068,093 lb.; zinc, 6,134,418 lb. "There was a slight falling off in the production of copper," remarks the Governor, "some increase in the production of gold, a material decrease in the production of silver and lead, and a slight decrease in the production of zinc."

The gross value of the 1910 production was $42,229,282, which was $717,462 less than the value of the 1909 output. After telling of the activities of the various companies, including the shut-down of the Imperial Copper Co., the report on mining closes with a paragraph on the gold mines of Mohave county, which increased their production and added to their ore reserves during the year.

COCHISE COUNTY

The force at the Commonwealth mine, near Pearce, has been much enlarged in the past few weeks, since it was acquired by the Montana-Tonopah M. Co., and in the near future the erection of a 300-ton mill will necessitate the employment of many more men.

GILA COUNTY

(Special Correspondence.)—The following wire has jsut been received from W. A. Eaton, of Duluth, president of the Summit Copper Co., by his local attorneys: "Notify at once the directors of the Gibson Copper Co. of my intention to abandon the property, and that they can take possession before the expiration of thirty days." The Summit, formerly known as the Gibson mine, produced copper to the gross value of $1,250,000 under the management of the Gibson Copper Co. and held the almost unique position among copper mines of paying for itself from the start, the only capital invested, outside of some that was taken out of the mine, being $90. In June 1910 it was bonded to the Summit Copper Co., which worked it until October 1911. This company, at the time of closing down, was shipping chalcopyrite ore assaying 20% copper. The Summit officials have issued no statement since the mine was closed down, and there is much dissatisfaction among local shareholders, who claim that the funds of the company have not been properly accounted for and that Mr. Eaton and his associates did not take over the stock for which they had subscribed.

Assessment work for the present year has been nearly completed by the Warrior Copper Co. Spencer D. Wright, of Philadelphia, president of the company, has just made a visit to the property and states that nothing has yet been decided as to future policy. The option on control, held by the Warrior Development Co., a Duluth corporation, was relinquished a few months ago.

PINAL COUNTY

F. W. Dunkell, mining engineer and mine foreman for the Ray Con. company, was killed in a stope by a falling rock.

CALIFORNIA

AMADOR COUNTY

(Special Correspondence.)—The representatives of Bewick, Moreing & Co. are completing numerous surface improvements at the Plymouth Consolidated group. The laying of a line of water-pipe from the reservoir to mines will soon be in full swing. The properties lie in the Plymouth district. The California Con. M. Co. has secured a short extension on the time required to redeem the miners' liens on the Keystone mine, at Amador City, and the Wildman-Mahoney at Sutter Creek. It is stated in local mining circles that Amador capitalists will open and operate the Keystone, if the California Consolidated fails to assume control. The Keystone is credited with a production of about $17,000,000. The Bunker Hill continues a steady monthly disbursement of $7\frac{1}{2}$c. per share in dividends. It is understood that development below the 1950-ft. point is planned. At this level the vein is reported to be about 80 ft. wide. Elisha Hampton is superintendent. What appears to be an entirely new vein has been found on the 2800-ft. level of the Kennedy. It was tapped by the east cross-cut. The South Eureka company within a few weeks will establish connections between the South Eureka and Oneida workings. Unwatering of the Oneida shaft continues. In the main South Eureka workings good ore is being mined. The 60-stamp mill is operating steadily. W. H. Schmal is superintendent.

Jackson, December 9.

William J. McGee of San Francisco is trustee for the holders of liens on the California Con. M. Co. property, mentioned in the above despatch.

CALAVERAS COUNTY

Bishop & Co. have resumed operations at Vallecito, four miles from Murphy. Messrs. Lanyon, Martin, and Flormann are developing the Hercules Horseshoe property, formerly owned by Conliffe & Driver. At Douglas Flat a man named Adams is treating black sand with the cyanide process. Many individual miners are active, and there is much development in the East Belt district.

NEVADA COUNTY

(Special Correspondence.) — The Idaho-Maryland and Union Hill mines have ceased production because of the water shortage. At the Empire several men have been laid off, and development will be largely curtailed until rains set in. The company expects to keep the mill in action. The unusually dry season has seriously impaired the water resources of the Pacific Gas & Electric Co., and it is unlikely that sufficient water will be available until heavy rains set in.

The North Star Mines Co. has completed the installation of the electric pump in the Providence shaft. Together with two smaller machines, the big pump will drain the entire Champion group. The electric cables from the Colgate power-house to the Champion are in place. It is expected to have the pump in commission by Christmas. The water shortage in the Pacific Gas & Electric Co.'s reservoirs does not affect the Champion, as this company secures its supply from other sources. The Pittsburg is another unaffected mine. An effort is being made to raise sufficient money to resume operations at the Greystone mine near Snow Tent. It is planned to drive the adit about 700 ft. to tap the vein, giving backs of 450 ft. Surface showings are said to be encouraging. Local people chiefly are interested.

Nevada City, December 10.

The Midas mine at Randolph Flat, state advices from Grass Valley, has been bonded by J. W. Young, of Young & Young, a real estate firm of Sacramento. The property is owned by the Nevada County Midas M. Co. The mine will be unwatered, and a 5-stamp mill will be erected. Herbert James will be manager of the property.

Shasta County

(Special Correspondence.) Private advices from Boston state that the First National Copper Co.'s plan for the manufacture of sulphuric acid at Coram will not require stockholders to advance funds, as the company has about $600,000 in reserve. The First National owns the Balaklala mines and smelter, near Coram, and has been considering several plans for the resumption of activities. A large amount of Balaklala ore assays as high as 38% sulphur. Five stamps are being added to the 10-stamp mill of the Little Nellie mine, in the Iron Mountain district. It is expected to have the new battery in commission before the end of the year. Sinking the main shaft is under way, and much development work is being performed. J. F. Parthington is superintendent. Arrangements have been made for the resumption of activities at the Uncle Sam mine, eight miles from Kennett, in the Squaw Creek district. Five stamps will go into commission about the middle of December. Electric power will be used. The mine is controlled by the Standard M. Co., with Portland, Oregon, people principally interested. W. W. Bowers is superintendent. The management of the Victor mine, Harrison gulch, reports satisfactory conditions at the property. Good ore has been developed in the main workings and 20 stamps are dropping. Some work is going on at the Vulcan copper property, in which San Francisco people are interested. The intersection of a small body of high-grade ore recently was reported.

Redding, December 10.

Tuolumne County

The shaft at the Somerset mine, under bond to W. B. McCubbin and George Ash, will be sunk an additional 100 ft. to enable the more extensive development of the rich orebody uncovered while sinking the first 100 ft. The ore milled recently in the Spring gulch plant gave splendid returns, but no more will be hauled to that property for treatment, it being the intention to put up a mill of adequate size—probably 10 stamps—early in the coming year. It is now believed by W. J. Graham, superintendent of the property, that there will be no water in the ancient channel which the Gold Ship M. Co. has been expending so much money to open. Equipment to handle a heavy flow, which it was thought would surely be met, was recently erected, but the only water thus far comes in at another part of the mine.

Articles of incorporation of the Harvard Mine, Inc., organized under the laws of Massachusetts, were filed in this county last week. The capital stock is $100,000 common stock; par value $5. The 20,000 shares of stock are to be issued as follows: To be paid for in cash, 1000 shares; in real property, 14,000 shares; in personal property, 5000 shares. The incorporators are James R. Simpson, Edward H. Mason, W. B. Buckminster, and Kalman Haas.

The work of retimbering the Santa Ysabel shaft is about completed. A quantity of ore is to be taken out of the Mammoth mine at Jacksonville and milled, and if results are satisfactory the property will be developed. The shaft at the Starr King is being sunk another 100 ft. The new 5-stamp mill is pounding steadily, and it is said the results are gratifying. It is reported that a company is about to begin operations at the Columbus, situated about two miles north of Tuolumne, which has been idle for many years. The Clio mill is being overhauled and will be started as soon as possible. The two 5-stamp batteries recently added to the New Albany mill are now in operation with the original 10 stamps, and between 60 and 70 tons of excellent ore is crushed per 24 hours.

Tuolumne, December 9.

COLORADO

El Paso County

Late press reports state that the Golden Cycle mill, since the temporary shut-down of the United States R. & R. Co.'s mill, is treating over 1000 tons of ore per day. In case the cyanide plant will be overtaxed in treating the increased amount of ore, another Edwards roaster will be added to the equipment. The Portland company and the Golden Cycle are quoting the same rates.

The Golden Cycle M. Co. paid its regular monthly dividend of 2c. per share on December 1. The total dividends paid in 1911 amount to $1,410,000.

La Plata County

The Durango smelter of the A. S. & R. Co. has been closed for the winter. One of the main reasons for the shut-down was the recent floods, which washed out the railroads and cut off the ore-supply.

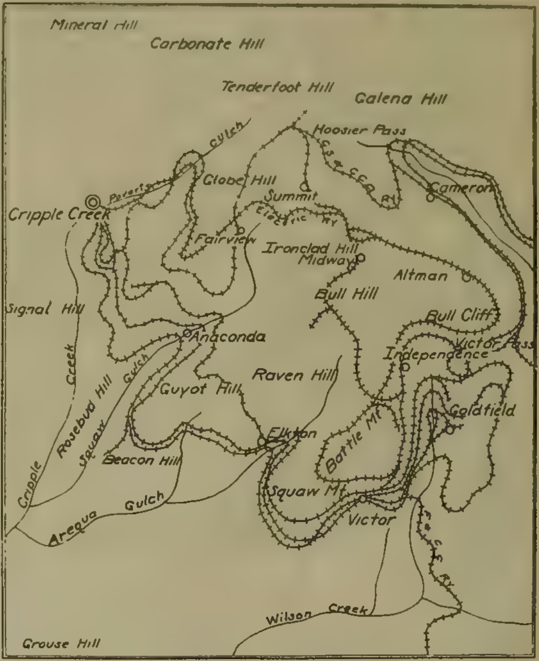
San Miguel County

The Liberty Bell mill is crushing 15,000 tons of ore per month with 80 stamps in operation.

Teller County (Cripple Creek)

The Union Leasing Co., operating the Gold Sovereign on Bull hill and the Husted shaft on Beacon hill, consigned 68 cars of ore to the valley plants during November. The ore yielded $8 to $45 per ton, the more valuable ore coming from Beacon hill. C. G. Jackson is superintendent for the company.

The Jerry Johnson, Ironclad hill, shipped 46 cars of ore during November. This amount was less than was expected, the shortage being due to delay in the construction of an electric compressor.



CRIPPLE CREEK DISTRICT.

The Colorado Mining & Investment Co. has found ore assaying over 7 oz. per ton in the Rice vein, 170 ft. below where Jones & Co. have been operating for some time.

The Granite company shipped 70 cars of milling-grade ore during November. The Western Investment Co. sent out 40 cars of ore from the Victor, Bull hill, and the Ophir, Raven hill, during November.

According to a statement by the management, the Stratton's Independence mine filled with water to an elevation of 8864 ft. in the shaft, when the pumps were stopped in 1907, owing to the cost of pumping and the refusal of adjoining properties to share the expense. It is asserted that the Stratton's Independence was really pumping for its neighbors as well as for itself. The mine's 900-ft. station is at an elevation of 8947 ft. above sea-level, and from the levels above the water about 1500 tons of ore per month was mined. The ore on the average assayed $26. Pumping was resumed last month and the lessees again started development at the 1050-ft. level.

IDAHO

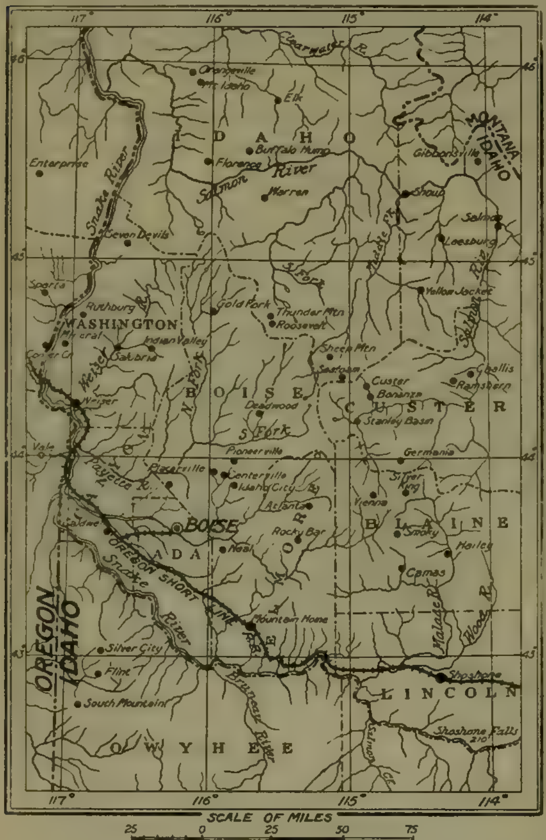
Bonner County

William Baptiese, of Lakeview, reports that capitalists of Cleveland and Pittsburg are planning to drive a 1500-ft. tunnel on the Vulcan mine at Lakeview.

Idaho County

(Special Correspondence.)—A rich find has been made on the Laufer & Davis property on Logan creek. A 4-in. streak of free-milling ore which assays an average of $2400 per ton, has been opened up at a depth of 100 ft. On the surface a series of open-cuts and shallow shafts yields rich pannings.

An adit is being driven on the Victor claim. It is now in 285 ft., and should cut the main vein of the system at a depth of over 200 ft. in another 100 ft. of distance. In the discovery shaft, at a depth of 30 ft., some fine specimens of native gold were obtained; the vein and feeders can be traced on the surface for several thousand feet. This property is situated on Profile creek.



SOUTHERN IDAHO.

The Eagle M. Co. again is operating the 10-stamp mill after a three weeks' shut-down owing to the freeze-up of the cyanide tanks.

Warren, December 9.

Lincoln County

Newspaper reports state positively that construction will be started at once on a branch railroad to connect the Prince Consolidated property with the Salt Lake Route station at Pioche. Much of the preliminary survey work has been done. The road is to be in commission, it is said, within two months.

Shoshone County

Five and a half feet of ore, of which more than 50% is of shipping grade, has been opened in the cross-cut on the 500-ft. level of the Marsh mine at Burke.

The Bunker Hill & Sullivan M. & C. Co., operating the Bunker Hill mine at Wardner, has disbursed $65,000 as its dividend for December, bringing the total to date to $13,159,650.

The Snowstorm M. Co. is having plans prepared for a new concentrator and leaching plant, according to recent newspaper reports. The capacity and cost proposed for the plant have not been announced. The Snowshoe mine is situated near Mullan.

MONTANA

Silverbow County

(Special Correspondence.) — According to the official figures, the Washoe smelter produced 15,700,000 lb. of copper during November, and the Great Falls smelter 5,150,000 lb., making a total production for the month of 20,850,000 lb. This was the smallest amount of copper turned out in any one month this year, the month of February coming next with 20,900,000 lb. In this respect it may be mentioned that, in the figures given, the production of the North Butte and the Tuolumne companies are included and both amount to about 2,500,000 lb. The only other producing company not included in the figures is the East Butte, and its output last month was about 900,000 lb. of copper.

According to information from a reliable authority, the proposed concentrator of the Boston & Corbin company will not be constructed until next spring, if at all, the whole matter hinging on the returns received from ore to be sent to different plants for treatment. There will be several carloads sent out and an effort will be made to ascertain exactly the kind of treatment which should be used. An interested party says that the money for the erection of the concentrator is in the treasury, but the directors feel that no false step should be taken in the way of expending the money.

The Little Annie of the Butte-Alex Scott company has been closed down. This mine was opened early in the summer and at once came into prominence through the discovery of some rich silver ore. Some shipments were made, and the result was so satisfactory that the company was believed to be on its way to a high state of prosperity. However, the directors did not feel justified in spending any money in sinking and opening up the orebody, so the mine was closed down. Regular shipments are being amintained to the East Butte smelter from the Alex Scott, although they do not amount to more than 30 tons per week.

Butte, December 9.

On December 8 the Pilot Butte cross-cut from the 1300-ft. level of the Black Rock shaft, in the North Butte section of this district, had penetrated 28 ft. in a large lode, mostly copper ore of commercial grade, and was not yet through the vein. The lode is believed to be the northwesterly extension of the Berlin vein of the North Butte company. No figures as to value have been disclosed, except that the ore is of commercial grade.

NEVADA

Esmeralda County

George Wingfield has released his option on the property held at Antelope Springs, of which the purchase price was to be $225,000. It is asserted that the terms of the option did not suit him.

Press reports state that there is renewed activity in the Cactus range district, 20 miles from Goldfield, and that three properties are making good showings. The ore is said to be similar to that of the Goldfield and Tonopah districts.

The Goldfield Con. M. Co. has declared a dividend of 30c. per share, payable January 31 to stockholders of record on December 31.

In addition to declaring the regular dividend of 30c. per share, the Goldfield Con. M. Co. has declared a special dividend of 20c. per share, payable on the same date. The company in the fiscal year ended October 31 earned about $400,000 in excess of dividend requirements. It is rumored that the company is seeking to buy another mine, although an early end to the Goldfield mine is not feared. The production for the fiscal year just ended is analyzed as follows:

Month 1910:	Tons.	Gross value.	Value recovered.	Net profit.	Net per ton.
November	24,956	$ 873,405.55	$ 817,756.13	$588,609.94	$23.60
December	25,550	746,761.00	709,069.86	488,708.00	19.13
Month—1911:					
January	27,692	798,177.24	742,980.28	552,626.95	20.32
February	23,675	973,730.78	913,684.43	719,325.04	30.38
March	25,714	1,119,951.75	1,064,068.54	846,283.13	32.91
April	28,253	1,061,496.53	1,010,073.91	796,151.64	28.18
May	29,450	962,110.35	909,441.12	679,537.16	23.07
June	28,540	923,472.87	874,180.20	646,830.48	22.67
July	29,253	848,429.44	802,117.06	582,021.68	19.89
August	30,580	910,477.60	862,661.80	634,658.42	20.75
September	26,766	676,383.20	636,888.00	444,366.25	16.60
October	30,626	860,153.81	819,858.02	616,141.87	20.12

Humboldt County

Preparation is being made for resuming development of the First National M. Co.'s and Mammoth National M. Co.'s properties in the National district.

Lyon County

The Empire property, including the old smelter building near the Yerington station, recently was sold at sheriff's sale. The principal stockholders in the company bought the property.

Reports from Yerington early in the week were to the effect that the new smelter at Thompson, Mason valley, would be blown in some time between December 15 and 20. The first shipment of copper ore from the Nevada-Douglas to the Thompson smelter was made December 1. This property is to deliver, according to a contract, 10,000 tons of ore per month to the new smelter.

In a statement to shareholders, W. Mont Ferry, president of the Yerington Central Copper Co., recently stated that unless a unanimous vote enabled the company to change its stock from non-assessable to assessable shares, the company would lose all its property at the suit of its creditors. The company owes on loans made by various stockholders $18,326 and to banks $46,200. No officials of the company have drawn salaries. It is believed the directors will not be able to sell the property. First mortgage bonds cannot be placed. The larger stockholders do not feel called upon to pay more than their share, pro rata, of the indebtedness. About $10,000 of indebtedness and interest must be paid this month, and the balance in February 1912. The property is considered valuable, and it is believed that some time it can be sold for enough to pay all indebtedness and yield a profit. Proxies are to be sent to Herbert M. Wells, secretary of the company, at Salt Lake City.

Nye County

The Berlin mine, which is reported to have produced $7,000,000 before the 1907 panic stopped development, is seeing renewed development, and the management believes that the present work will open up new orebodies. The tailing-dump is being treated at the Berlin mill with the cyanide process. The capacity of the mill is to be doubled in the near future.

The Shoshone Quicksilver Co. is preparing for active development at its property, at Ione, seven miles from Berlin. Only lack of railroad facilities is stopping active development in the North Bell M. Co.'s Richmond mine, according to late reports, as there is ore in sight. The nearest railroad point is Luning, about 50 miles from the property.

The shipments last week for the Tonopah district, according to a summary by the *Tonopah Miner*, amounted to 8376 tons, valued at $209,440.

Storey County

The Comstock mines last week, according to a summary made by the *Virginia Chronicle*, produced ore valued at $33,806. The Ophir made the largest production, with $21,349 to its credit. The Mexican produced ore valued at $7857, and the Crown Point ore valued at $4600.

White Pine County

There was a walk out of short duration recently of the men employed on the churn-drills on the Nevada Con. property at Copper Flat. The drillers were receiving $5, and the tool-dressers $4 for twelve hours on a nine-hour schedule of $4 and $3, and for a while objected to a ten-hour day on the same schedule.

In a report of the Ely Con. Copper Co. for the 11 months ended November 30, it is stated that the water, which gave some trouble in shaft-sinking, is now being handled with ease. Among other development, there was found near the 500-ft. level a vein between 5 and 6 ft. wide assaying on the average 3.84% copper and $1.10 gold and silver per ton. Westerly workings are in oxidized copper ore assaying nearly 6c. copper and $2 gold and silver per ton. The claims, about 370 acres, are valued at $10,326,997.

NEW MEXICO

Quay County

More than 100 claims have been filed during the past week, principally for the Bad Lands district, 13 miles east of Tucumcari. An abortive oil-boom was started in the district last summer, but now the mineral resources of the place are receiving renewed attention.

Socorro County

(Special Correspondence.)—The new power plant building for the Socorro mines is rapidly nearing completion. Some of the machinery for same has been delivered and considerably more is on the way. Ten of the Ernestine M. Co.'s new Allis-Chalmers stamps will be dropping this week and the erection of 10 more will be started. Mine developments continue showing up ore of a grade above the average in this camp. The bullion recovery for the last 10 days of November was 9480 oz.; four tons of concentrate was shipped in the period. The past week's ore reduction was 630 tons. The Treasure M. & R. Co. plant lately has had an abundance of water for power generation, aand the mine and mill have been operating at full capacity. About 70 tons is treated daily. The ore haulage crew will soon be equipped to transport between 80 and 100 tons per day from mine to mill, a distance of about three miles. Regular shipments are being made by the Oaks Company to the Deadwood mill from development on the Pacific, on which mine the adit was advanced 35 ft. during the week. A contract has been let by the Ann Arbor company for driving the main adit.

Mogollon, December 8.

OREGON

Benton County

(Special Correspondence.)—A general advance in the mineral output of the State and the development of mining into one of Oregon's leading industries, is the prediction of H. M. Parks, of the State Bureau of Mines, head of the Oregon Agricultural College School of Mines. A vast mineral wealth besides the gold, silver, and coal awaits capital and men to fit it for the needs of industry—such raw materials, for example, as soda, cement, and many other natural elements. Mr. Parks will shortly issue a bulletin from the Bureau of Mines showing the 1910 mineral output of the State to be worth $4,200,546, an increase of nearly $2,000,000 over the 1900 output. Gold, silver, granite, sandstone, limestone, clay, mineral water, copper, sand, gravel, lime, and gypsum are in the list of valuable mineral products of the past year.

Corvallis, December 9.

UTAH

BEAVER COUNTY

The Moscow M. & M. Co. has declared a dividend of 1c. per share, this being the second dividend. The first was paid September 15. There are 797,600 of the 1,000,000 shares issued. The company has been shipping about five cars of ore per month.

SAN JUAN COUNTY

The Bluff & Norwood company has 'brought in' the Galloway oil well in the San Juan district. Oil was found at a depth of about 1800 ft. in the Honaker sand. The company plans to erect a pump at once.

SUMMIT COUNTY

(Special Correspondence.)—Beggs & Miller, who are building a milling plant of 3 Wilfley tables and 24 MacQuisten tubes at Park City for the purpose of re-treating the tailing that has accumulated at the dry-concentration mill of the Grasselli Chemical Co., expect to have it ready to operate before the first of next year. This tailing consists of zinc and iron sulphide, lime, and silica. The first step in the process will be to pass the tailing over the tables for rough concentration; the middling resulting from this is to be treated in the MacQuisten tubes, by which the most of the lime will be eliminated and the iron content much reduced, leaving a tolerably clean concentrate that will run higher than 50% zinc. The lime passes out with the silica as tailing, and its separation from the zinc is important, because buyers of ores for zinc smelters regard the presence of lime as especially objectionable, and such ores as have been practically freed from lime find a ready market. This plant will have capacity to treat 35 tons per day.

Park City, December 11.

WASHINGTON

FERRY COUNTY

The Insurgent M. Co., owning the Insurgent claim at Republic, Washington, has just declared its fourth dividend of $2500, at the rate of 1¼c. per share. This brings the total of dividends paid by the company to date to $25,000, or 25% of the par value of its capital.

SPOKANE COUNTY

The Spokane Mining Men's Club, composed of operators in the four Northwestern States, has started a campaign for such reciprocal relations between the United States and Canada as will permit the free entry into this country of Canadian lead and zinc ore and products.

AUSTRALASIA

The Commonwealth Oil Corporation is operating at Newnes and in the neighborhood with a capital of $6,083,000, and the British Australian Oil Co. at Temi, near Murrurundi, in the Liverpool ranges, with a capital of $1,460,000, states the *Daily Consular Report*. Both are purely British-Australian ventures, financed and controlled from London. There are also Tasmanian ventures struggling valiantly, especially the Tasmanian Oil & Shale Co., at Latrobe, but they are said to be badly handicapped, owing to lack of capital. And without capital there is no hope of conducting successful shale oil mining and refining upon a commercial scale.

CANADA

BRITISH COLUMBIA

A. N. C. Treadgold is reported to have purchased all claims on Dominion creek, from Granville to Head creek. The placer ground extends for about 27 miles. The same report, from Dawson, states that he has acquired more than 100 claims on Hunker creek from the Hunker Development Co. The Treadgold company recently completed a four-mile conduit to supply water for hydraulic purposes from the Klondike river.

The Hedley G. M. Co. has declared its regular quarterly 3% dividend and an extra dividend of 7%. The strike of the coal miners has been settled, and the Granby Con. M. S. & P. Co. will resume operation at its Grand Forks smelter in the near future. The British Columbia Copper Co., Ltd., will resume development.

ONTARIO

According to an official statement by Ambrose T. Monell, managing director of the 'Big Dome' mine, there are two drifts at the 50-ft. level, one of which runs uniformly for 136 ft., assaying $28 per ton; the other, running parallel, assays $30, except for the last 20 or 30 ft., where it assays over $40. Below that level diamond-drilling has shown good ore, but the grade cannot at present be definitely announced. Under what is known as the 'golden stairway,' a diamond-drill put down 200 ft., showed high-grade ore. The diamond-drill cores, taken at points 1000 ft. apart and put down 200 to 750 ft., give varying results up to as high as $1000, but it is impossible to strike an average.

Press reports state that high-grade ore has been found at a depth of 200 ft. in No. 4 shaft of the McIntyre mine. The vein at that point is 24 ft. wide. The McIntyre mine is in the Porcupine district.

The Wettlaufer-Lorrain company of Cobalt has declared its regular quarterly dividend, payable January 5, of 2½%, and an extra dividend of 2½% payable the same date. The company's report showed that on November 27 there was $86,559 cash on hand; silver on hand and in transit, $99,677; total, $186,267. The liabilities were $30,050. The new mill is almost completed and should be in operation in a few weeks.

HAWAII

(Special Correspondence.)—Topographic surveys on the island of Hawaii have been begun by officers of the U. S. Geological Survey. The survey of Kauai has been completed and advance proofs of the map are now available. The final prints will not be ready for a few weeks longer. The scale of the map is 1 to 3160, and in style it follows closely those made on the mainland. The work has been under the charge of C. H. Birdseye, who has now gone to Washington but will return to the Islands in February. T. G. Gerdine, who has been inspecting the work in the Islands, announces that the survey of Maui will be begun in July.

Honolulu, December 1.

MEXICO

CHIHUAHUA

The Alvarado M. & M. Co. has acquired the Parral Power & Reduction Co.'s plant, a short distance from Parral, on the Parral y Durango railroad.

Messrs. Stallforth have given an option on the Sierra Madre property to an English syndicate. The price named is ₱100,000, states a report from Parral.

The Ginther interests have taken over the Refugio mine from the Refugio M. Co., on an option.

Important finds of gold ore are reported at the La Chamaquita and Las Palmas, Francisco Gomez y Socios properties. The vein yields ore assaying 4 to 5 oz. gold and 1½ kg. of silver.

Reports from Parral state that Pedro Romero and Everado Ortego have denounced ten *pertenencias* in the San Lorenzo district of Iturbide, naming their claims 'La Luz.' Isidoro Carbeo has denounced five *pertenencias* in the El Puerto del Arroyo Hondo, on the State line between Chihuahua and Sonora.

SONORA

The new reverberatory-furnace replacing and taking the name of the old No. 1 furnace of the Cananea Con. Copper Co. was placed in commission last week. This makes two new furnaces installed this year. Each is 17 by 100 ft. and has an arch in proportion. No. 1, however, is more strongly reinforced, and has a lighter steel-plate construction front, than the older No. 2 furnace.

Decisions Relating to Mining

Specially reported for the Mining and Scientific Press

Miners' Lien Priority

The president of a mining company purchased a stamp mill under a conditional sale contract and caused such mill to be erected and permanently affixed to the freehold at the mines of the company. Miners who performed work for the corporation owning the mines were entitled to liens on the stamp mill as the part of the freehold, the conditional agreement of purchase not being recorded was invalid to them where they had no notice of such condition.

Washburn *v.* Inter Mountain Mining Co., (Oregon) 109 Pacific, 382.

Who May Hold a Miners' Lien

Under the statute of Oregon a foreman at a mine whose business it is to see that the work of mining was done in different places, and who framed timbers and helped the men, took part in the erection of the mill and did other things generally to assist in the furtherance of the work, is not such an executive representative of the mining company as to preclude him from obtaining a miners' lien upon the property of the company for such services performed by him.

Washburn *v.* Inter-Mountain Mining Co., (Oregon) 109 Pacific, 382.

Mechanics' Lien on Mining Property—Filing

Where the mining property and all the improvements are in the hands of a receiver, and all the parties in interest are brought into court within four months after the date upon which material was last furnished or labor last performed under contract, this will be deemed a sufficient filing of the claim within the Oklahoma statutes and the court may adjust the rights of all lien-holders. And a statute authorizing mechanics' liens on improvements applies to a coal mine, as a coal mine is an improvement within the meaning of the law.

Peaceable Creek Coal Co. *v.* Jackson, (Oklahoma) 108 Pacific, 409.

Stock in Mining Corporations

The term "treasury stock" as used in the statute of Nevada which regulates the issuance by mining corporations of treasury and promotion stock and requires the stamping of certificates, means certain stock that is set aside for the actual development of the property, while "promotion stock" is that issued to those who may originally own the mining ground or rights connected therewith in consideration of their transferring the mining property to the mining company, but such stock as is issued to promoters for promoting the corporation of the company. But such statute had no application to any stock issued prior to April 15, 1909, when the statute went into effect.

State *v.* Manhattan Verde Co., (Nevada) 109 Pacific, 442.

Notice of Location of Mining Claim

The statute of Nevada does not require the notice of the location of a mining claim to be recorded. And a notice of location of such a claim, though not in strict compliance with the statute as a certificate of location, and therefore not evidence of the act of location, is admissible in support of a claim in adverse possession. The rule is that such a notice is not required to be strictly exact, and is not controlling, and that courses and distances given therein yield to the monuments erected on the ground. It is also the rule that the filing of a defective certificate of location, or the failure to file any certificate does not invalidate the claim. Neither does the fact that the end lines of a mining claim are not parallel invalidate the location, but only affects extralateral rights.

Gibson *v.* Hjul, (Colorado) 108 Pacific, 759.

Book Reviews

Any of the books noticed in these columns are for sale by or can be procured from, the Mining and Scientific Press

The Metric System. By A. D. Risteen. Pp. 196. The Hartford Steam Boiler & Inspection Co., Hartford, 1911. For sale by the *Mining and Scientific Press*. Price $1.25

Everyone who has had occasion to convert English weights and measures into their metric equivalents, and conversely, is familiar with the irritation produced by finding that the particular units required are not included in the tables at hand. But the tables in this handbook are so numerous that this annoyance will be reduced to its lowest terms. The book is of convenient pocket size and is well and strongly bound.

Electrical Mining Installation. By P. W. Freudemacher. Pp. 181. Ill. D. Van Nostrand Co., New York, 1911. For sale by the *Mining and Scientific Press*. Price $1.

This little handbook is especially intended for the use of colliery engineers and contractors, but also contains much that will be of service to the metal miner, who will be grateful for a brief presentation of the subject in its simplest terms. Some confusion may arise from the imprint of New York on the title page, for the author's references to "this country," and the legislative acts cited are evidently intended to apply to England.

The Design of Walls, Bins, and Grain Elevators. By Milo S. Ketchum. Pp. 556. Ill. Second edition, revised and enlarged. McGraw-Hill Book Co., New York, 1911. For sale by the *Mining and Scientific Press*. Price $4.

This book is one of the evidences of the high degree to which specialization has been carried in engineering. The somewhat bulky volume is entirely devoted to the analysis of the stresses due to granular materials, and their application to the design of structures for containing materials of this class. The admirable way in which this has been done is evidenced by the demand for a second edition of a work of such special interest. In the revision nearly 150 pages of new material has been added, and those portions of the book dealing with reinforced concrete have been rewritten. Though the discussion is chiefly of grain bins and grain elevators, engineers engaged in ore-dressing design and practice will find much that is of service to them.

Rock Drilling. By R. T. Dana and W. L. Saunders. Pp. 319. John Wiley & Sons, New York, 1911. For sale by the *Mining and Scientific Press*. Price $4.

This volume, compiled from data collected by the engineers of the Construction Service Co., is chiefly intended for civil engineers, most of the data bearing upon quarrying and river and harbor improvement work. The first three chapters, which deal with the general features of drilling, are of universal applicability, contain much that is new, and are well written and arranged. An exceedingly valuable feature of the book is the free use of diagrams and charts, in which a large volume of data is collated in a form which allows ready comprehension. Not so much can be said for the photographic illustrations, and it is difficult to perceive any significance for many of those used in chapter V. The accurate records of data upon many different kinds of work make the volume especially valuable; the 40 records of the cost of drilling given on pages 67 to 70, for example. These are not the usual bare figures, but are accompanied by all the other data necessary to obtain a proper conception of working conditions. The book will be of the greatest service to civil engineers, and mining engineers will find much that is useful in it. Fortunately the book-making has been done by professional publishers; too frequently volumes of this sort are privately printed, with the result that from poor arrangement of material the usefulness of the book is greatly decreased. The book, therefore, is a highly satisfactory one.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

L. D. **Ricketts** is in London.

W. J. **Loring** has gone to Burma.

Howard D. Smith is at Ely, Nevada.

R. **Gordon Walker** is in Mexico City.

H. S. **Denny** has left London for Mexico.

W. S. **Noyes** has returned to San Francisco.

Mark B. Kerr was in San Francisco this week.

R. S. **Rainsford** was in San Francisco December 10.

Dyke V. Keedy is in Texas on professional business.

James Douglas left London December 9 for New York.

Herbert P. Sawtell was in San Francisco on his way East.

T. G. **Gerdine** has returned to Sacramento from Honolulu.

J. **Malcolm Maclaren** left on December 14 for Valdez, Alaska.

R. T. **Bayliss** is expected in London from Mexico in January.

Z. **Cushing** was at Mazatlan, Mexico, and has gone to Honolulu.

Robert A. Bryce was in San Francisco, returning from Mexico City.

S. F. **Shaw** has removed from Los Angeles, California, to New York City.

Fred Searles, Jr., has been appointed geologist for the Goldfield Consolidated.

Gaston Claus will sail from New York for Havre on *La Provence*, December 21.

C. H. **Birdseye** passed through San Francisco traveling from Honolulu to Washington, D. C.

Robert H. Richards is spending a week at Hancock, Michigan, on professional business.

The address is wanted of M. J. **Silvia**, who before the earthquake and fire, lived in San Francisco.

C. W. **Goodale**, who stopped at Honolulu on his way home from Japan, arrived in San Francisco December 12.

Carl J. Stahl spoke to the mining men of Ouray on December 9 on the 'National Forests and the Prospector.'

George W. Schneider, professor at the Colorado School of Mines, visited Telluride and Ouray on December 8 and 9.

H. V. **Winchell** lectured before the Geological Club of the University of Minnesota, December 7, on 'Secondary Enrichment of Ore Deposits.'

George L. Mackenzie has resigned his position as senior examining engineer for the Tharsis Sulphur & Copper Co., Ltd., of Spain, and intends settling in California.

A. E. **Anderson**, of the E. I. Du Pont de Nemours Powder Co., delivered a practical talk on 'Recent Experiments in Explosives' to the mining men of Telluride on December 8.

O. **Bergstrom** has accepted the position of general manager for the Rea Consolidated Gold Mines, Ltd., and remains as consulting engineer for the Calaveras Copper Company.

Obituary

R. M. **Brereton**, a well known mining and civil engineer, died at his home at Woodstock, Oregon, on December 7, at the age of 78. Mr. Brereton was connected with the construction of the Calcutta-Bombay railroad from 1857 to 1870, and came to America in 1871. For a number of years he was identified with mining and irrigation enterprises in California and the Northwest, and was associated with the Jonathan Bourne mining interests in Oregon.

Market Reports

LOCAL METAL PRICES.

San Francisco December 14.

Antimony	11—11¾c	Quicksilver (flask)	44.50
Electrolytic Copper	14—15¼c	Tin	47—48½c
Pig Lead	4.70—5.65c	Spelter	7½—8¼c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50—9.75; large $7.50—8.50

METAL PRICES.

(By wire from New York.)

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Dec. 7	13.08	4.45	6.33	55⅜
" 8	13.08	4.45	6.21	55½
" 9	13.20	4.45	6.21	55¼
" 10	Sunday.	No market.		
" 11	13.30	4.45	6.21	55
" 12	13.40	4.45	6.21	55¼
" 13	13.48	4.45	6.21	55

ANGLO-AMERICAN SHARES.

(Cabled from London.)

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

	Dec. 7. £ s. d.	Dec. 14. £ s. d.
Camp Bird	1 11 3	1 10 3
El Oro	1 3 0	1 3 0
Esperanza	1 10 3	1 7 6
Dolores	1 5 0	1 5 0
Oroville Dredging	0 5 6	0 5 6
Mexico Mines	7 13 9	7 11 3
Tomboy	1 4 0	1 3 9

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing Prices. Dec. 14.		Closing Prices. Dec. 14.
Amalgamated Copper	$ 65⅜	La Rose	$ 4
A. S. & R. Co	73½	Mason Valley	11¾
Braden Copper	5⅝	Miami Copper	23
B. C. Copper Co	4⅝	Mines Co. of America	4
Butte Coalition	19⅝	Nevada Con	19
Chino	23¾	Nevada Utah	⅛
Davis Daly	⅞	Nipissing	7⅛
Dobie	⅞	Ohio Copper	1
Dolores	4	Ray Central	1⅞
First National	1⅞	Ray Con	16½
Foley O'Brien	½	South Utah	½
Giroux	4⅛	Superior & Pittsburg	16
Goldfield Con	5	Tenn. Copper	38
Greene-Cananea	8¼	Trinity	4¼
Guanajuato Con	⅜	Tuolumne Copper	3¼
Hollinger	12½	United Copper	1⅞
Inspiration	10½	Utah Copper	52⅜
Kerr Lake	2¾	Yukon Gold	3⅜

COPPER SHARES—BOSTON.

(By courtesy of J. C. Wilson, Mills Building.)

	Closing prices, Dec. 14.		Closing Prices Dec. 14.
Adventure	5	Mohawk	$ 48
Allouez	38	North Butte	25¾
Calumet & Arizona	60⅝	Old Dominion	47½
Calumet & Hecla	415	Osceola	101
Centennial	13	Parrot	12
Copper Range	53½	Shannon	10
Daly West	5⅝	Superior & Boston	3⅜
Franklin	10	Tamarack	27¼
Granby	33	Trinity	5
Greene Cananea, ctf.	8⅛	Utah Con	17
Isle-Royale	21¾	Victoria	2¼
La Salle	5¾	Winona	5
Mass Copper	7½	Wolverine	92

NEVADA STOCKS.

(By courtesy of San Francisco Stock Exchange.)

San Francisco, December 14.

Atlanta	$ .16	Mayflower	$ .02
Belcher	.40	Mexican	4.37
Belmont	8.25	Midway	.22
B. & B.	.18	Montana-Tonopah	.75
Booth	.06	Nevada Hills	2.35
Chollar	.08	Ophir	1.72
Combination Fraction	.16	Pittsburg Silver Peak	1.27
Con. Virgina	.78	Round Mountain	.55
Florence	.66	Sandstorm Kendall	.03
Goldfield Con.	4.95	Savage	.37
Gould & Curry	.08	Tonopah Extension	1.17
Jim Butler	.31	Tonopah of Nevada	6.95
Jumbo Extension	.22	Union	1.35
MacNamara	.28	West End	.77

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EDITORIAL

COLORADO citizens have an effective way of doing things, and elsewhere in this issue, Mr. Walter A. Koch describes the means taken by an earnest and progressive group of men to stimulate prospecting and the development of new mining areas in that State. We wish the Colorado Grubstake & Mining Company the fullest measure of success.

VERSATILITY is not the least of the characteristics of Mr. Thomas A. Edison, who has recently proposed to construct concrete houses at a cost of $1000 each, and provide them with concrete furniture for $200 additional. Presumably the settee used by the daughter of the house and her young man would be reinforced. But this is not all; Mr. Edison is about to devise a generic law which will take the place of the Sherman Act. Apparently, Mr. Edison considers himself the national 'Lady from Philadelphia.' Meanwhile we are still looking for the automobile which he was about to make so cheaply that none would be too poor to be able to afford one.

PLEAS for revision of the American mining law are becoming increasingly frequent, and there is a general feeling that the time is ripe for change. Committees from the American Mining Congress and the Mining and Metallurgical Society of America are giving the subject careful consideration, and it is expected that Congress will this year take at least preliminary steps toward revision. In Canada, as well as in the United States, the matter has been up, and an able committee has prepared a draft for a new law, which is soon to be submitted to Parliament. Any change made should take full cognizance of the past, and therefore the discussion of the mineral land laws of the United States by Dr. James Douglas, published on another page, is especially timely. As always, what Dr. Douglas has written is scholarly and well worth while. We commend it to our readers, reserving, for the present, our comment on the whole matter.

HONOLULU is at the cross-roads of the Pacific. Living at such a prominent meeting-place of lines of travel has its pleasures, but also imposes obligations. One of these, the duty of hospitality, the citizens of Honolulu take most seriously. To judge from the experience of a trans-Pacific traveler, life in Honolulu would seem to consist of one continuous round of gaiety. A Government engineer detailed for duty in the Islands complained humorously that he found no time for work. Evidently the tropics richly reward the skilled Anglo-Saxons who care to make them their home. There is no mining in Hawaii, though there is some quarrying, and just now especially interesting tunnel work is under way. Absence of any local mining engineers did not, however, prevent the Institute members returning from Japan from being received as among brothers. The Hawaiian Engineering Association arranged for them a visit by the Naval tug *Navajo* to Pearl Harbor, the new dry-dock, Fort Kamehameha, a sugar plantation and refinery, and a luncheon tendered by the Commercial Club of Honolulu. It was only the absence of mines that prevented the party from staying indefinitely.

IMPROVEMENT in the copper situation has been made much of during the past fortnight, and the present turn in the market is being hailed as marking the passing of the 'menace of accumulated stocks' and as ushering in an era of higher prices. There is no argument existing as to the conditions that have prevailed or as to the causes responsible for the conditions, but it is somewhat difficult to perceive which of these causes have been eliminated and what is to prevent a recurrence of the same conditions. If a reduced surplus is to make for higher prices, will not higher prices stimulate production to a point where accumulated stocks will once more constitute a heavy burden? Perhaps the underlying skepticism is most clearly shown in the share market, where under normal conditions the future is always forecast with remarkable accuracy and most quickly discounted. Notwithstanding the advent of a 14-cent copper market, advances in copper shares have been but nominal, in many cases there have been actual declines as compared with May last, when the metal was at the lowest figure for the year. The truth is that no small part of the difficulties apparent in the copper situation are not peculiar to copper. Business is generally depressed, and stable conditions must first be secured as a basis for increased prosperity.

POLITICAL conditions abroad have much improved during the week. The Moroccan situation is much easier, and the dispute between Russia and Persia is about to be amicably terminated. And in China an effective step toward peace has been taken in the presentation of a joint note by the United States, Great Britain, Germany, France, Russia, and Japan, pointing out the necessity for the restoration of stable conditions under some form of government. What this form will be, only those whose opinions are valueless are venturesome enough to prophesy as yet. The international relationships of China are extraordinary, and cannot be considered in the ordinary way. Such an action in the case of a civil disturbance in any other country would probably be regarded as an impertinence, but the foreign interests bound up with the material prosperity of China through the cohesive power of loans, put the matter in a different light. The Imperial Maritime Customs, the great source of revenue to the Peking government, has been practically under foreign supervision for years, and only recently has the Chinese Government obtained any large degree of control in its administration. Nations are remarkably like individuals, and if affairs in China are conducted in a way inimical to the financial interests of the great Powers, it is not improper that they should issue to themselves international letters of guardianship, though with proper foresight and the exhibition of diplomacy and tact it is to be hoped that such an outcome can be avoided. It is not too much to hope, then, that within a few months reasonably stable conditions in China can be restored. The critical problem is the securing of an adequate national revenue. This was formerly drawn from a variety of sources, such as tribute from the eighteen provinces, the salt gabelle, the maritime customs, and others. The total has long been barely sufficient to meet the current needs of the central Government, and the capital for national undertakings has been obtained through foreign loans, which have given rise to the present outbreak. Tribute from the provinces has been entirely ceased, and it is probable that no little difficulty will be experienced in securing its resumption. There appears to be a good deal of wrangling with regard to the form of State. The revolutionists, [illegible] to clear the way and [illegible] that the present [illegible] effect will be [illegible]. The [illegible] more [illegible] than [illegible] the gradual strengthening of the central Government [illegible] at best, be greatly set back by the outbreak [illegible] desirable but essential to the rapid, sound, and right development of the nation and the national resources. The problem of readjustment is also likely to be complicated by a famine, more widespread and distressing than that of last year, which threatens a large part of east central China during the winter and spring.

Merry Christmas

Christmas, appropriately enough, is a combination of pagan and Christian observances, thereby showing the universality of its appeal. The pagan element is kept discreetly in the background, much as New England spinsters have been known to modestly drape the 'limbs' of the piano. Nevertheless, it is always there, just as the pagan is an essential feature in the individual character. We are too civilized now-a-days, and we thereby lose much. Physically we cannot return to medieval conditions, nor is it even desirable that we should do so, but gain would accrue from some return to the mental atmosphere of the Middle Ages, and the lapsing of the stereotyped custom of gifts that too frequently are a source of but little pleasure to either recipient or giver. Joy is but a relative emotion, and may be less felt by the millionaire than by the humble miner who, in the content of mind resulting from an honest and honorable occupation, and with the hearty appetite derived from arduous though healthful labor, dines heartily off bacon, flapjacks, and coffee, while outside his cabin door stands his Christmas tree, powdered with real snow and lit with a thousand candles by the sun of Christmas day. Though its branches are but bare, we hope he may find its roots decked with the gold he seeks, and we wish him, and all our readers, a full measure of Christmas good cheer and a happy and prosperous New Year.

Foreign Trade and the Steel Corporation

The United States Steel Corporation has recently been discussed from numerous standpoints, but one of the most interesting contributions to current criticism is an article entitled 'A British View of the Steel Corporation' by Mr. T. Good, published in the *Atlantic Monthly* for December. The Corporation is a large institution, and we, who live close to it, labor under some difficulty in getting a general view. Mr. Good, from his vantage point of practical experience in the industry and residence in England, boldly sketches the outlines and fills in details, though, be it said, against a somewhat somber background. He gives high and deserved praise to the officers of the Corporation for having introduced economies in mining, transportation, and manufacturing, paid liberal wages and dividends, provided adequately for maintenance and for new construction of the highest type, and regulated prices and business. The old disturbing ups and downs of the steel business have disappeared, and Mr. Good points out what it is easy to forget, that while the Corporation refused to lower prices in 1907, it also prevented a runaway market in 1901 and 1902. The Steel Corporation has in fact been a magnificent experiment in the effect of regulation of prices. It has brought to our most important industry that benefit so much desired by business men, steady markets. It has made possible the planning of construction long in advance with definite knowledge of costs. Mr. Good echoes the usual American opinion that in the conduct of its business the Steel Corporation, while a 'trust', deserves a place among the 'good trusts.' None the less, he emphasizes strongly that even this 'good trust' has been bad for its home country, and in view of frequent discussion of a possible copper merger, his reasons have peculiar interest for miners and metallurgists.

Briefly, the British critic blames the United States Steel

Corporation with the admitted failure of Americans to capture that share of the foreign trade which seems naturally to belong to them. This failure is reported in the one particular direction in which success was most surely anticipated. From 1900 to 1910 the iron and steel exports from Great Britain increased from 3,213,000 tons to 4,594,000, those of Germany from 838,000 to 4,868,000, those of the United States from 1,154,000 to 1,535,000. At present steel plants in Germany and Great Britain are working nearly to capacity, while of our own about one-third capacity is idle. This is true despite the fact that many at least of the idle furnaces are large modern stacks that would seem able to produce at as low working cost as any. It will be recalled that immediately before the Steel Corporation was formed, American costs of manufacture of iron and steel were below European and that the export business of the United States was increasing by leaps and bounds. In the past ten years the cost of pig iron and steel in the United States has, admittedly, increased rapidly. Just how much, is not altogether certain, but it is not necessary to take as literal truth the gloomy figures presented by manufacturers at the tariff hearings, to be sure that the margin of 1900 has largely disappeared. American furnaces can not compete successfully for the foreign trade because their costs of manufacture, instead of being lower than those of competitors, are now higher, and it is pertinent to ask why.

Into the cost of iron and steel, as of other materials, three factors enter: fixed charges, materials, and labor. When the Steel Corporation was formed it was heavily capitalized. The common stock quite frankly represented the hopes of the promoters, and much at least of the preferred stock represented the crystallized hopes of those already in the business. The bonds and some of the preferred stock represented existing values. It will be remembered that the immediate occasion for the formation of the company was the threat of Mr. Andrew Carnegie to parallel the Pennsylvania railroad. Another strong factor was the growing conviction of the steadier business men that means must be found for eliminating such manufacturers as the late John W. Gates, whose antics (and no other word accurately describes them) were a constant menace to business. Mr. J. P. Morgan and his associates took the easy and simple method of buying everybody off. Each man was given his price and turned loose to his own devices. That extravagant prices were paid is well known, and he knows but little of the history of affairs who can not point to properties which cost their owners thousands but for which the Corporation paid millions. The managers of the new enterprise had, therefore, a difficult load from the first. It has been contended that since the birth of the Corporation surplus earnings have been so successfully reinvested in plants, ore, and lands, that there is now solid value back of all the outstanding securities. Even if true, this merely emphasizes the fact that selling prices have been loaded to permit any such accumulation of profits. At home the Corporation has been able to hold prices at a level that permitted this. Abroad, where prices have been fixed by cost of manufacture, it has been at a disadvantage and American trade has suffered. Since the bulk of the sales of the Corporation have been domestic, there can be no escape from the conclusion that whatever value there is now behind the common stock of the Steel Corporation, has been created by the American people by payments in addition to a fair return on the actual money invested.

Materials as well as money enter into the production of iron and steel. When the Corporation was founded it was well supplied with furnaces, but it had only a moderate hold in the Lake Superior iron-ore districts. The first move was to increase the ore reserve. This was done so successfully that for several years now the Corporation has dominated the Lake Superior region, which, in turn, has dominated the iron-ore situation in the United States. In the main, purchases were plainly with a view to obtaining ore rather than forestalling competition. An exception, possibly, was the case of the Great Northern lands which were leased upon terms extremely favorable to the owners. Notice has recently been given that this lease is to be terminated, and a review of its terms and the history of ore production under the lease, indicates that Steel Corporation officials, in signing it, were not only unduly optimistic as to future business conditions, but probably influenced by fear of competition. At the time it seemed a wise or at least a necessary move. Conditions have, however, changed. The Lake Superior ores no longer completely dominate the situation. The seaboard furnaces, which ten years ago seemed likely to be pushed off into the ocean, have found satisfactory ores abroad at prices that permit them to compete on equal terms. High-grade Swedish ore is now delivered to Atlantic ports at 8 cents per unit, equivalent to 9 cents at the furnace, while this year the basis price of lower-grade non-bessemer ore from Lake Superior districts, delivered to Ohio and Pittsburg furnaces, was but a trifle below 8 cents. The Maryland Steel Company has drawn 54 per cent ore from the new Cuban fields at a cost that equals only 5 cents per unit, and it is possible that even this price may be lowered. At the same time the Southern furnaces and Southern ores are much more highly regarded than they were ten years ago. The Corporation, therefore, has not obtained quite the dominance that was anticipated from its heavy investments in iron-ore land.

That the general cost of materials has gone up in the last ten years needs no argument, and materials used by the Steel Corporation have afforded no exception to the general rule. What, possibly, is not recognized, is that the artificial prices of iron and steel products, first fixed to cover promoters' profits, have reacted to raise the price of practically everything else. If railways pay a large price for steel rails and equipment, they must exact a large price for transportation; and the cost of freight, often absurdly multiplied, enters into the selling price of every article of general consumption. The Steel Corporation, manifestly, can not be loaded with the whole sins of the community, and has been victim as well as villain, but it is our largest business organization and its influence in the matter is far from negligible. The major influence, after all, has been psychological. The sight of the millions 'cleaned up' by those who sold properties to the Corporation or who obtained promoters' profits, the constant and frank statement of large current profits, set everyone thinking of the desirability of going and doing likewise. Demands for higher wages could not well be denied when the cost of living had admittedly increased and profits were palpably high. With a high interest charge and increasing cost of materials and labor, the managers of the Steel Corporation have drifted into the position where prices must be maintained, and they have been holding aloft a huge umbrella under whose protection has crowded a multitude of smaller concerns. We believe it is the general opinion of business men that the United States Steel Corporation has been managed with signal ability along lines of the truest business statesmanship. It has been a generous buyer, a liberal employer, and a fair competitor. Its public statements have been frank and full. Criticism is directed not at the conduct of the enterprise, but at its promotion. Its history and present difficulties emphasize the fact that, in business as in other relations, peace may cost more than it is worth.

Mine and Mill of the Brakpan Mines, Ltd.

By H. S. Gieser and C. A. Tupper

In this article the description of the mine is due to H. S. Gieser, while C. A. Tupper has contributed to the description of the mill. The property of the Brakpan Mines Ltd. is situated on the far east Rand, 21 miles from Johannesburg. It consists of deep-level claims opened by two 7-compartment shafts 4400 ft. apart in the direction of the dip. The No. 1, or north shaft, is 3100 ft. deep vertically; No. 2, or the south shaft, is 3700 ft. deep, at which point the reef was intersected. An incline with an average grade of 7½° connects the two, and from this six levels are driven in both directions. Underground haulage in the incline is effected by means of an endless rope.

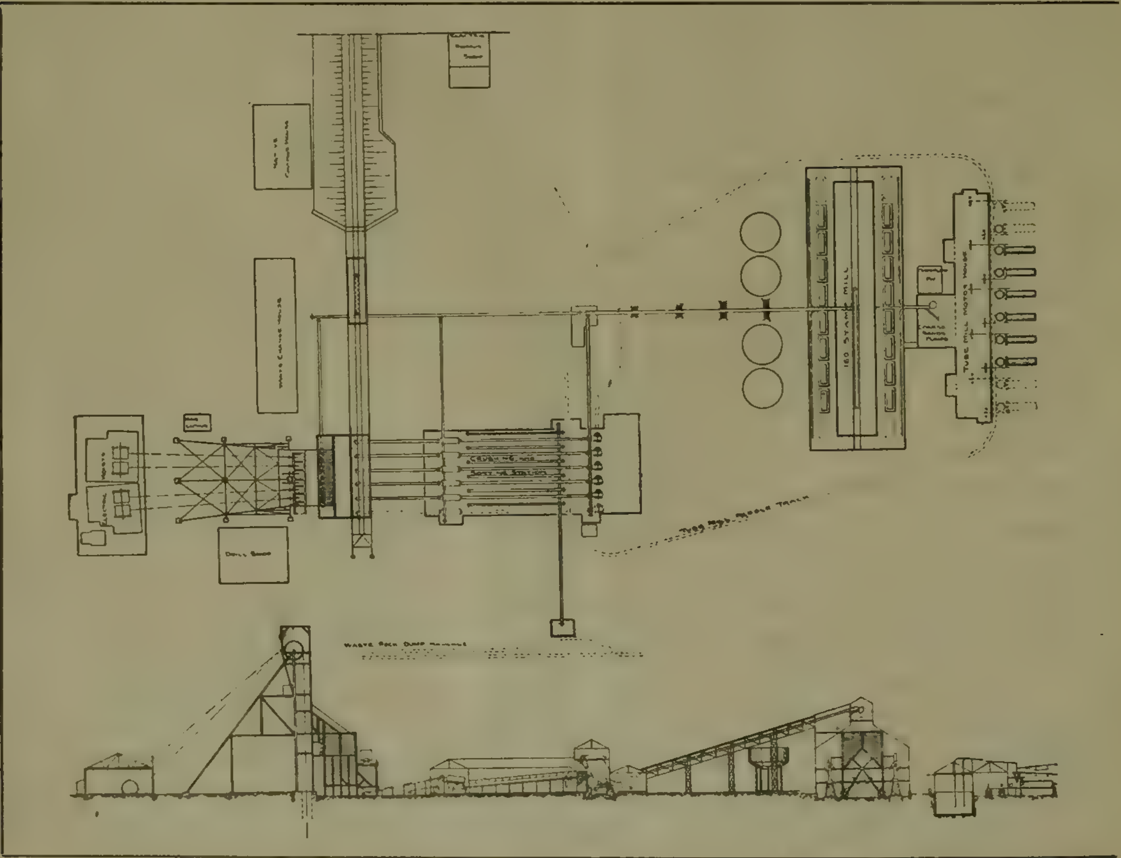
The electric power is purchased from the Victoria Falls & Transvaal Power Co., and is used throughout the plant, over 10,000 hp. being taken, distributed as follows: Main hoisting-engines, 4500 hp.; mine pumps, 1500 hp.; battery and tube-mills, 1950 hp.; reduction works pumping plant, 1000 hp. The remainder is used on the surface and for underground ventilation and haulage. All transmitting cables are paper-insulated, lead-covered, and armored, and are laid underground throughout, upward of 30,000 ft. having been placed. To a large extent they are laid on the ring system, thus preventing serious stoppage due to cable failure or damage. Power is metered to show the consumption for pumping, hoisting, milling, etc.; also, each pair of feeders is separately metered, enabling the supply to different departments to be closely checked.

The No. 2 shaft has 7 compartments, measuring 42 by 9 ft. over all. It is provided with a steel head-frame and is served by 2 electric hoists. One has parallel drums 11 ft. diameter and 8 ft. wide, and is grooved for 1½-in. rope. Tooth-clutches are provided for adjustment, also the standard type of liquid starter and automatic overhoisting prevention devices. The post brakes are applied by a dead weight relieved by air-operated cylinders with the ordinary cataract cylinder attachments. The second hoist, the main dimensions of which are the same as the other, is of the Ilgner system, with Ward-Leonard control, direct current, the motor generating-set being placed in a subdivision of the engine-room.

No. 1 shaft is equipped with a steel head-frame and a Ward-Leonard hoist similar to those erected at No. 2 shaft. All three hoists are 1500 hp. each and have a capacity of 100 tons per hour from a vertical depth of 3800 ft. The maximum hoisting speed is 3500 ft. per minute, and the average time for a complete trip is about two minutes.

The reduction plant has recently started operation, with 2,000,000 tons of 6.62 dwt. ore in reserve in the mine, where there is a stoping width of 55 in. Aside from pneumatic slime-agitation in Pachuca tanks, followed by vacuum filtration, with zinc-dust precipitation and subsequent filtration in Merrill presses, the features of interest include the following:

(1) Heavy stamps (2000-lb.), supplemented by eliminating screens at the back of the mortar-boxes; (2) multiplicity of service with the same centrifugal pumping units; (3) amalgamation following the tube-mill grinding only; (4) amplified and thorough classification, with simplified arrangements; (5) improved and simplified tube-mill feed; (6) sand treatment in accordance with the practice of separate collection, belt transfer, and the Blaisdell system of distribution in the treatment vats; (7) simple, direct, and efficient means of separating and conveying material; (8) aerial system of tailing disposal; (9) power consumption sep-



GENERAL ARRANGEMENT OF REDUCTION

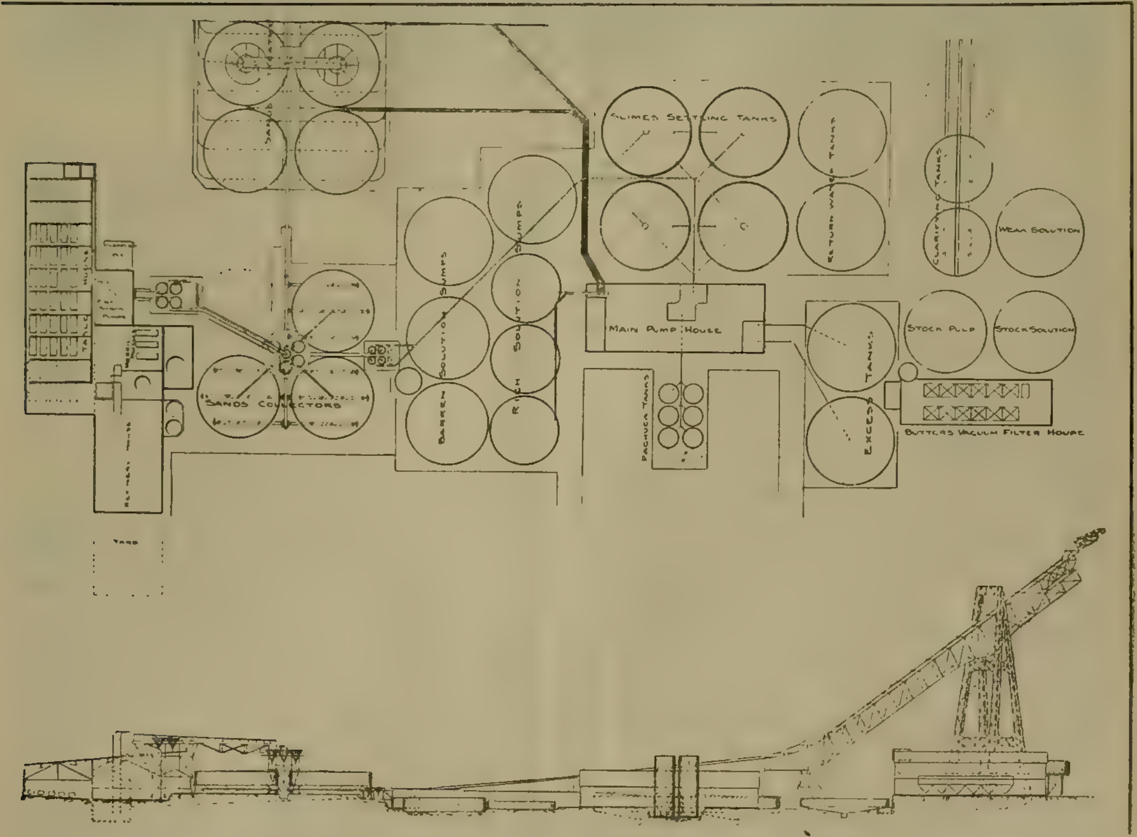
arately metered and kept relatively low throughout.

A surface tram runs from No. 1 shaft to No. 2, and delivery of ore, as hoisted, is all made at a point immediately adjacent to the latter. Here the fine ore from No. 2 is discharged into a hopper and thence to a conveyor to the mill, which is also fed from the fine-ore bin at No. 1.

PANORAMIC VIEW, BRAKPAN MINES PLANT.

The coarse ore from both shafts is dumped into a large holding bin. From this bin six parallel belts, five of which are in use, were provided for in the plans, to carry the material to the sorting and crushing plant, and each belt delivers its burden to a revolving trommel, whence the undersize falls to a feeder-belt of the mill-conveyor, and the reject passes to belts discharging to the crushers. From the latter, which are equipped with a dust removal system, the product is taken to the same mill conveyor carrying the fine ore from the shafts and the trommels. In the sorting shed are belts parallel with and slightly lower than the conveyors, upon which the waste rock is thrown, and these discharge at the end to a large belt-conveyor, running at right angles, which carries the waste to a bin, whence it can be hauled along the dump.

The main fine-ore conveyor, rising to the top of the mill, discharges on a transverse belt, extending the width of the 600-ton bin, which is provided with a tripper for evenly



PLANT, BRAKPAN MINES, LTD.

distributing the ore. From the bin the ore is delivered by suspended automatic feeders to 160 stamps, with heads 42 by $9\frac{1}{2}$ in. and stems $14\frac{1}{2}$ ft. by $4\frac{1}{2}$ in. The mortar-boxes are of the open-front type. The stamps weigh 2004 lb. each, of which 1076 lb. is in the head and shoe, and 928 lb. in the stem and tappets, and they are driven in groups of ten each. The stamps are arranged in two rows, with room at each end for an additional battery, the ultimate capacity of the mill to be 200 stamps.

The ore is crushed through a coarse eliminating-screen, at the back of the mortar-box, whence it is forced by two sand-gravel pumps (Robeson-Davidson) through pitch-lined launders to Caldecott diaphragm-cone classifiers or pulp thickeners. These deliver a product which contains only about 27% moisture. The spigot flow from the classifiers drops into steel hoppers, from each of which it passes to a Schmitt spiral tube-mill feeder. This is a feeder of a new type, originating on the Rand, which has already made a good record there. It is on the same general principle as the Pryce feeder, well known in South African practice, except that the pebbles for grinding in the mill may be fed in by belt, or in any continuous manner. It also permits lowering the classifier cone, and this enables the tube-mill to be erected with less allowance for head. Furthermore, the 'bayonet' joint of the older type is replaced by a plain flange. The feeder is lined with silex blocks, except in the outer ring or receiving drum, where a removable steel plate is used to prevent the sand from packing and retarding delivery of material to the spiral casing. The pebbles are selected in the sorting shed from pieces of a hard flinty substance forming part of the banket ore and are delivered in cars over a return track.

The plans of the mill, with 200 stamps erected, provide for 10 tube-mills, or one to every two batteries, but the initial installation consists of 6. These are $5\frac{1}{2}$ by 22-ft. Gates wet-grinding mills, 3 right-hand and 3 left-hand, made of heavy tank steel, with 6-in. silex lining. Manganese steel is used for the trunnion liners and ring liners of the feed end, and also for the discharge screen, these parts being the ones most subject to wear. In grinding, enough water is added to the contents to bring the moisture in the pulp up to 35%. Each machine is operated by spur gearing. This is placed at the outlet end to avoid the crowding together of the classifying, feeding, and driving arrangements at the head of the tube-mill. Each tube-mill discharges, through suitable launders, over five 5 by 12-ft. copper-plate tables, sloping 2.16 in. per foot. In the end of each table, and in the launder at the end of each set of 5 tables, is a cast-iron amalgam trap. The pulp from these plates flows to a sump, whence it is raised by Robeson-Davidson rotary pumps to return cone-classifiers, the overflow of which goes directly to the cyanide plant, while the spigot product is returned to two of the tube-mills for regrinding. The grinding machinery and accessories were erected under the supervision of Herbert Ainsworth, the South African representative of the Allis-Chalmers Co.

In the plans, allowance was made for four 60-ft. sand-collectors, three of which are now in service; and, by the interposition of suitable Caldecott cones, a relatively barren sand is delivered to them, the slime overflow being taken away through launders. Subsequently the remaining content of the sand is extracted as far as possible in 6 (of an eventual 10) treatment-vats, and the treated sand is discharged by hand into buckets, underneath the vats, of 22-cu. ft. capacity, holding about one ton, and automatically dumped by the Bleichert system of aerial sand haulage from the top of a cantilever (see illustrations), 210 ft. high, rising at an angle of 32°, driven by a 75-hp. motor. Adolf Bleichert & Co., of Leipzig and London, installed this system under a guarantee to dump sand at a cost not to exceed 3c. per ton. The buckets run on a monorail, are automatically attached to an endless rope, and can be dumped at any point on the circuit. The cantilever can be extended when the dump reaches the top.

The overflow from the sand collectors, and that from the cone-classifiers first above referred to, is re-treated in a third set of cones, the sand from which is returned to the collector cones. The slime is distributed to four settling-tanks and thence pumped to six Pachuca tanks, each 15 by 45 ft. After 4 hours agitation, the direction of the pump suction is reversed by by-passing and the valves in the pipe-line set so that the pulp flows to a stock-pulp tank. From the latter it is taken for treatment in a vacuum-filter plant of the Butters type. At this point there are placed the stock-solution tank, stock and surplus-pulp tanks, solution-storage tank, and others required in the system. There are two sets of Butters filter-boxes, each containing 6 sections of 28 leaves each, or a total of 336 leaves. Each leaf is 5 by 10 ft. A vacuum-pump draws the gold solution through the filter-frames.

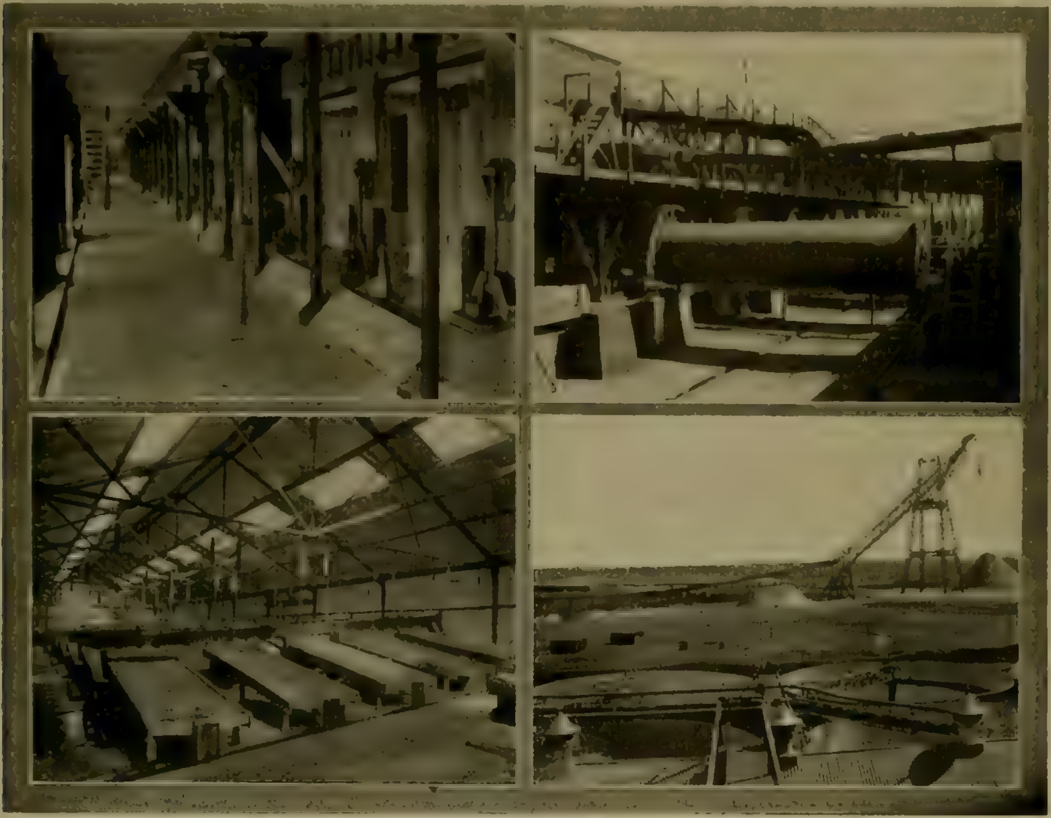
Two sand-filters, each used alternately, are provided for clarifying the solution from the Butters filter, which is then delivered to the gold-solution storage and afterward pumped to filter-presses in the refinery. As the solution is drawn off, zinc-dust emulsion is fed into it automatically and continuously. The filter-presses, of which there are three, each containing triangular frames, are of the type invented by C. W. Merrill, who first used the system when metallurgist for the Homestake mines, Lead, South Dakota. From these the gold-bearing zinc slime is conveyed to acid-vats and subjected to the customary treatment. Adjacent to the Merrill presses is the plant for recovering the gold from the amalgam and precipitate, and the apparatus for refining. The equipment includes, in part, a reverberatory-furnace capable of taking twenty No. 100 pots, and a calciner to take eight 3 by 2 by $\frac{1}{2}$-ft. trays. There are three barrels for black sand treatment, whence the product passes to a batea amalgamating-plate and 2 by 2 by $\frac{1}{2}$-ft. settling-bins. The amalgam from the batea is pressed in a couple of $4\frac{1}{2}$-in. presses, and sent finally to a set of standard Fraser & Chalmers retorts. It is a noteworthy feature that, in the construction and equipment of the entire plant for ore reduction, the estimates originally made by the engineer were closely approximated, an excess in any one direction having been balanced in another.

In June of this year, when over 2,000,000 tons of 'payable' ore and half as much lower-grade ore had been blocked out, with the levels 500 ft. apart and stoping well in progress on all except the 9th and 12th levels, the stamp-mill made a preliminary run of 18,133 tons, yielding 4310 oz. of fine gold, valued at £18,087, the low yield being due to the absorption by amalgamating-plates and in cyaniding usual to the starting of a new plant. The working costs, including all overhead burden and 1s. 6d. per ton milled for development, the same as for all figures given below, amounted to £20,936. An operating loss of £2849, therefore, resulted.

In the following month, July, the figures were as follows: 100 stamps and 3 tube-mills running; 27,906 tons of ore hoisted and 4626 tons taken from the dump, representing stoping and development; with waste sorted, 25,400 tons milled; fine gold recovered, 9594 oz., value £40,352, or 31s. 9d. per ton milled; working costs, 21s. 10d. per ton milled; profit, 9s. 11d. per ton milled. Owing to certain favoring conditions not likely to be duplicated in subsequent operations, this recovery was conservatively rated by the management as above normal. But in August the record again improved. The ore milled, with 100 stamps and as many of the tube-mills as required, running 25 days, was 35,051 tons; ore hoisted, 27,946 tons; ore from dump, 9401 tons; waste sorted; fine gold recovered, 12,149 oz., value £51,102, or 29s. 2d. per ton milled; costs, 17s. 5d. per ton milled; operating profit, 11s. 9d. per ton milled.

In September, with 100 stamps and 6 tube-mills in operation 28 days, 40,753 tons of ore was milled, as follows: ore hoisted, 38,173 tons; ore from dump, 9650; waste sorted; fine gold recovered, 13,139 oz., value £55,071, or 27s. per ton milled; operating costs, 16s. 10d. per ton milled; operating profit, 10s. 2d. per ton milled.

During October, with 100 stamps and 6 tube-mills in operation for 30 days, 42,089 tons of ore was milled, 43,176 tons having been hoisted, 6889 tons taken from the dump, and the waste sorted out. The fine gold recovered was 13,125 oz., valued at £55,070, or 26s. 2d. per ton milled. The operating costs were 16s. 7d. per ton, yielding a profit of 9s. 7d. per ton milled.



MORTAR BOXES. TUBE-MILLS.
PLATE HOUSE. TAILING STACKER.

The management of the Brakpan Mines, Ltd., is to be commended for the fact that, besides blocking out large ore reserves in advance of milling, it has apparently not attempted to make an impression of economy by niggardliness in expenditure. On the contrary, the construction and equipment all bears evidence of having been planned with a view to permanent investment, so far as any mining enterprise can be considered permanent. Building materials, for example, were mainly restricted to iron, steel, concrete, and brick. Furthermore, ample provision is made for repairs and maintenance, and for the welfare of employees, including a native compound and hospital, and the company bears its share in all work for the good of the district as a whole. It is also a member of the Consolidated Mines Selection Company's Recruiting Agency, and has been successful in obtaining a good grade of Kaffir labor. Among contributions made with other companies is one for the maintenance of the Miners' Phthisis Sanatorium.

For the excellent results already obtained credit is shared with F. L. Bosqui and W. L. Honnold, by their assistant, C. E. Knecht, J. F. Cook, consulting mechanical engineer, A. J. R. Atkins, mill superintendent, and especially the general manager, C. B. Brodigan, as well as others to whom supervision of the various details has been entrusted. When operating to its maximum capacity, as sufficient ore is mined, the plant will exceed the estimate of 60,000 tons per month originally made for it, particularly in so far as the stamps and tube-mills are concerned; and it is reasonable to believe, from the experience already had, that the remainder of the equipment will do its proportionate part.

The Colorado river discharges during an average year, into the Gulf of California 338,000,000 tons of mud and silt as suspended matter. In addition to this the dissolved substances in the water include 4,550,000 tons of sodium chloride, or common salt; 3,740,000 tons of sodium sulphate; 4,000,000 tons of lime; 2,400,000 tons of gypsum; and 4,800,000 tons of magnesium sulphate. In spite of all this dissolved material the Colorado at its mouth is not considered to be a stream of unusually high mineral content for that region of the country. The reason is that the river carries so enormous an amount of water that the dissolved salts constitute a comparatively small proportion of the total discharge. Other streams in the country contain dissolved salts in greater concentration; for example, Elm fork of the Red river, in Oklahoma, discharges nearly 1,300,000 tons of common salt annually. Although this amount is not so great as that discharged by the Colorado it is much greater in proportion to the size of the area drained. The discharge of salt from the Colorado is equal to 20 tons annually to each square mile drained by the river, but the salt in Elm fork of Red river is equal to 1680 tons per square mile of area drained. The same river discharges annually 177,000 tons of magnesium chloride, 168,000 tons of magnesium sulphate, 690,000 tons of gypsum, and 54,000 tons of lime. These quantities, too, are considerably greater than those carried in the Colorado in proportion to the size of the drainage area. The Belle Fourche river, at Belle Fourche, South Dakota, discharges 191,000 tons of gypsum, 79,000 tons of sodium sulphate, and 236,000 tons of magnesium sulphate. The mud and silt carried in suspension by this river amount to 1,100,000 tons. Milk river at Havre, Montana, discharges annually 41,000 tons of soda; Payette river, in Idaho, discharges 46,000 tons; Salt river at Roosevelt, Arizona, discharges 288,000 tons of salt and 170,000 tons of magnesium sulphate; and the Rio Grande 245,000 tons of lime and 386,000 tons of sodium sulphate.

The United States is the largest individual producer of lead in the world, with a total of 372,227 out of a world's output of 1,211,411 short tons.

The Mineral Land Laws of the United States

By James Douglas

*While the homestead laws continue to meet with popular approval, it is very generally recognized that the laws under which desert land, and those under which coal, mineral, timber, and stone lands can be secured, should be radically amended. These laws were all passed with the object of stimulating mining and quarrying, and encouraging the reclamation of the country's desert districts. Some of the measures erred in the direction of over-liberality, while others were framed to put, as it was hoped, the minerals as well as the land into the possession of the poor man, and prevent their being monopolized by wealthy corporations. But in every case the policy was to develop the natural resources as speedily as possible and induce population to enter. The policy, has succeeded so far beyond anticipation that if the legislators of a generation ago had been able to foresee the rapidity with which wealth would grow, and the national resources be proportionately used up, they might have hesitated to frame measures as generous as those which have attracted to the country the most enterprising spirits of all Europe, and to have afforded to men of magnificent powers of imagination and organization, aided by great wealth, the material for creating huge enterprises, which it is now found more difficult to control than it was to create.

In the colonies before the Revolution the title to the common minerals passed, under the common-law rule, to the owner of the soil, and the colonies, when they entered the Federation, retained control of these lands. But the mineral lands owned by the United States after the Revolution were disposed of under three statutes.

1. An Ordinance (May, 1785) entitled "An Ordinance for ascertaining the mode of disposing of lands in the Western Territory," which was of the vaguest character.
2. The Lode Law of 1866.
3. The General Mining Law of 1872, known as the law of the apex.

There was substantially no mining done in the United States till the purchase of Louisiana and the acquisition of the lead mines of Missouri, which had been one of the most alluring baits of Law's Mississippi scheme. As a result of the Louisiana purchase, a law was passed in 1807 to the effect that "the President of the United States shall be and is hereby authorized to lease any lead mine which has been or may hereafter be discovered in the Indian Territory for a period not exceeding five years." The leasing of mineral lands was entrusted to the War Department, but it did not impose on it a heavy burden till 1845, when, after the extinction of the Michigan Indian titles in 1843, active mining commenced in the native copper deposits of Lake Superior. For two years only, subsequently to 1845, the system of leasing was carried out. It was the system inherited from the mother country, but badly practised when applied on the large scale by inexperienced officials.

In his interesting address to the American Institute of Mining Engineers on 'A Century of Mining,' Abraham S. Hewitt† tells of the process by which the leasing system was supplanted by the out-and-out purchase system:

"For a few years the rents were paid with tolerable regularity, but after 1834, in consequence of the immense number of illegal entries of mineral land at the Wisconsin land office, the smelters and miners refused to make any further payments, and the Government was entirely unable to collect them. After much trouble and expense, it was, in 1847, finally concluded that the only way was to sell the mineral land, and do away with all reserves of lead or any other metal, since they had only been a source of continual embarrassment to the department.

"Meanwhile, by a forced construction (afterward declared invalid) of the same Act, hundreds of leases were granted to speculators in the Lake Superior copper region, which was from 1843 to 1846 the scene of wild and baseless excitement. The bubble burst during the latter year; the issue of permits and leases was suspended as illegal, and the Act of 1847, authorizing the sale of the mineral lands and a geological survey of the district, laid the foundation of a more substantial property."

It may be doubted whether reform of the working of the leasing system, instead of its abolition, would not have been a wiser course; but the radical step of alienating absolutely the mineral lands was recommended by President Polk on December 2, 1845, and enacted into law, and the copper lands of Michigan were offered for sale at $5 per acre, the price at which mineral lands have ever since been disposed of. The principal argument adduced by President Polk for the change of policy was the unprofitableness of leasing. He said:

"According to the official records, the amount of rents received by the Government for the years 1841, 1842, 1843, and 1844, was $6354.74, while the expense of the system during the same period, including salaries of the superintendents, agents, clerks, and incidental expenses, were $26,111.11, the income being less than one-fourth of the expense. To this pecuniary loss may be added the injury sustained by the public in consequence of the destruction of timber, and the careless and wasteful manner of working the mines."

But President Fillmore, in his annual message to Congress on December 2, 1849, referring to the application of the land laws to the newly-acquired territory of California, gives as the most logical reason for the out-and-out sale of the public lands, that "the relation of debtor and creditors between the citizens and the Government would be attended with many mischievous consequences." The public feeling in favor of actual ownership of land has always been strong.

The first mining excitement followed the first successful effort to mine the metallic copper of Lake Superior, and, as we have seen, the result was the adoption of the sale in preference to the lease system. The next modification of importance followed the rush for gold in California, then a remote area, newly acquired by conquest and subsequent treaty. To meet local exigencies, a mining code was framed by the miners, through methods curiously illustrative of the working of popular institutions.

When California was occupied by the United States the Mexican mining laws were in force, and till 1849 the conquered province remained under military rule. Colonel Mason, the governor, while still ignorant that the treaty of Guadaloupe Hidalgo had been signed on February 2, issued the following proclamation from Monterey on February 12, 1848:

"From and after this date the Mexican laws and customs now prevailing in California relative to the denouncement of mines are hereby abolished.

"The legality of the denouncements which have taken place, and the possession obtained under them since, till the occupation of the country by the United States forces, are questions which will be disposed of by the American Government after a definite treaty of peace shall have been established between the two Republics."

Without questioning the right of Colonel Mason to revoke arbitrarily the existing mining law, the miners obeyed, and framed rules and regulations, not only for regulating the conduct of mining, but for the mode of acquiring the mines themselves, although all of them were virtually trespassers on the public domain.

Hence arose the custom, afterward embodied in the United States statute, of allowing miners to create a mining district and constitute themselves into a legislative body, whose rules and regulations, if not contrary to either Federal or State or Territorial laws, have a binding obligation. These self-constituted legislators in California followed the Mexican code so far as it applied to discovery

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*Excerpt from an address on 'The Industrial Progress of the United States,' delivered before the Royal Society of Arts, London, November 22.

†*Trans.* Amer. Inst. Min. Eng., V. 181.

and development, but they introduced into their mining code a principle which had no place in any modern mining statute. To them the ownership of the surface was subsidiary to that of the lode, or quartz vein, which might happen to crop out at any given spot. Therefore they conceded to the owner of the outcrop the right to follow his discovery to any depth, and under the 'dip, spur, and angle clause' of their amateur regulation, created extralateral rights and introduced the law of the apex, which came to be the distinguishing feature of the statutes passed in 1866 and 1872, and which has remained unaltered till today. This anomalous law of the apex was apparently copied from an old custom confined to the High Peak district of Derbyshire, and probably incorporated in the California mining code at the suggestion of some English miners. Judge Field, who was ultimately elevated to the Supreme Court of the United States, but who had been one of the pioneers of California—an *alcalde* before the admission of the State—a legislator in the first Assembly, and a State judge, thus graphically describes the process by which these mining regulations were framed by these early intelligent miners:

"The discovery of gold in California was followed, as is well known, by an immense immigration into the State, which increased its population within three or four years from a few thousand to several hundred thousand. The lands in which the precious metals were found belonged to the United States, and were unsurveyed and not open by law to occupation and settlement. Little was known of them further than that they were situated in the Sierra Nevada mountains. Into these mountains the emigrants in vast numbers penetrated, occupying the ravines, gulches, and canyons, and probing the earth in all directions for the precious metals. Wherever they went they carried with them that love of order and system and of fair dealing which are the prominent characteristics of our people. In every district which they occupied they framed certain rules for their government, by which the extent of the ground they could severally hold for mining was designated, their possessory right to such ground secured and enforced, and contests between them either avoided or determined. These rules bore a marked similarity, varying in several districts only according to the extent and character of the mines; distinct provision being made for different kinds of mining, such as placer mining, quartz mining, and mining in drifts and tunnels. *They all recognized discovery*, followed by appropriation, as the foundation of the possessor's title, and development by working as the condition of its retention. And they were so framed as to secure to all comers within practicable limits absolute equality of right and privilege in working the mines. Nothing but such equality would have been tolerated by the miners, who were emphatically the law-makers, as respects mining upon the public lands in the State. The first appropriator was everywhere held to have, within certain well defined limits, a better right than others to the claims taken up; and in all controversies, except as against the Government, he was regarded as the original owner, from whom title was to be traced. * * * These regulations and customs were appealed to in controversies in the State courts, and received their sanction; and properties to the value of many millions rested upon them. For eighteen years, from 1848 to 1866, the regulations and customs of miners, as enforced and molded by the courts and sanctioned by the legislation of the State, constituted the law governing property in mines and in water on the public mineral lands."

The Argonauts not only carried to the west coast the habits of self-government which were the heritage of the race, but carried them into practice with the same independence and originality as characterize most of the legislation of the colonists of Australia.

The rapid development of the Comstock Lode, after its discovery in 1859, rendered the framing of a Federal mining law a matter of necessity, and therefore in 1866 Congress enacted the first law under which a Federal title could be obtained to Federal mining land. The provisions of the Act are as vague as its title: "An Act granting the right of way to ditch and canal owners through the public lands, and for other purposes." Lindley says (I, p. 63):

"The title gives no clue to the scope of the Act. As a matter of fact, the title belonged to another Act which had passed the House, and for which the Mining Act was substituted in the Senate, without any attempt to change the title, and in this form passed both houses."

The Act provided:

"1. That all the mineral lands of the public domain should be free and open to exploration and occupation;

"2. The rights which had been acquired in these lands under a system of local rules, with the apparent acquiescence and sanction of the Government, should be recognized and confirmed;

"3. That titles to at least certain classes of mineral deposits or lands containing them might be ultimately obtained."

The Act, however, which is still in force is that passed in 1872 as "An Act to Promote the Development of the Mining Resources of the United States." The Act expresses decisively the liberality with which the country has disposed of its mineral lands, and the result has certainly justified its title and intent. The Preamble states:

"Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled: 1. That all valuable mineral deposits in land belonging to the United States, both surveyed and unsurveyed, are hereby declared to be free and open to exploration and purchase, and the lands in which they are found to occupation and purchase, by citizens of the United States, and those who have declared their intention to become such, under regulations prescribed by law, and according to the local customs or rules of miners, in the several mining districts so far as the same are applicable and not inconsistent with the laws of the United States."

The extent of the mining claim is prescribed as follows:

"A mining claim located after the passage of this Act, whether located by one or more persons, may equal, but shall not exceed, one thousand five hundred feet in length along the vein or lode; but no location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim located. No claim shall extend more than three hundred feet on each side of the middle of the vein on the surface, nor shall any claim be limited, by any mining regulation, to less than twenty-five feet on each side of the middle of the vein at the surface, except where adverse rights existing at the passage of this Act shall render such limitation necessary. The end lines of each claim shall be parallel to each other."

The extralateral rights of the early California regulation are secured to the locator under the Federal law, under the third clause of the Act:

"That the locators of all mining locations heretofore made * * * shall have the exclusive right of possession and enjoyment of all the surface included within the lines of their locations and of all veins, lodes, or ledges, throughout their entire depth, the top or apex of which lies inside of such surface lines extended downward vertically, although such veins, lodes, or ledges may so far depart from a perpendicular in their course downward as to extend outside the vertical side lines of the said surface locations; provided, that their right of possession to such outside parts of said veins or ledges shall be confined to such portions thereof as lie between the vertical planes drawn downward as aforesaid, through the end lines of their locations, so continued in their own direction that such planes will intersect such exterior parts of said veins or ledges. And provided, further, that nothing in this section shall authorize the locator or possessor of a vein or lode which extends, in its downward course, beyond the vertical lines of his claim, to enter upon the surface of a claim owned or possessed by another."

Whether granting these extralateral rights has advanced the progress of mining is a disputed question, but they have been the source of most protracted and costly litigation.

The Act prescribes the manner in which a mining claim must be monumented and recorded, and the amount of work which must be actually done upon it, either above or below ground per annum ($100 worth) in order to secure possessory rights. No rent or royalty is exacted by the Federal Government, but after $500 has been expended on the claim, the possessory title may be converted into an absolute patented title by payment of $5 per acre. The Act is admittedly defective in many of its provisions, but it would be foreign to my purpose to discuss its shortcomings. My object is to emphasize the motive which actuated the people, through their legislators, in throwing open all their lands, agricultural and mineral, not only to occupation, but to actual ownership by citizens or by anyone who has "declared his intention to become such." Under the Homestead Act the agricultural land is given freely; under the mining law no charge is made for the possessory title, and for a patent to a mining claim the trifling price of $5 per acre, hardly enough to meet the administration cost of the Land Department. Considering the incalculable hidden mineral wealth of the Western half of the continent, it is not to be wondered at if the active spirits of the world accepted the cordial invitation to share it on such liberal terms, and that it has been uncovered, developed, and marketed with such extraordinary speed, at extravagant profits to some, and that it has created spasms of speculative mania which have not had a healthy effect on public morals.

Mining companies are permitted the liberal allowance of 5000 acres, but if a company reaches its limit, the same shareholders simply organize another. Metal mining, therefore, on a large scale can be carried on without evasion of any law.

Most of the coal and iron is mined east of the Missouri, and possession therefore passed to the owners of the land. But the gold and silver, and most of the copper and lead, is produced in the Rocky Mountain States under the liberal Federal laws which we have described. The sum total in value for 1909, as given by the United States Geological Survey, is as follows:

Non-metallic products	$1,132,417,033
Metallic	753,427,290
Unclassified	300,000
	$1,886,144,323

The value of the metals in 1910 is given as $791,702,857.

Assuming the most modest estimate of actual profits on this large sum, we begin to appreciate the wealth that is accumulating in the country. Nor does this all fall to the lot of the shareholders of the large mining companies. If we take, for instance, the 2,000,000 acres of mineral lands which have been sold by the Federal Government, by far the largest proportion has been first located by prospectors and sold at often high figures. The poor man has been given the prospects, by the Federal Government, while the corporation has paid him the higher value of a promising though perhaps undeveloped holding. Comparatively little actual mining is done by the poor man. He avoids doing more than will give presumptive value to his claim, and even if it proves to be a claim which may develop into a mine, he obtains for it a high speculative return.

The Law of Co-ordination and the Cost of Delays

A surprising amount of the time of men and machines is spent, in almost any work of construction, waiting for something else to be done. The cause is improper co-ordination of work. While the law of co-ordination of work is not the first of the laws of management engineering, it is by no means the last. It may be seen from actual records how much waste time, delays waiting on some other construction operation may count into. Such a record is at hand in the latest report of the Isthmian Canal Commission. Besides giving the unit costs of all the major items of construction during the twelve months reported on, this report records the performance of several of the largest plant units employed. These records give the total time plant was under pay, the time consumed by delays of various sorts, and the output of work done per unit of time under pay and per unit of actual working time. A careful study of every item of these performance data will repay the labor.

From the records of delays it is seen that the total delays to plant and the delays due to 'waiting' were, in percentages of the total time the plant was under pay, as follows:

Purpose of plant:	Total delays, %	Delays waiting. %
Rock crushers, Porto Bello	27.34	7.10
Main mixing plant, Gatun	40.57	33.34
Auxiliary mixing plant, Gatun	40.57	37.86
Unloading cableways, Gatun	50.57	24.21
Unloading derricks, Gatun	50.92	26.24
Concrete placing cableways, Gatun	27.04	17.59
Rock crushers, Ancon	25.80	3.15
Sand unloading cranes, Balboa	29.41	26.14
Mixing cranes, Pedro Miguel	27.60	21.39
Mixing cranes, Miraflores	37.75	8.08
Concrete placing cranes, Pedro Miguel	32.56	23.15

Of the eleven plants recorded, only one was able to work more than three-quarters of the time it was under pay; two were not able to work half the time they were under pay. Delays of one sort or another consumed from 25.8 to 50.92% of the nominal working time of the plants recorded. Delays, waiting for some co-ordinate task to be performed, consumed from 3.15 to 37.86% of the nominal working time of these plants. In only three cases were delays waiting less than 10% of the time named, and in only four cases were they less than 20 per cent.

The vital significance of the figures quoted cannot be easily overlooked, but they nevertheless deserve emphasis. What has been the increased cost of concrete work at Panama, due to these delays? Probably no one can say exactly. No one, on the other hand, can doubt that it has been considerable. A cableway, or a derrick, or a concrete-mixer is not costing quite as much when waiting for work with steam up and the gang standing ready, as it is when actually carrying load, but the difference is not very great. Every stoppage of a mixer or cableway or any other tool under pay costs money and adds to the unit expense of production. It being true that delays increase the cost of production, then the converse is true that the elimination of delays decreases the cost of production. All delays cannot be eliminated. There will always be break-downs of machinery and stoppages from other unavoidable causes, and no series of construction operations can be so perfectly co-ordinated that there will not be some waiting of one on another. Good management, however, can reduce the number of delays due to almost any ordinary cause, and every reduction saves money.

The fact that is here shown to be true at Panama will be found to be true on almost any piece of construction work. Workmen and machines spend a considerable portion of their time waiting for something else to be done, or for materials with which to work. The various operations required are not in co-ordination. What are the causes of this lack of co-ordination? They are many; some of them are unavoidable, but most of them can be avoided entirely or in great measure. Lack of a carefully-drawn schedule of performance is one cause. There is no timetable to guide the performance of the various working units or to disclose when any unit is ahead of or behind time. Another cause is irregular arrival of materials and supplies to the workmen and machines. Failure to keep the plant in good repair, resulting in the break-down of a machine upon which workmen or other machines depend, is a third cause. Still another cause is improper quality of supplies, poor steel for the blacksmith, or poor coal for the boilers. The list of minor causes is much longer, but, like those named, they are ordinarily all susceptible of being in great measure eliminated.—*Engineering-Contracting.*

The Sinaloa Mining District

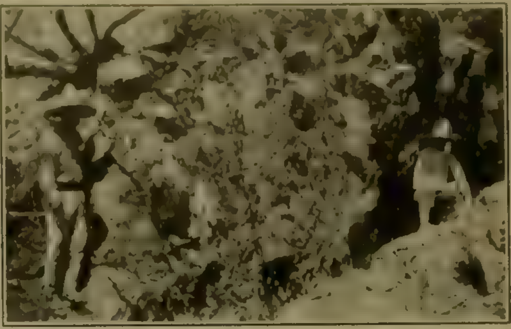
By G. L. Sheldon

The Sinaloa mining district is due south of the Fuerte and north of the Mocorito district, in the State of Sinaloa, Mexico. The county seat, Sinaloa, on the river of the same name, is an old town with a population of about 2000. Bamoa, a station on the Southern Pacific railroad Mexican system, about 14 miles south, and across the river, is the nearest railroad point. The western half of the district extends to the Gulf coast and is an agricultural area. The eastern half is in the foothills and Coast range section, extending to the Chihuahua State line, north and south from San Jose de Gracia.

STREET BOOTHS, SAN JOSE DE GRACIA.

At Bacubirito, 20 miles east of Sinaloa, the river makes a large bend, 6 to 8 miles long, and at the narrow neck, only about 300 yd. wide, the river bed, it is claimed, carries a good deal of placer gold. About twelve years ago considerable gold was taken from it, including numerous nuggets of good size, one of $4\frac{1}{2}$ lb. At the neck of a tunnel could be driven that would carry the water of the river during the low-water stage, and the bed below could be cleaned to bedrock. The tunnel would give a 70-ft. fall on the downstream side and generate a large amount of electric energy. A few years ago Messrs. Yard and Hughes did some work on the placer benches above the river, near Bacubirito, putting in a small pumping plant. Five years ago some Philadelphia people put up a small mill on a gold property near the river, between Bacubirito and Sinaloa. The San Jose de Gracia section is the principal one in the district that has received attention, because of the high gold content of its veins; this has been recently described in the *Mining and Scientific Press.*

Twelve to fifteen miles west and north of San Jose is an old silver district where several mines in past years have produced and shipped considerable high-grade silver ore. Ten years ago the San Jose mine was worked by an American, and some shipments of good ore were made, but the owner lacked capital to properly develop it. It is in a mountainous country. North and east of this, at Alisos, on San Jose creek, near its head, are several prospects carrying gold and silver. Thirty miles east of San Jose, near San Vicente on the river, during the past two years, a new discovery has been made. The vein is 30 to 40 ft. wide and shows a gold content of \$10 to \$50, with some copper; the vein can be traced several miles, and shows mineralization. Many locations have been made upon it, but so far it is but little developed. About ten miles above San Vicente, on the river near Torrogueno, Don Zarapo Lopez owns the Torrogueno gold property. This is 2000 ft., above the river in the andesite—a good 9-ft. quartz vein. Two years ago some Americans did some work upon it, but quit for want of funds, it is said. South from Torrogueno, near the divide between the districts of Sinaloa and Badirahuato, is the La Colorada mine, worked thirty years ago to a considerable extent. This is a 10 to 15-ft. vein carrying silver. Two years ago a waterspout completely covered the old works with débris, as it is in a small gulch. West of this and south down the river, on the east side, is a large limestone area which has many known prospects, mostly silver, with not sufficient development to demonstrate their value. In the vicinity of Bacubirito the veins contain mostly gold.



TORROGUENO VEIN, SINOLOA DISTRICT.

Northwest of Sinaloa, 12 or 15 miles, is Ocoroni, on the river of the same name, known above the Yecorato river. Four miles above this place is a lead-silver district which, while known for many years, has only received attention since the advent of the Southern Pacific railroad. Many claims have been located and considerable work done during the past year or two; for a distance of several miles there is a very good showing on a vein or veins, from 10 to 40 ft. wide, carrying 10 to 70% lead, good silver content, a little gold, and in some places zinc and copper. It was examined two years ago by an engineer who had several years' experience in the Coeur d'Alene in its early days, who thought the showing here was as good as that on the surface. It is only 20 miles by wagon-road from the station of Naranjos, on the Southern Pacific railroad, where it crosses the Ocoroni river. On account of its good transportation facilities and the urgent need of lead ores on the west coast for fluxing purposes, it is a promising lead district. Above it a few miles is an old silver-mining camp with ruins of old *haciendas*, where the ores were treated years ago. While the Sinaloa district is not as large as the Fuerte there is no doubt of its containing much good ore, and in time more than one producing mine will be opened.

SAN JOSE DE GRACIA MILL BEFORE ERECTION OF CYANIDE PLANT.

The San Jose de Gracia is probably the best small gold district in the State. The lower agricultural country is fully equal to the valley of the Fuerte, and with its rich silt soil probably surpasses it. There is abundance of water in the Sinaloa and Ocoroni rivers for irrigation purposes.

The world's production of zinc during 1910 was 883,419 short tons, and the consumption 882,573 short tons. In the United States the production was 269,184 short tons, and consumption 245,884 short tons.

Boyer Copper Deposits, Nevada

By Arthur Howe Carpenter

The Boyer property was located by Alva Boyer, a pioneer ranchman and prospector of Nevada. He has disposed of interests to others, but still retains the control. This deposit occurs near the contact of a flow of andesitic porphyry over an earlier mass of green andesite. The earlier mass is provisionally classified as 'melaphyre,' more in the sense of meaning black or dark porphyry, a use of the term proposed by Chamberlain and Salisbury. It is a dark greenish andesite with rather abundant white crystals of feldspar. Magnetite, augite, and olivine occur. The overlying eruptive was called an 'obscure trachyte' by Clarence King, whose Fortieth Parallel Survey passed over the property. Following the proposed scheme of classification, this might properly be called 'leucophyre.' It is not trachyte. It has a rough fracture, the ground-mass is even and uniform to the eye, and the only crystals certainly visible are clear tabular sanadine.

The contact lies flat, dipping about 20° to the northwest. The white porphyry is the base upon which the thick series of basalt flows make a long high table-land called Table mountain. These flows of basalt have the same dip as the contact, suggesting that the white andesite was intruded after the basalt flows, but the dip of these old lava beds is more probably due to faulting and folding. The mass of white porphyry outcrops for about four or five miles in an easterly direction, and the dark melaphyre outcrops below it for the same distance. There are a number of copper prospects along this contact and near it in addition to the Boyer group, which is near the west end, and some of these deposits near the eastern end might repay prospecting. Chalcopyrite and chalcocite intermingled occur, almost at the surface. However, on the Boyer, the deposits seem to be the strongest and most abundant. Near the eastern end of this white andesite belt the nickel and cobalt mines of Cottonwood canyon occur, which are described by F. L. Ransome on pp. 55 to 58 of Bulletin 414, U. S. Geological Survey. These mines attracted a great deal of attention thirty years ago by producing rich cobalt ores, which were shipped to Swansea. At the prices then paid, some of the ore brought over $1000 per ton. At either end these andesitic flows disappear against massive rhyolite hills and mountains, while several miles farther south a similar outcrop occurs with copper veins capped with pure hematite.

The main workings at present on the Boyer property are on Treasury Box hill, about 200 ft. below the contact and in the altered zone in the melaphyre. The copper was evidently deposited at the time of the eruption of the white andesite. The heat and steam accompanying this flow altered the upper two hundred feet of the underlying melaphyre, forming at the base of the altered zone a hard and impervious layer with a peculiar banded structure. This forms the foot-wall of the copper deposits, which lie in the 200 ft. of altered material above, and below the contact with the overlying andesite. In many places throughout the altered zone, small dikes of the white porphyry occur, shooting off from the main body. In places just above the contact, small iron-capped veins are seen coming up through the leucophyre. When followed these veins lead to massive chalcocite disseminated in a gangue of breccia, pieces of the pure black sulphides half as large as a man's hand having been occasionally found. Massive bornite, tenorite, and cuprite occur also, mixed with the two carbonates, melachite and azurite, making small rich deposits of ore. If followed, it is thought that these oreshoots will lead to the larger deposits that may lie at the contact and in the altered zone below it. At one place, from a deposit occurring at the surface (almost exactly at the contact), several large wagon-trains were loaded with rich copper sulphides and oxides, in 1861, and taken to Sacramento overland. The old shallow pits are still to be seen, surrounded with the piles of refuse, where was cobbed out the richer ore. Samples of these piles assay 29% copper. These rich ores carry 5 oz. of silver and traces of gold. Every other occurrence of copper ore on the property, when carefully assayed, seems to carry about 20c. gold per ton for every per cent of copper present.

The main work on Treasury Box hill was done in a bed of copper-bearing andesite about 100 ft. or more in thickness. The ore is chalcopyrite disseminated through the melaphyre, and the lower 30 ft. of the bed averages from samples obtained, wherever it has been opened, nearly 5% in copper and $1 in gold and traces of silver. Owing to lack of funds, it has been impossible to continue the development work as far as the contact, which dips in the direction the prospecting adits have been driven, but when this development work is done, interesting results may be obtained.

About a mile of the contact is included within the limits of the property, and throughout this distance it is possible to find ore in the altered zone in the melaphyre below the contact. At three other places besides on Treasury Box hill the surface indications are promising, and, in fact, at few of the well known copper properties of the West are the outcrops of copper-bearing rock more extensive. Large masses of carbonate ore exist assaying about 1.5% copper, and in places it is much richer.

The ground explored by the adit is badly faulted, so that it has not been possible to develop a continuous bed of ore, but it is thought that a bed of copper ore once existed over 100 ft. thick, 200 ft. wide, and, measured along the line of the dip, 500 ft. or more in length. Owing to the many faults, however, there are only blocks of ore lying at different levels, and not all of them have been opened. The dimensions given are simply the limits of the present exploratory work, and there is not so much ore actually developed. It is only possible ore. But there is reason to believe that the lower 30 to 50 ft. of each of these broken blocks will average over 4% copper. There is also reason to hope that the beds will continue down along the plane of the contact in the altered zone. The richer beds may be wider than this, but this is a matter of speculation. Naturally it is not thought that all of the altered zone beneath the contact is as rich in copper as this bed. The whole of it, however, seems to be copper-bearing, but most of it will be too low grade for profitable mining. Other beds will likely be found as rich and extensive as the one opened on Treasury Box hill, and the ore-bearing zone should continue as far down as the contact between the two porphyries and the beds of valuable ore prove strong and permanent. This ore zone lies so that several thousand feet of it, perhaps, underneath the white porphyry and back from the outcrop, could be prospected with churn-drills, though many of the holes farther back would have to go quite deep.

The ores are primary, and there is little or no secondary enrichment, nor has there been much chance for it. Large areas of the copper-bearing rock have been leached barren near the surface. The ground-water line does not seem to lie very deep now, however, and springs come to the surface in the contact and near it, and in places above it. In his general description of these properties Mr. Ransome refers to the occurrence of pyrite, but, so far as known to me, after a residence of nearly a year at the property, no pyrite occurs, all the sulphide ore consisting of chalcopyrite. This carries almost the theoretical content of copper, several pure specimens having been carefully analyzed. The general trend of the belt described by Ransome is the same as that described here, but it is not actually over 200 ft. wide.

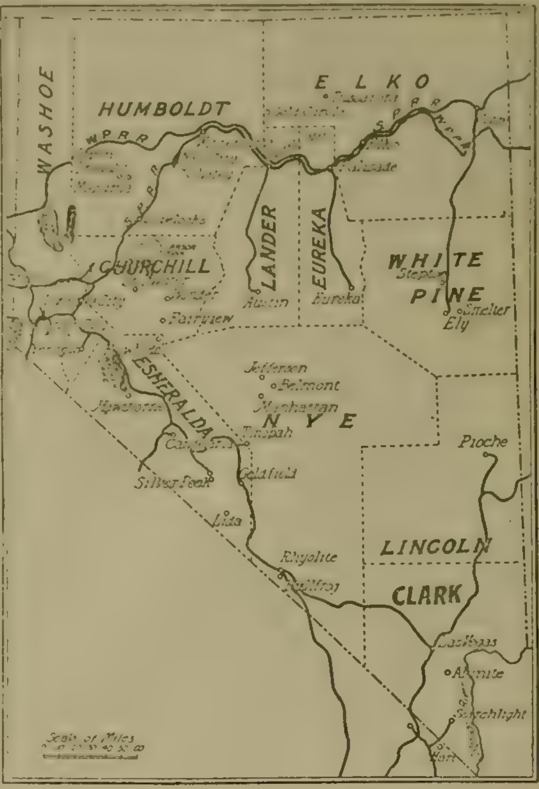
Chalcopyrite is hard to concentrate, as it slimes badly in crushing. Several concentration tests made with Wilfley tables, however, gave a recovery of 70 to 80% of concentrate assaying over 20% copper, which is high for such an ore. It is therefore apparent that no difficulties exist like those encountered at Yerington. The ore is an ideal one for oil flotation processes, and a test made with a laboratory machine gave the wonderful result of 92% recovery in concentrate assaying 30% copper.

There are over 1000 acres in the group [illegible] [illegible] in Dixie valley, two or three [illegible] [illegible] [illegible] sites are held. Plenty of water can be had in the flat or valley, and it is probable that [illegible] water can be developed. In the centre of the flat a number of springs come to the surface. In the next valley to the east, flowing artesian wells thirty years old exist. That valley is said to be 500 ft higher than Dixie valley, which is the lowest in Nevada, and, according to King, the point in front of the property is the lowest in the interior basin, so that water cannot get away. Everywhere in the centre of the flat water seems to stand permanently about 6 ft. below the surface. At the old borax plant, formerly operated there, they were not able to lower it below this point in a well, using a 4-in. triplex pump operated with a gasoline engine. The lower portion of this flat is occupied by the great Ossobb salt marsh, fully described by King. The whole valley is really a rock-bound lake, full of rock, silt, and clay of Quaternary times, and covered with the débris from the old lake floor. Water stands on the salt beds most of the year. The springs are fresh water. It is about 75 or 80 miles to either Battle Mountain or Winnemucca, both on the Southern Pacific railway. In going to either place there are no mountains or other barriers to cross. Winnemucca would probably make the better point for shipping and serving this section.

On Treasury Box hill about 500 ft. of work has been done, adits, drifts, raises, and winzes. Other parts of the group have received less attention. At one point about one-half mile north of the Treasury Box workings a shaft was put down into the melaphyre at the contact. They intended to drive from the bottom of this shaft back into the contact. This shaft cannot be explored now. It is supposed to be 170 ft. deep and passed through a bed of copper ore said to be 17 ft. thick, of oxides and carbonates. A sample taken from the ore piled on the dump assayed 15% copper with a little silver. The story among the local miners is that they actually drove toward the contact from the bottom of the shaft, but when they approached it, the ground got soft and, owing to the use of too few timbers, forty feet or more of the drift suddenly caved, becoming filled with decomposed rock, mud, and water. It is said that this water coming from the breast of the adit was greenish from copper salts, and that picks and shovels left standing in it became coated with metallic copper. An adit was then started farther down the hill to cut under the shaft and meet the contact lower. It was never finished, though about 800 ft. was driven. This could be cleaned out and driven through, but it was not laid out with any idea of future work and is on the wrong side of the hill, so that any ore developed would be inaccessible and costly to move. A shorter adit from the opposite side would cut the contact more quickly and develop more promising territory.

The property is a promising prospect. There is no large tonnage of ore blocked out at present. Probably 70,000 tons is all that can be counted as probable ore so far developed in the sulphide zone on Treasury Box hill, and much of this is low-grade concentrating ore. The adit through this zone averages 1.70% copper. This was driven at the time the porphyry copper mines were so fashionable, and this is a 'porphyry copper mine' in the sense that the gangue of the ore is an eruptive rock and the sulphides are disseminated through the rock. But it is chalcopyrite, not chalcocite, and while the grade compares well with the copper content of the ores at Ely and Bingham canyon, in America at least, no one has so far attempted to exploit primary ore deposits of this character. At present it is remote from railroads. However, local conditions are favorable for cheap mining operations, once a railroad reaches the district. There is reason to expect that the Southern Pacific company will build a line or 'cut-off' from Battle Mountain to Hazen through this valley. This will shorten the distance across Nevada by the present route 49.3 miles, but necessitates the construction of a long tunnel, about six miles. There would be no other mountain ranges to cross and an almost level grade can be had. The estimated cost of this construction is much less than the cost of the Lucin 'cut-off' across Salt Lake, and the distance saved would be much greater.

The copper belt of the Piute range of mountains is about ten miles long and a number of other prospects occur north or south. On one group a vein or deposit outcrops about 100 ft wide. An adit has been driven to cut this, but, so far, has only entered the foot wall. The breast of the adit is in decomposed rock, badly stained with iron oxide. It will cut the vein about 200 ft. below its outcrop, and, I believe, will open a valuable deposit. There are a number of veins or zones extending the whole length of the ten miles, easily noticeable from a distance out on the flat, on cloudy days, as dark bands along the mountains. These are siliceous irony outcrops, 50 to 100 ft. wide, and the zone in which they occur is 2000 or 3000 ft. wide. Whenever closely examined, copper sulphide, oxide, and carbonates are found, and it is likely that important deposits of copper will be discovered below. However, the ore of this region is chalcopyrite, and, until the secondary ores of Bingham, Ely, and the great Arizona 'porphyry' copper mines become scarcer, it is not likely that attention will be turned to these primary ores. But, sooner or later, the disseminated chalcopyrite ores that occur in large masses will attract attention, and it is from these deposits that future copper supplies of the world will be drawn. When that time comes, with the advent of a railroad, this region will become a copper producer of no mean importance.



MAP OF WESTERN NEVADA.

THE Straits Settlements Land Office returns show that during 1910 the area alienated for mining in Perak amounted to 10,464 acres. These figures show a considerable advance on those of the preceding year. There was some activity in mining in the Kinta district. In face, however, of the increased area alienated for mining in the year, the total area held under mining titles is said to have been reduced by about 3000 acres; the labor conditions have been enforced with some stringency, and there have been fairly numerous applications for the conversion of mining titles into agricultural.

Deterioration and Spontaneous Heating of Coal in Storage

By Horace C. Porter and F. K. Ovitz

[*]Not many years ago, coal was commonly regarded as an extremely unstable material, subject to very serious alteration and losses on exposure to the elements. The 1889 edition of Groves & Thorp's 'Chemical Technology of Fuels' says: "In some places coal is known to lose 50% of its heating value in six months." Other statements like this are to be found in recent literature, but probably the great majority of chemists and engineers today hold no such exaggerated ideas on the subject. There is, on the other hand, a well defined suspicion, in the minds of many, that sufficient loss of volatile matter and sufficient deterioration by oxidation does occur in coal to be of industrial importance; and for that reason the investigations described in this paper were undertaken, by the Bureau of Mines, to determine accurately the extent of the deterioration in different types of coal. First, a study was made in the laboratory of the loss of volatile matter from crushed coal during storage. The results of these experiments have been published in Technical Paper No. 2, Bureau of Mines, entitled 'The Escape of Gas from Coal,' and will therefore not be given here in detail. Suffice it to say that while several coals evolve methane in large volume, especially in the early period after mining, the coal suffered in one year a loss in calorific value from this cause of but 0.16% as a maximum. It seems, therefore, that the loss due to escape of volatile matter from coal has been greatly overestimated.

At the instance of the Navy Department, however, which is a purchaser of coal to the extent of two or three million dollars annually, and stores large lots in warm climates for long periods of time, more elaborate tests were undertaken to determine the total loss possible in high-grade coal by weathering. The extent of the saving to be accomplished by water submergence as compared to open-air storage was a point to be settled, and there had also arisen the question as to whether salt water possessed any peculiar advantage over fresh water for this purpose. Coal-storage problems have assumed importance during the past few years on account of the uncertainties of supply due to strikes and transportation difficulties. The naval coaling-stations, the Panama Railroad Co., the commercial coal-distributing companies of the Great Lakes, large coke and gas or power plants at a distance from the coalfields, and the railroads themselves, particularly those in the West, keep 50,000 to 500,000 tons in storage a large part of the time.

In brief outline, the tests by the Bureau were carried out as follows: Four kinds of coal were chosen: New River, on account of its large use by the Navy; Pocahontas, as a widely used steaming and coking coal in the Eastern section and as being also the principal fuel used in the Panama Canal work; Pittsburg coal, as a type of rich coking and gas coal; and Sheridan, Wyoming, sub-bituminous, or 'black lignite', a type much used in the West. Every test portion was sampled each time in duplicate. Moisture, ash, sulphur, and calorific value determinations were made on each sample, the last by means of the Mahler bomb calorimeter and a carefully calibrated Beckman thermometer. All the calorific values in the tables have been calculated to a comparable unit basis.

The results show in the case of the New River coal less than 1% loss of calorific value in one year by weathering in the open. There was found practically no loss in the submerged samples, and fresh water seemed to 'preserve the virtues' of the coal as well as salt water. There was almost no slacking of lump in the run-of-mine samples, and the crushed coal, in all cases, deteriorated more rapidly than run-of-mine. The Pocahontas run-of-mine, in a 120-ton pile on the Isthmus of Panama, lost during one year's outdoor weathering 0.4% in heating value, and suffered little or no physical deterioration of lumps. The Pittsburg gas coal, during six months outdoor exposure, suffered no loss whatever of calorific value, measurable by the calorimetric method used—not even in the upper surface layer of the bins.

The Wyoming coal lost as much as 5.3% in one of the bins during 2¾ years, and 3.5% even in the first three months. There was bad slacking and crumbling of the lumps on the surface of the piles, but where the surface was fully exposed to the weather this slacking did not penetrate more than 12 to 18 inches in the 2¾-year period.

No outdoor weathering tests have been made by the Bureau on coal of the Illinois type. Thorough tests, however, on this type have been reported by S. W. Parr, of the University of Illinois, and by A. Bement of Chicago, both of whom find from 1 to 3% calorific loss in a year by weathering. Mr. Bement reports a slacking of lumps (in tests on small supplies) of over 80% in one case and about 12% in another. It is probable that in this type, as in the Wyoming, the slacking in a large pile would not penetrate far from the surface.

Storage under water unquestionably preserves the heating value and the physical strength of coal. But it practically necessitates firing wet coal, and therefore means the evaporating in the furnace of an amount of moisture varying from 1 to 15%, according to the kind of coal. This factor is an important drawback to under-water storage with coals like the Illinois and Wyoming types, which mechanically retain 5 to 15% of water after draining, but in case of the high-grade Eastern coals, if firemen are permitted, as is ordinarily the case, to wet down their coal before firing, "so as to make," as they say, "a hotter fire," then the addition during storage of the 2 or 3% moisture which these coals retain would be of little consequence. Submergence storage is an absolute preventive of spontaneous combustion, and on that account alone its use may be justified with some coals, but merely for the sake of the saving to be secured by avoidance of weathering, there does not seem to be good ground for its use.

Losses in coal due to spontaneous heating are a much more serious matter. Oxidation, probably in the main an absorption of oxygen by the unsaturated chemical compounds in the coal substance, begins at ordinary temperature in any coal, attacking the surfaces of the particles, thus slowly developing heat. In a small mass of coal this slowly developed heat can readily dissipate itself by radiation, and no rise in temperature results. If radiation is restricted, as in a large pile densely packed, the temperature slowly rises. Now, the curve of oxidation rate, plotted against temperature, rises with great rapidity; and when the storage conditions are such as to allow a certain point (near 100°C.) to be passed, the rate of oxidation is great enough ordinarily so that the heat developed overbalances the heat radiated, and the temperature will rise to the ignition point if the air supply is adequate. The importance, therefore, can be seen of guarding against even moderate heating in the coal, either from internal spontaneous causes or by radiation from external sources. Increased loss of heating value and of volatile matter occurs at moderately increased temperatures, even though the ignition point is not reached.

The amount of surface exposed to oxidation in a given mass depends on the size of the particles and increases rapidly as the fineness approaches that of dust. Dust is therefore a dangerous thing in a coal pile, particularly if it is mixed with larger-sized coal which form air passages to the interior. Spontaneous combustion is brought about by slow oxidation in an air supply sufficient to support the oxidation but insufficient to carry away all the heat formed. There is a wide variation among coals in friability. In comparative rattler tests under certain standard conditions, Pocahontas, New River, and Cambria county, Pennsylvania, coals produced nearly twice as much dust (through ⅛-in. screen) as a sample from the Pittsburg bed. This is a large factor in spontaneous combustion. Mixed lump and fine, that is, run-of-mine, with a large percentage of dust, and piled so as to admit to the interior a limited supply of air, make ideal conditions for spontaneous heating.

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[*] Presented, by permission of the Director, Bureau of Mines, at a joint meeting of the New York sections, Amer. Chem. Soc., Amer. Electrochem. Soc., and the Soc. of Chem. Ind., New York, November 10, 1911.

High volatile matter does not of itself increase the liability to spontaneous heating. A recent circular letter of inquiry on spontaneous combustion sent by the Bureau to more than 2000 large coal consumers of the United States has brought 1200 replies, of which 260 report instances of spontaneous combustion, 220 of them naming the coal. Of these 220, 95 referred to semi-bituminous low volatile coals of the Appalachian region, and 55 to Western and Middle Western coals. This result shows at least no falling behind on the part of the 'smokeless' type and no cause for placing special confidence in these coals for safety in storage.

A serious fire in cinder-filling under a manufacturing plant in Pittsburg was recently investigated by the Bureau, and all evidence pointed to spontaneous combustion as the cause, induced by external heat radiated from a furnace. The cinders contained 40% carbon. A similar fire occurred two years ago in cinder-filling under a smelting plant on Staten Island, in which case the cinders contained 33% carbon. Damage amounting to $20,000 was done. The cause was not definitely determined, but from the reports of the insurance adjusters, spontaneous heating appears to be the most plausible explanation. The volatile matter in the material could not have been a factor in these cases.

Pocahontas coal gives a great deal of trouble from spontaneous fires in the large storage piles at Panama. It is reported also by several large by-product coke concerns to be more troublesome in this respect than their high-volatile gas coals. The high-volatile coals of the West are, to be sure, usually liable to spontaneous heating, but they owe this property to chemical nature of the substances which compose the coal, rather than to the amount of volatile matter. Strange as it may seem, a high oxygen content in coal appears to parallel its avidity for oxygen and to promote, therefore, its tendency to spontaneous combustion.

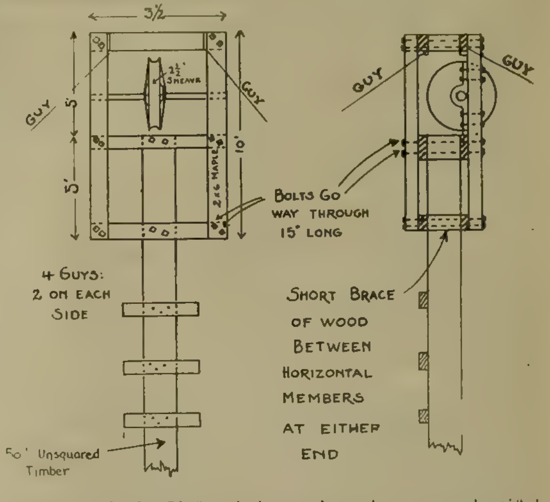
The influence of moisture and that of sulphur upon spontaneous heating of coal are mooted questions much discussed, not much actually investigated, and certainly not yet settled. Richters has shown that, in the laboratory, dry coal oxidizes more rapidly than moist, but the weight of opinion among practical users of coal is that moisture promotes spontaneous heating. The observation by the Bureau of many actual cases has not developed any instances where moisture could be proved to have had such an effect. Sulphur, on the other hand, has been shown by these investigations to have, in most cases, only a minor influence. In a number of actual cases, samples of the heated coal from areas where the heat was greatest have been analyzed, both for the total sulphur and that in the sulphate form. The difference between these—or, in other words, the unoxidized sulphur—was in no case less than 75% of the average total sulphur in the original. In other words, not more than 25% of the total sulphur has entered into any heat-producing reaction. The possibility remains, however, that all of the sulphur which was oxidized was concentrated in one pocket of moist flaky pyrite, and thus sufficient heat was developed in one spot to act as an igniter. On the other hand, a Boston company, using Dominion (Nova Scotia) coal of 3 to 4% sulphur, has much trouble with spontaneous fires in storage, but a number of samples taken by the Bureau from exposed piles of this coal in which heating had occurred showed that 90% of the sulphur was still unoxidized. Experiments in the laboratory, passing air over coal at 120°C. has developed enough heat to ignite the coal and no change was found in the form of the sulphur. While not entirely conclusive, these results point to a very minor contribution, if any, on the part of sulphur to spontaneous heating in coal.

Freshly mined coal, and even fresh surfaces exposed by crushing lump coal, exhibit a remarkable avidity for oxygen, but after a time become coated with oxidized material —'seasoned', as it were—so that the action of the air becomes much less vigorous. It is found in practice that if coal which has been stored for six weeks or two months and has even become already somewhat heated, be rehandled and thoroughly cooled by the air, spontaneous heating rarely begins again. A large power plant in New York crushes its coal to pass a 4-in. screen immediately after unloading from barges, the fine coal and dust, 50%, or more, being left in the coal to be stored. This freshly crushed coal is elevated to iron hopper-shaped bunkers directly over the boilers, and the air temperature in these often reaches 100°F. As the coal hangs on the sloping sides sometimes three or four months at a time, it seems hardly surprising that some of the bunkers are on fire practically all of the time.

With full appreciation of the fact that any or all of the following recommendations may under certain conditions be found impracticable, they are offered as being advisable precautions for safety in storing coal whenever their use does not involve an unreasonable expense: (1) Do not pile over 12 ft. deep, nor so that any point in the interior will be over 10 ft. from an air-cooled surface. (2) If possible, store only lump. (3) Keep dust out as much as possible; therefore reduce handling to a minimum. (4) Pile so that lump and fine are distributed as evenly as possible—not, as is often done, allowing lumps to roll down from a peak and form air passages at the bottom. (5) Rehandle and screen after two months. (6) Keep away external sources of heat, even though moderate in degree. (7) Allow six weeks' 'seasoning' after mining before storing. (8) Avoid alternate wetting and drying. (9) Avoid admission of air to interior of pile through interstices around foreign objects such as timbers or irregular brick-work; also through porous bottoms such as coarse cinders. (10) Do not try to ventilate by pipes, as often more harm is done than good.

Simple Sheave Stand

The accompanying sketch shows a simple sheave-stand for the hoisting-cable between engine-house and head-frame. It is much cheaper for a small plant to erect such a support on a single 50-ft. timber, where logs are plentiful, and to hold it in place by guy-wires, than to build the elaborate self-supporting structure of the four-post design. The bottom is set in a hole dug three or four feet deep, and the timber raised by block and tackle. This design is used in the Lake Superior iron region at a mine which hoists a three-ton skip from 700-ft. depth.



The Biggenden bismuth mine, Queensland, treated 478 tons of ore during the quarter ended September 30, yielding 10.67 tons of bismuth sulphide. The value of the metal content, after allowing for a 10% loss in the process of reduction, with bismuth at 7s. 6d. per pound, is £1043. The ore now being handled contains less arsenic than previously, thus giving a better product, and enabling a lower grade ore to be profitably treated.

Subsidizing Prospecting

By Walter A. Koch

The citizens of Colorado have resorted to an unusual but apparently sensible expedient to rehabilitate the State's metal-mining industries. They have sought to bring the mining industry in Colorado back to the prosperous plane of ten years ago by sending out into the hills prospectors, supported by public subscriptions, to search for new deposits of mineral. In the early part of this year the commercial organizations of Denver began an earnest inquiry into the causes of the decline in Colorado's metal production, and the consequent lessening of the number of men employed in the mines and mills; these circumstances having a most important bearing upon business conditions in Denver. Figures published by the State Bureau of Mines and the U. S. Geological Survey indicated that the production of metals in the State had decreased from a little over $50,000,000 in 1900 to $33,000,000 in 1910—a loss of about 33%. The gold output alone decreased from nearly $29,000,000 to $20,297,000 within the decade.

This condition forced itself so heavily upon the attention of the citizens of Denver and the State that public meetings were held to discuss means for rejuvenating the State's best known industry. Columns of newspaper comment were offered by mining men, journalists, and business men. While many theories as to the decline in metal production had been advanced, it was a generally accepted belief that it was due to the fact that during late years but little prospecting has been going on in the hills, and that mines in the development and even the producing stage have greatly lessened their exploration for new orebodies. This was attributed to the tightness of the money market, to the restrictions of the Forest Service, which were alleged to have had a deterrent effect upon prospecting within forest reserves, and to the undue exactions of the 'smelter trust' in ore treatment. At the same time the people of the State were hoping, and with great confidence, that a new mining district would be found. The daily newspapers teemed with stories suggesting that the mountains of the State harbored many still undiscovered Cripple Creeks. One of such, if developed, would bring the excitement that would furnish a great stimulus to industry in all parts of the State.

The Denver *Republican* advocated the idea of raising by popular subscription a fund sufficient to send prospecting parties out on a search for minerals, during the summer. The plan was accepted by the Denver Chamber of Commerce, coöperating with other commercial bodies, and funds for such a purpose were solicited. A 'Grubstake Committee' empowered to make contracts with prospectors and furnish the necessary supplies for the season, was appointed. Last May the movement was put under way. The season of prospecting under the auspices of the Denver Chamber of Commerce was to end on December 1. The committee, composed entirely of experienced mine operators and engineers, gave close attention to the work during the entire time. The prospectors were chosen with great care and were fully instructed as to what districts to prospect and how to proceed with locations and discovery work. It was intended to be a campaign of scientific surface prospecting. At the close of the season the committee carefully reviewed the work done, and in a report just issued it has pronounced the experiment a success, expressing at the same time the belief that much good to the State's mining industry would result. The following is taken from the committee report:

During the season 34 prospecting parties, comprising in all 53 men, were sent out on prospecting tours, with supplies furnished by the committee. The money raised for the campaign amounted to $9215. Of this amount, $7400 was expended in the work, at the rate of $250 per party or $160 per man. The committee was very fortunate in selecting the men, there having been few disappointments from this source. The number of locations made was 43, and on each location the usual discovery shafts were put down. In eleven of these, good ore was discovered in 10-ft. holes, the assays going as high as $1000 per ton. In the opinion of the committee, these are unusually good prospects, and easily warrant further development. The contracts with the prospectors provided that all locations were to be made jointly in the name of the Chamber of Commerce and the individual prospector; both being equal owners in the claims.

The committee, in a preliminary report, recommended the organization of a development company to exploit the claims considered to have sufficient mineral showing. As a result the Colorado Grubstake & Mining Co. was formed, with a capital of $250,000, shares $1 each, to assume charge of the development. The Chamber of Commerce is to receive $25,000 of the capital stock for 'fathering' the enterprise; the contributors to the grubstake fund are to receive full-paid stock at par value in amounts equal to their contributions, and the remainder will be sold at par to raise funds for development.

Without question, many Colorado citizens will subscribe for the stock, and it is not considered that there will be much difficulty in raising money. The provision is made that the entire proceeds of stock sales are to be expended in actual development, all officers in the company contributing, for the present, their services. The men identified with the management of the development company include Phillip Argall, Ernest LeNeve Foster, R. D. George, V. C. Alderson, G. Montague Butler, F. W. Traphagen, George W. Schneider, Thomas Tonge, and Henry C. Beeler.

The feeling generally prevails among leading mining men that the results of this attempt to stimulate metal mining activity have already justified the efforts put forth. The agitation has attracted capital to many legitimate and worthy enterprises, and mining activity throughout the State, due to this or other reasons, has been decidedly increased. All districts have felt an impetus from this Statewide attempt to promote Colorado's mining interests. Just what success will attend the efforts of the Colorado Grubstake & Mining Co. in operating the claims located by its prospectors remains to be seen, but the directors of that enterprise, in raising money for the work, are prepared to hold out the representation to intending purchasers of stock that they will get the fairest 'run for their money' that the mining industry can afford, so far as a venture of that kind is concerned.

Mining Possibilities Near Constantinople

On the railroad line Panderma-Balikessir-Sousourlok-Soma, for which the concession has recently been granted, about 71 kilometres distant from the harbor of Panderma, is found the antimony mine of Demir Kapou, near the village of the same name. The concession extends over an area of about three thousand acres and includes four veins of considerable strength. The region is not being worked at present, owing to a lack of capital.

Another mine on the Asiatic coast of the Sea of Marmara is the argentiferous lead mine of Kara-Dagh. It is situated in the *caza* of Bigha, about 40 kilometres distant from Kara-Bigha, which has excellent harbor facilities. This mine is said to be one of the best of its kind in Turkey. The former proprietor made attempts at exploitation at three points. Dodja, Kodja-Kavouchlar, and Gumuch-Acheka, but finally limited his efforts to the last named. This mine was successfully worked in former times, but was abandoned fifteen years ago, after the crumbling in of the earth, which destroyed the entire plant. It is thought, however, that the work might be taken up again and be carried at this point to a depth of 20 or 30 metres and for a length of 600 metres. The mine has several shafts and drifts. Transportation facilities to the place of embarkation at Kara-Bigha are not difficult and wagons carrying 750 kg., drawn by buffalo, make this trip in a day, at a charge of 50 piastres. The entire expenses to the ship, including lading and storage, amount to about 17 francs per ton.—*Levant Trade Review*.

Shifting a Bucket Dredge

A short description of the method adopted by the Stanthorpe Proprietary Dredging Co. in removing its bucket dredge at Emmaville, New South Wales, to another dredging site, given by a correspondent of the *Australian Mining Standard*, will prove of interest.

The distance the dredge had to be moved was about half a mile. There was a choice of three methods: (1) to dismantle the dredge and transport it piece by piece; (2) to arrive at a satisfactory arrangement with the Great Britain Co. to work through its ground, which lies between the other company's property; and (3) to shift the dredge as a whole, along dry land, by means of its own power. Of these, the second method might possibly have proved the most economical, but the third was adopted, and the fact that the method is unique is the excuse for the description.

Operations were started about July 15, 1911, and the dredge successfully reached the site at the beginning of November. Calking operations have been started, which will take about a fortnight to complete. The buckets and tumblers were removed from the dredge for separate transport, but otherwise the barge was left intact. A track was roughly prepared along the hillside for the dredge to travel along. Trenches were then dug some twenty yards ahead, and headers put in. Wire ropes, with a suitable arrangement of pulleys, were fastened to the gantry framing of the dredge, taken out and passed around and connected to the head logs, and thence back to the main hauling winch of the dredge. The barge itself was run on skids about 10 by 10-in. hardwood, placed approximately 2 ft. apart. When these were laid in position the pull was commenced, when, all going well, the dredge began to move. Great difficulties were encountered at first. The inclines from the dam to the road were very steep. Headers were not used at first, but trees and stumps were utilized instead, and in many cases were promptly uprooted. The haulage ropes also, at first, were much too light, and constantly broke at the critical time. The weight of the dredge is 250 tons, and the pull on the ropes was 60 tons. Progress for some time was very slow, but toward the end of the journey an average advance of 60 ft. per day was maintained. Trouble was experienced throughout the job by the tendency of the skids to shift to one side directly the weight came on them. The ground in some places also caused great delay, owing to its softness and consequent inability to bear a load.

The management claims that if the question of a further removal occurs again, the same method will be adopted, with the exception that many of the initial mistakes will be avoided, by the experience which has been rather dearly bought. An improvement on the method would be to lay a line of rails and mount the dredge on small wheels, when progress would be greatly facilitated and much work save in the moving of the heavy skids from length to length.

The cost of the work was about £800. The best method of moving, if terms had been agreed upon, would have been to work through the Britain ground. This could, at an outside estimate, have been done in a month, and, although a sluicing plant had previously treated the ground, a certain amount of tin would have been obtained from the dredge as it worked through. With regard to dismantling, it must have proved quicker than the present method, but the dredge is old, and some difficulty would have been experienced in putting it together again. It could, however, probably have been dismantled, removed, and rebuilt in three months. It is said that at first a contract was made to shift the dredge for £300 in three weeks, but the contractor had to relinquish the task, which was then taken up by the company's engineer.

Negotiations are proceeding between the Lieutenant-Governor of Papua and the Commonwealth Government for a loan of £80,000, to be spent in developing the gold mining industry of Woodlark island and the copper fields in the Astrolabe district.

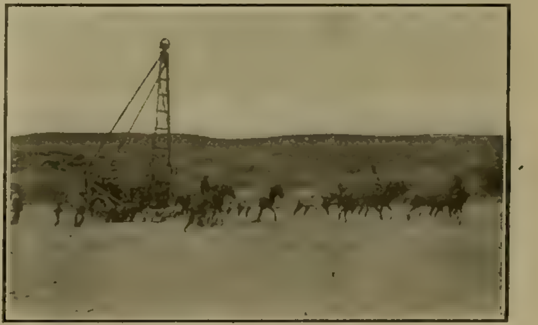
Tube Concentrator in the Coeur d'Alene

By W. A. Scott

The plant of 119 tube concentrators, built as an auxiliary to the Morning mill of the Federal Mining & Smelting Co., at Mullan, Idaho, has been in operation since May 15, 1911, and the results have been so satisfactory that the company is negotiating for the building of another unit of equal capacity to that now in operation. The original plant, as designed by O. B. Hoffstrand of the American Direct Concentrator Co., had an estimated capacity of 50 tons per day, but this has been exceeded. During the month of October the average was 61 tons per day, the month's output having been 200 tons of concentrate carrying 48 to 49% zinc. According to tests made in operating the mill it has been demonstrated that by keeping the flow surface in the tubes crowded, or fully covered, the grade of concentrate produced is higher than that obtained while running with lighter feed. The original practice was for some of the tubes to re-treat the middling of the other tubes, and this no doubt will be eventually the accepted practice after the present equipment has been doubled; but during the past three months all tubes have been given direct feed, with no re-treating of the middling, and this has resulted in raising the capacity of the present plant to 95 tons per day, giving a concentrate product of close to 300 tons per month that is estimated to sample 49% zinc. The object of this temporary practice is to recover as large a tonnage of zinc as possible at a sacrifice of the higher saving effected by the aid of reconcentration. The material treated consists of the middling and tailing from Wilfley tables and the tailing from vanners, containing zincblende, siderite, and silica, also a small percentage of galena that is mechanically associated with the blende. This flotation process effects a separation of the zinc sulphide from the siderite, the former floating on the surface of the water, the latter sinking and passing out with the gangue. The use of sulphuric acid in the process is found to be an aid, as it serves to cleanse the surfaces of the sulphide particles, making them more amenable to flotation; but the quantity of acid used does not exceed 2c. per ton treated. The operation of the plant, especially while some of the tubes were used in reconcentrating the middling of the others, has given results equivalent to those indicated by the original tests made by the General Engineering Co. before the mill was built. Mr. Hoffstrand, who designed the plant, has had general charge of its operations for the Federal company.

Travel Under Difficulties

The sandy deserts of the intermountain region present much difficulty to traction machinery, both because of the sinking of the driving wheels into the loose soil and the rapid wear of the driving machinery from the fine sand which arises. As is usual on the desert, resort is had to primitive means, and the accompanying illustration shows a traction drill being drawn by a string of horses across a sandy desert in southern Utah.



The Caylloma Silver Mines

By Fernando C. Fuchs

The Caylloma silver mines in southern Peru, discovered and worked on a large scale by the Spaniards, are in the Department of Arequipa, about 170 kilometres by trail from the Southern railway. Records in the possession of the British Institution of Mining and Metallurgy show that the production of these mines from 1668 to 1675 was 2,412,359 oz. of silver, while the Caylloma Silver Mining Co. produced, from 1890 to 1905, by amalgamation, operating a dry 30-stamp mill at San Ignacio, 1,779,135 oz. of bar silver and exported 3,753,143 oz. in the form of ore.

From 1906 the Sociedad Explotadora de Caylloma (British) introduced wet crushing, operating 30 stamps with classifiers, Buss concentrating and Luhrig slime tables, and ball-mills, utilizing water-power. The ores formerly ran 2.5 kg. per ton, though at the present time they are from 0.6 to 0.8 kg. per ton, the concentration being at the rate of 11 into 1, with a saving of 60%. Tests have been made for cyanidation, which it proposed to introduce. The ores are brought to the mill by tramway, and the concentrate shipped by mules and llamas to the railway.—*Peru Today.*

Danger From Steel Stacks

A steel smoke-stack danger, where the stack passes through a wood roof, is revealed by the statistics of fires in electric light and power stations in the *Quarterly* of the National Fire Protection Association. Out of eighteen fires in boiler plants, six of them were due to the steel-stacks being placed too near woodwork. As such a cause has probably been the source of fires in many boiler plants the details of construction at this point in the roof deserve consideration. It is self-evident that if a hot stack is close to woodwork, the latter is likely to become ignited. Even where some distance separates the stack from the woodwork, and the intervening space is covered by steel plates, enough heat may still be transmitted by the latter under exceptional circumstances to render such construction a source of danger. Another cause of trouble at this point has recently been suggested by the John C. Paige Insurance Agency of Boston, which has been investigating the subject. The difference in temperature between the portion of the stack above a roof and below it may be great enough, it is suggested, to cause some condensation of the acid products of combustion near the roof line, and these may cause a rapid corrosion of the stacks from the inside, so that eventually small holes will be eaten through it and afford an outlet for those minute sparks which are believed to cause some of the fires originating on boiler-house roofs. Whether or not this is a tenable theory, the fact remains, that there are good reasons for allowing a free air space entirely around one of these stacks and protecting it by a steel plate umbrella attached to the stack some distance above the roof opening and spreading out around the latter so as to protect it without touching the roof. The opening itself should have a cylindrical ring of sheet steel projecting above and below the roof.—*Engineering Record.*

Good iron deposits are known to exist in various parts of Siberia; the principal one in the Amur province is situated in the Little Hingan mountains, on the bank of the Samara river, and is estimated to contain about 350,000 tons of ore, averaging 50 to 70% iron. The principal known iron deposits in the Maritime province are near Nikolaievsk and St. Olga, on Olga bay. The former is estimated to contain 2,250,000 tons, averaging about 43%, and the latter about 1,850,000 tons of magnetite, averaging 56 to 61% iron. None of these deposits, however, is being worked, due principally to the lack of capital and the drawbacks to general mining conditions. An important zinc mine situated on the Tutiha river near St. Olga bay is at present being operated, the output in 1909 being about 9500 tons of ore.

A Source of Error in Metallurgical Tests

By George A. James

In grinding samples containing free gold in modern laboratory grinding apparatus, no matter what degree of fineness is obtained, or the amount of free gold contained, it is unusual to find metallic particles on the sieve. Native gold is almost always brittle enough to be reduced to the fineness of the gangue. This, of course, is the ideal condition for accurate assaying, but when this pulp is to be used for metallurgical experiments, it introduces a fatal source of error, and will give higher amalgamation or cyanide extraction than can be obtained from pulp produced by the tube-mills, or roller mills used in metallurgical plants, which have in a comparatively small degree this grinding and scouring action. Where samples are not ground finer than 40 mesh, by making a gradual reduction in size and sifting frequently, it will be found that this error is comparatively unimportant, but where samples are slimed for agitation test, with cyanide, the results are to be considered as unreliable, and should be checked up by samples prepared in tube-mills.

A Bangkok Custom

The Appeal Court has given judgment in an interesting test case dealing with the custom of Bangkok merchants in receipting the bills sent out with the collector. Originally, in the bankruptcy of Kee, Chiang & Co., Behn, Meyer & Co., Ltd., put in a promissory note on which over 880 taels were still due. The note bore a receipt on its face, and the Official Receiver refused to accept it on the ground that, according to the receipt on the face, it had been paid in full. Behn, Meyer & Co. appealed to the International Court against this decision, but the International Court upheld the Official Receiver's view. The case was then taken to the Appeal Court, Behn, Meyer & Co. asking for leave to call evidence of custom. This was granted, and E. C. East, A. N. Warrack, and E. Leth gave evidence as to Bangkok custom. The Appeal Court then gave judgment reversing the decision of the International Court, stating that in view of the fact that the promissory note remained in the hands of the payees, the fact that the note bore a receipt on its face made no difference.—*Bangkok Times.*

Queensland Gold Yield for October

The output of gold in Queensland for the month of October was 30,547 oz. fine, of the value of £129,755, a decrease, when compared with the corresponding month of last year, of 6014 oz. in weight and £25,546 in value. Charters Towers shows an increase of 939 oz., and the Rockhampton fields also recorded a small improvement. On the other hand, there were decreases at Cloncurry of 307 oz.; at Gympie, of 507 oz.; at Mount Morgan, of £4009; and at Ravenswood, of 87 oz.; while from the Etheridge field the falling off was 692 oz. The returns do not include the output of the Croydon field for October, as that was not available when they were made up. The dividends declared by gold mining companies for October totalled £12,387. The gold yield of the State for the expired ten months of the present year was 314,721 oz., of the value of £1,336,848, a decrease, compared with the corresponding period of last year, amounting to 47,929 oz. in quantity and £203,930 in value.

Since wages boards were introduced in Victoria in 1896 they have (according to an estimate prepared for the Department of Labor) increased the pay of workers coming under their jurisdiction by £4,477,489. This estimate has been arrived at by comparing the rates of pay in operation prior to the awards of the various wage boards with the average wage in force on December 31, 1910.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting

BAUXITE is infusible, even before the blowpipe, and in the manufacture of aluminum it is dissolved in a fused bath of cryolite. Ore containing so little as 27% Al is low grade, and probably would be unsalable under ordinary conditions.

THE fundamental requirement for the successful working of an ore deposit is that there should be a sufficient amount of ore recoverable to pay for the direct and indirect cost of its removal, and yet still leave a margin for profit. The cost of mining the ore is governed by a number of principles, which vary greatly according to the local conditions.

SOLID walls of either stone or concrete collect moisture on the inside, and not only keep the interior damp, but the floor and walls will become soiled and discolored. Weatherboarded plank on a steel framing has a low first cost, but has a high insurance rate. The best wall is reinforced concrete, using a thin curtain wall, and facing around windows and doors with buff brick secured by metal anchors.

PENNSYLVANIA was the first producer of coal, in 1814, and has been by far the largest producer in the United States, according to the United States Geological Survey, having now a record which surpasses all foreign countries except England and Germany. Pennsylvania's total production since the beginning of mining has been 4,432,071,767 short tons, or more than one-half of the total production of the United States.

A LOOSE PULLEY may be balanced in the following way: After it has been bored out ready for use, place it upon a smooth arbor that is solidly supported in place. Wind a cord around the hub, or the rim, according to the size of the pulley, and give the cord a long even pull, that unwinds it, setting the pulley in motion like a horizontal top. The inner end of the cord is not tied to the pulley, but left free, except that the cord crosses to hold it in place. When the pulley is perfectly balanced it will run a long time without 'chattering.'

TO MAKE rubber packing air and steam-tight, brush it over with a solution of powdered resin in ten times its weight of strong water of ammonia. This mixture when first made is unfit for use, but in three or four weeks it readily adheres to rubber as well as to wood or metal and becomes absolutely impervious to liquids. A good cement for joints in steam or water pipes, and which will set under water, is composed of 4 lb. paris white, ground; 10 lb. litharge, ground; ½ lb. yellow ochre, fine; ½ oz. hemp, cut short. Mix well with linseed oil to a stiff putty.

BY USING a steel framework for a building, much of the uncertainty as to its safety may be done away with. There is also a saving of head room and floor space, as the steel beams and columns are smaller than those of reinforced concrete. In a building of many stories a few inches to each story adds up to quite an item. The columns in the lower stories become so large that, as one writer has put it, the building resembles the Egyptian pyramids—most of the room is on the outside. Nor are engineers agreed as to how concrete sets when poured wet in large masses.

EUROPEAN countries have found workmen's compensation acts of little use, unless obligatory insurance guarantees the compensation awards to the injured workmen without overburdening the small employer. There are, therefore, found many forms of insurance plans in the different countries. Without going too deeply into the various plans, they can be divided into two classes, compulsory and voluntary, which, again, can be divided into sub-classes, (a) compulsory insurance in prescribed institutions, (b) compulsory insurance with choice of insurance institutions. Under the voluntary insurance there are: (c) private companies or mutual associations, with State institutions competing; (d) private companies or associations, without State institutions competing. In a general way, the following countries come under these four heads: (1) Compulsory insurance: (a) Norway, Luxemburg, Hungary, Austria, Germany, and New South Wales; (b) Italy, Netherlands, and Finland. (2) Voluntary insurance: (c) Sweden and France; (d) Belgium, Denmark, Great Britain and her colonies, Russia, and Spain.

DRY BATTERIES which have become exhausted can be re-charged by a very simple process. Remove the outer cardboard casing from each cell and drill six small holes in the zinc casing about 1 inch from the bottom. As four cells are generally used for ignition purposes in connection with an induction coil, get four small glass or stone jars an inch or so larger in diameter than the cells and about three-quarters their height. Dissolve about ½ oz. of powdered sal-ammoniac in each jar, in a sufficient quantity of water to bring it almost to the top of the jar when the cell is in it. Get four cells of gravity battery and put them in series with each other by connecting the zinc element of one cell to the copper element of another. Put each dry battery cell in the solution in its respective jar and connect the three binding posts of the zines together, and the three carbon posts also, by means of insulated copper wire. Then connect the zines to the zine and the carbons to the gravity element of the gravity batteries. Allow the cells to remain over night, and if they are of good reliable make they will be found in the morning to be almost as good as new. The process of recharging dry batteries can be repeated at least twice, and even three times, but, of course, after each successive re-charging their renewed life will be shorter than before. After the batteries have been re-charged the small holes, which were drilled in the casing, can be stopped by means of a strip of adhesive tape, covered with bicycle tire cement, and tightly wrapped around the zinc casing over the holes. The cells should be thoroughly dry and then may be replaced in their cardboard casing ready for use.

TO TEST for vanadium, the mineral may be digested with nitric acid. If hydrogen peroxide be added to the resulting liquid, a brown color will appear if vanadium is present. Some vanadium minerals are also attacked by hydrochloric acid and by sulphuric acid. To the solution resulting from the use of either acid, hydrogen peroxide may be added, and a brown solution will show the presence of vanadium, as when nitric acid is used. If either hydrochloric or sulphuric acid is used, metallic zinc may be added after hydrogen peroxide, and a bright blue color will be given by the reduction of vanadium compounds. The same effect can be obtained in a nitric-acid solution by adding sulphuric acid, evaporating to white fumes, diluting, and adding metallic zinc. If preferred, hydrochloric acid instead of sulphuric acid may be added to the nitric-acid solution, but in that case evaporation must be carried almost to dryness at least twice to get rid of the nitric acid. The liquid may then be diluted and more acid added, followed by zinc as described. At times the tests given above are not wholly satisfactory. In such cases, if the apparatus is at hand, pass hydrogen sulphide (H_2S) gas through a filtered solution made alkaline with ammonia until it is saturated. The solution will take a fine garnet or deep wine color if vanadium is present. Copper, if present, is precipitated as a sulphide and does not interfere with the test. If commercial iron sulphide for making hydrogen sulphide gas is not at hand, pyrrhotite, galena, or zincblende may be used with hydrochloric acid. The only accessories needed are two test tubes, one of which is closed with a cork in which is inserted a bent tube, the other end of which can be placed in the solution to be tested for vanadium.

Special Correspondence

JOHANNESBURG, TRANSVAAL

RANDFONTEIN MINES HEAD GOLD PRODUCERS FOR OCTOBER. —REPORT ANALYZED.—GELDENHUIS REPORT.

For the first time in its long history, the Randfontein mines headed the list of gold producers on the Rand in October with a declared output of 60,778 oz., valued at £258,169. This is an achievement upon which all who have taken a hand in the development of this property are to be congratulated, because it represents many years of labor, and, like other big concerns on the Rand, the Randfontein property lately has been subjected to much misrepresentation and abuse. It has certainly taken many years to bring the Randfontein property to its present stage of production, but, with its equipment totaling 1000 stamps and the accompanying tube-mills and cyanide-plant, it is now in a position to give a good account of itself. With an adequate supply of native labor it should be able for some time to come to put up a good fight for the position of largest producer on the Rand and likewise premier gold producer of the world. However, huge properties like the Randfontein, as has recently been shown by the East Rand Proprietary Mines affair, are subject to disappointments, as the larger the area the more liable to variations of grade, and no real importance need be attached to any fall of grade which is reported to have occurred in the northern section of the property. Seeing that the Randfontein property is a huge faulted outlier of the upper Witwatersrand and beds, no one can say with certainty what is likely to occur in depth, especially at the extreme southern end of the property. The fact that the shaft of the Randfontein Deep shows signs of approaching the reef, ought, if widths and value of the ore are maintained, be sufficient to place the permanency of the largest and most important portion of the Randfontein property beyond doubt, if any ever existed in the minds of those interested.

The Chamber of Mines' declaration of the October output as 708,644 oz., of a value of £3,010,130, perhaps did not come up to expectation, on the whole, yet the whole output of the East Rand Proprietary Mines was not declared, and nothing from Glynn's Extension in the Lydenburg district appeared, while no one was prepared for such a shortcoming as that displayed at Geldenhuis, notwithstanding that the gold held in reserve by this property was reduced from 1646 to 1020 oz. The total gold output of the Transvaal has been well established as above £3,000,000 per month, and with a slight improvement in the labor position the Rand itself could easily produce this amount. Perhaps as it is, the Rand will soon claim the honor of a gold output valued at £3,000,000, despite its labor troubles and the inability of the Victoria Falls Power Co. to meet the power requirements of the mines. The returns also show that the marked increase in the number of stamps dropped in September was due to the desire to avoid coming under the Sunday law, whereby it is proposed that all stamps coming into operation after September 30 shall not be allowed to work on Sundays. Even in the days of the old Transvaal Republic, when religious prejudice prevailed among the Boers to a greater extent than today, Sunday milling was allowed because it was considered a necessity, so that some surprise was expressed when such strong opposition was shown in the Union Parliament against Sunday milling which even the persuasive manner of the Minister of Mines could not remove. Only 9450 stamps on the Rand, 589 outside, making a grand total of 10,039, were operated during October, as against 9675 and 632, respectively, a total of 10,307, in September. There thus was an apparent reduction of 299 stamps in October, while in tube-mills there was a net decrease of only one for the month. The average daily yield for October was valued at £92,891, and it is necessary to go back six months to find a lower average daily output. The labor position, as far as the gold mines are concerned, is distinctly worse than during the other periods of the present year. Figures show that it continued to improve until April last, when the total number was 194,328, but in October it had fallen to 179,194, against 183,268 in January. The following table shows the companies producing over 20,000 oz. in October:

	Tons milled.	Yield, oz.	Value.
Randfontein	212,510	60,778	£258,169
Crown Mines	148,900	60,275	256,032
East Rand Proprietary	169,256	51,028	216,753
Robinson	51,700	27,278	115,870
Simmer & Jack	73,200	22,067	93,735
Geldenhuis	67,220	21,365	90,753
Rose Deep	61,000	20,668	87,792
Robinson Deep	53,200	20,213	85,859

The Gendenhuis property declared an estimated profit of £15,050 for October as compared with £18,900 in September, the official explanation being that the grade of ore mined has been below normal. It is added that steps have been taken to mine more in accordance with the average grade of available ore reserves. No explanation is given as to why, during the month of October, mining operations were not conducted so as to reflect the true value of the available ore reserves in the returns, and for well known reasons such an explanation no doubt would be interesting. The Geldenhuis property has just been placed under the control of an engineer who recommends concentration of underground operations so as to bring about a reduction in the average working cost per ton, and the adoption of this new system of working may, or may not, be the cause of the marked fall in grade and profits. This same engineer has recommended the adoption of a similar plan of concentrating the underground workings at the neighboring Nourse Mines, with the object of reducing the working cost per ton, and providing that, if after the experience at the Geldenhuis, this system of concentrating underground operations at the Nourse Mines is carried out, much interest will centre in the results, especially as regards the resulting grade and profits. It has hitherto been the general custom on the Rand to scatter the mining operations so as to make the grade fairly representative of the average of profitable ore reserves, which has naturally resulted in the average working cost per ton being higher than if concentrated mining were adopted. The advantages of this system are evident, as on the Rand grades vary quite perceptibly over limited areas, even if they always keep above the profitable or economic limit. The excellent and easy underground mining conditions on the Rand also lend themselves readily to this system of mining, in addition to the advantage of producing an ore approximating uniform grade on the whole. There can be no doubt that concentration of mining operations must result in lower average working costs on the Rand, but it will also produce varying monthly results and will call for a much higher and more varying gold reserve to be kept on hand. Whether this concentrated method of mining is one to be adopted must depend, of course, upon the prevailing circumstances of the

RANDFONTEIN CENTRAL MILL.

mine. The time, however, has not arrived when concentrated mining has become essential on the Rand. When the mines reach such a depth as to make it necessary, not only will concentrated, but wholesale mining, with its attendant advantages and disadvantages, be required.

LONDON

British Aggressiveness in Arizona Copper Co. Policy.—Encouraging Report of Great Cobar, Ltd.

A great scheme for the expansion of operations has been adopted by the shareholders of the Arizona Copper Co., a British corporation with headquarters in Edinburgh, and owning the Longfellow and Metcalf groups of mines near Clifton, Arizona. Operations started in 1882, but like many other copper ventures in that part of the world, the early days were anxious ones. During recent years the venture has been highly profitable, and, for the last completed year for which the accounts have been published, the profit was £250,000, sufficient to pay 50% dividend on the ordinary shares; the output of copper was 14,739 long tons, and the yield 2.15%; moreover there is no gold or silver content. It has been known for some years that there are enormous ore reserves averaging less than 2%, but their profitableness was a debatable point. Seeing, however, that other mines in that part of the world had demonstrated the possibility of beneficiating this class of ore at a profit, the Edinburgh people decided to take steps to investigate the chances in this direction for their mines. At first, with characteristic Scottish caution, they were inclined to spread the necessary expansion of the mine operations, the concentrator, and the smelter, over a series of years, without issuing any new capital, and their former manager, James Colquhoun, favored this plan for extension. But L. D. Ricketts, who was called in to advise, strongly urged the bolder course of making a clean sweep and providing immediately the best and most up-to-date plant possible. He showed that with a plant of similar type to that at Cananea a saving in expenses of a million dollars per year could be effected by the expenditure of $2,500,000, and that there was enough proved ore to yield 20,000 tons of metal for ten years, besides immense resources in the way of probable and possible ore, averaging not much less than 2%. Accordingly the directors and shareholders have accepted Mr. Ricketts' proposition, and the capital is to be raised by the issue of £500,000 debentures. A large part of these debentures are already subscribed and I feel sure that the rest will be forthcoming.

Mr. Ricketts' scheme involves the building of oil-burning reverberatory furnaces, the gases from which will be used for steam-raising and the generation of electric power. It is estimated that 2200 hp. can be obtained in this way, and that this will save £66,000 per annum in the fuel bill. The power will be sufficient for the metallurgical works and for the greater part of the requirements of drilling, hoisting, and hauling at the mines. The concentration plant is to be remodeled by the scrapping of No. 3 and No. 4 mills at Clifton and the enlargement of No. 6 at Morenci. The whole of the concentration, therefore, will be done at one spot. The capacity of the enlarged mill will be one million tons per year. Many improvements are required in the mines, and in the methods of hauling, so as to fit the new requirements. As regards the new smelter, it is fortunately possible to acquire a site not far from Clifton, large and level enough to provide the necessary room for efficient mixing and preparation of the ores. Altogether the scheme is one of prime importance, and its adoption is a good example of the untruthfulness of the jibe about British lack of enterprise.

The Great Cobar mine in New South Wales has had a checkered career since it was owned by an English company. On its flotation here in 1906, an enormous sum in cash (some £800,000) was paid to the local owners, who had made fortunes out of the ores in the zone of secondary enrichment. They evidently sold at the right time as far as they are concerned, for though the ore deposit has been proved to be persistent and of great extent, the content is nowadays only 2½% copper, contained in pyrite. The smelting problem has therefore been difficult, and the expense of flux, and the low content of the smelting charge has made for high costs. The designer of the new smelting plant made many mistakes, and the expenditure in getting matters put straight again has been great. H. C. Bellinger, formerly of Montana, has straightened out the metallurgy and improved the system of development. The most important step taken recently has been the purchase of the Cobar gold mine which yields a silicious ore containing 10 dwt. of gold. The Cobar gold mine was not a success financially while working on its own account, as the antimonial content had a deleterious effect. So the consolidation of the two interests was to the advantage of both parties. The Chesney copper mine has also been acquired. The company now appears to have passed its troubles and to be on a sounder commercial basis. The English public has been much perturbed during the past half year or so because the directors have not issued a report nor convened a meeting of shareholders. All sorts of rumors have been flying around in consequence. In order to be perfectly fair, it is best to give an abstract of the belated report now issued, covering the eighteen months ended June 30 last. During this time two stoppages of a month each were made, one due to the coal strike and the other to repairs in the main shaft. The operations have been hampered by labor troubles, and the costs have increased owing to the rise in the rate of wages. Capital has been spent in developing the Great Cobar, the Chesney copper mine, and the Cobar gold mine, and in building a concentrator at the Chesney, which will be in operation early next year. The company then should be able to maintain a regular output from all the mines and to produce a suitable smelting mixture. The Cobar gold mine promises to be an exceedingly useful factor in the situation, providing a silicious mixture for the pyritic ores of the other mines. The monthly outputs will be 26,000 tons from the Great Cobar, 13,000 from the Chesney (to be concentrated to 5000 tons) and 9000 from the Cobar gold mine. During the 18 months under review, 386,154 tons of ore was raised from the Great Cobar, 46,137 tons from the Chesney, and 43,697 tons from the Cobar gold, a total of 475,988 tons. The smelter treated this ore and also some of the accumulated stock and purchased material, the total amount being 606,791 tons. The production of the smelter was 9652 tons copper, 36,649 oz. gold, and 174,657 oz. silver. During the last 6 months of the 18, the assay of various ores were: Great Cobar, 0.98 dwt. gold, 0.429 oz. silver, and 2.508% copper; Chesney, 1.64 dwt. gold, 0.369 oz. silver, and 3.287%; Cobar gold, 0.5 oz. gold, 0.5 oz. silver, and 1.32% copper. On June 30 the reserves were: Great Cobar, 2,142,000 tons; Chesney, 602,000 tons; and Cobar gold, 344,000 tons. The total reserve at the first two has increased by 361,000 tons during the 18 months. The income during the period was £817,434, and the gross profit £102,354. Out of this £13,000 has been allowed for depreciation, £22,,886 has been devoted to the purchase of debentures, and £66,492 has been paid as interest on debentures. In October 1910, 50,000 new shares of £5 each were created; of these 15,000 were issued at par for cash, and 20,000 were issued as purchase price for the Cobar gold mine, so the issued capital now consists of £925,000 in shares, and there is £732,152 in debentures and debenture interest outstanding.

SILVERTON, COLORADO

Railroads Resume Service.—Iowa Tiger Leased.—Gold King Milling.—Sunnyside Acquires New Property.—Ledge Company Milling.—Congress Developing.

Railroad connection with the South was restored on December 7, and supplies of all kinds are being rushed to this district. An ample supply of foodstuff and coal will soon be on hand and all danger of any shortage is now removed. The weather for the past three weeks has been exceptionally fine for this season of the year and some properties will be able to resume operations this fall. The Iowa Tiger has been leased to Messrs. Otto Mears and Slattery, and the new lessees have a small force at work on the

Tiger mine. Development will be vigorously pushed during the winter, and the lessees hope to resume milling at full capacity in the spring. The railroad to Gladstone was promptly repaired and the lessees of the Gold King are milling. The tonnage will be increased as rapidly as possible and the mill may soon be at full capacity. Forty men are employed at present. The Sunnyside has taken a lease and bond on the property of the Quartz Mining & Milling Co. and will start development on a large scale at once. The Sunnyside continues its steady production. The Ledge is again milling at full capacity and has materially reduced the cost of mining by the installation of a double-drum electric hoist, which does the work of two steam hoists formerly used at this mine. The Congress mine is being unwatered and development will start within the week. The Gold Bug at Bear Creek has laid in supplies for the winter and will resume shipments in the spring. The Intersection has been leased for a period of five years and the milling capacity will be doubled by the addition of another battery of five stamps. The re-establishment of railroad communication and the continued good weather are sources of great encouragement to the operators of this district, but many plans will be delayed at least six months. The season of 1912 is looked forward to as one of vigorous development, and there is every reason to believe that 1913 will find this in the front rank of Colorado mining districts.

MINES AT BISBEE.

NEW YORK

Development in Miami District Merger.—Greene-Cananea May Pay 50 Cent Dividend.—New Producers Threaten Increased Copper Output. — Porphyry Notes.

The merger of the principal properties in the Miami district is 'marking time.' L. D. Ricketts, general manager of the Greene-Cananea, has just returned from Glasgow, where he went to report upon the properties of the Arizona Copper Co. Mr. Ricketts will represent the Cole-Ryan interests in the negotiations that will take place between the Live Oak, the Inspiration, and the Miami companies. The Cole-Ryan people, which Mr. Ricketts represents, have something more than a passing interest in Arizona Copper and are undoubtedly anxious to see this old producer properly equipped and turning out copper as it should, and no doubt will, do. The Raritan refinery, now a part of the International S. & R. Co., has for many years handled the copper of the Arizona Copper Co., while the metal has been sold by the United Metals Selling Co. It will be recalled that about a year ago the Cole-Ryan crowd made a strong effort to secure control of the Arizona Copper Co.; failing this, it is but natural and proper that they should be anxious to have Mr. Ricketts reconstruct the plant and repeat for the Scotchmen the splendid work that he did with the plant on the Greene Consolidated. Mr. Ricketts' work with the tumble-down plant that Mr. Greene left is bearing its first fruits. It is anticipated that the Greene-Cananea subsidiaries can make a distribution of profits the first of the year that will allow the Greene-Cananea to pay a dividend of 50c. Greene-Cananea is one of the properties that will stand ready to extend itself under the stimulus of higher prices in the metal market; with 14c. copper Greene-Cananea should make some records for itself, for the new plant, and for Mr. Ricketts, who built and rebuilt it. On the Live Oak, the last property to come under Mr. Ricketts' charge, and which was acquired while he was abroad, the churn-drills are at work and the data are being gathered for an accurate estimate of the ore, developed and partly developed. The reduction plant of the Miami is nearly all installed, the fifth unit of the concentrator is just being started up, and the sixth and last unit will be started in January, when production is expected to reach 3,000,000 lb. of copper monthly. It is anticipated that the Miami plant will be enlarged to care for the ores of all three properties if the contemplated merger is finally effected. It is stated from confidential sources, upon what appears to be good authority, that, while negotiations have not been discontinued, there is no real hope of the consolidation being made.

While it is the fashion of the moment to point with pride to the restricted output of the past month or two as being partly responsible for the betterment of the copper metal market, and to lay no emphasis on the prospects of the new producers, there are, nevertheless, several properties about to begin turning out copper. The Mason Valley smelter at Yerington, Nevada, has been completed and is just about to be blown in. The Mason Valley mine will turn out about 1,000,000 lb. of copper per month, and the smelter will have custom business from the Nevada-Douglas, which is to furnish 10,000 tons of ore per month, and will eventually handle ores from the Bluestone and several other as yet undeveloped properties in the immediate vicinity. The Mason Valley is owned by the Inspiration people. Another producer that is making preparations to 'come back' is the Shattuck-Arizona, which is about to build a small smelting plant, costing some $450,000, which will have two blast-furnaces, each of 400 tons capacity. The Shattuck-Arizona is one of the most promising of the newer mines at Bisbee, Arizona, and has the distinction of making some copper for a little less than nothing, if that be possible. In its first days of operation, it produced about 1,000,000 lb. of copper one month, when the precious metal content of the ore a little more than paid all expenses. Tuolumne, a neighbor of North Butte, has suspended dividends and has installed a large Nordberg hoist, in the meantime developing the ground and taking out only about 100 tons of ore per day. It is making preparations for greatly increased production, which will surely follow close upon the heels of the present advances in price of the metal. Pilot Butte, which is in turn a neighbor of the Tuolumne, has made a rich find in zinc. A part of the Pilot Butte ground lies near the Elm Orlu, W. A. Clark's mine, which is a heavy zinc producer, and it is thought the new find is important, as indicating a big zinc output for the Pilot Butte. With both Granby and British Columbia ready to begin operations on an enlarged scale, after a forced shut-down, to say nothing of the much-talked-of output of the porphyries, there will hardly be any runaway market for the metal. As 14-cent copper will prove a great stimulus to production, it may be confidently expected that during the next six months production figures will show that all curtailment hobbles have been thrown off, and every one will ride to beat the other fellows to the market.

Phelps, Dodge & Co. is forming a subsidiary mercantile company to take over all of the business of the company stores controlled by the various Phelps Dodge mining companies. The Phelps Dodge Mercantile Co. has been incorporated under the laws of the State of New York, with a capital of $400,000. The Phelps Dodge company has just declared its usual quarterly dividend of 2½%, and 2% extra, making the disbursement for the year total 12%, which is the same as was paid in 1909 and in 1910.

Henry Krumb has just completed his report upon the Inspiration, giving an estimate of ore reserves up to December 1. He figures developed ore reserves at 30,302,300 tons, with an average copper content of 1.95 per cent.

The Calumet & Hecla management is bending all its efforts toward a reduction of copper costs at various properties which it controls. One large cost item is being cut down by the use of one-man drills, and an order for 1000 drills was recently placed. Several of the lake mines, which have been unable to take out a profit for some time, are now, under closer management and with improved prices, expected to run ahead of the expense account by a fair margin.

It is somewhat monotonous to chronicle another reorganization of the Nevada Utah. It has been some years since anybody could follow the mazes of the various windings in and out of the corporate formation of the Nevada Utah, and another convolution more or less is mainly interesting only to shareholders, who will probably be called upon for an assessment in some form or other.

Never, since the days prior to the first discoveries at Tonopah and Goldfield, has interest in precious metal mining been at so low an ebb in the East. The flattening out of the excitement at Porcupine, and the continued unrest in Mexico, which lately seems to have become more serious, are two elements that are most important. Mexican mining properties are largely held in New York, but to enlist any new capital is out of the question under prevailing conditions, while trading in the shares and trading in properties are alike at a standstill.

A recent feature of the rooms of the American Society of Mechanical Engineers, in the Engineering building, New York, has been the exhibition of a portrait of the retiring presdent of the society, E. D. Meier. The portrait was painted by D. J. Strain and is the gift of members to the Society to commemorate Mr. Meier's seventieth birthday.

GLOBE, ARIZONA

CHURN-DRILL HOLE NO. 1 OF SOUTHWESTERN MIAMI DISCONTINUED.—DEVELOPMENT AND PRODUCTION NOTES.

Churn-drill hole No. 1, of the Southwestern Miami Development Co., has been discontinued at a depth of 1285 ft. without passing through the orebody, the bottom of the hole being in ore. On account of the great depth and the fact that the ground was caving badly near the bottom of the hole, it had to be abandoned. It is by far the deepest hole ever drilled in the Miami district. The drill will be moved to a location 400 ft. east of this hole and about 450 ft. from the nearest holes on Live Oak ground, some of which are known to have disclosed good ore. Hole No. 1 seems to have proved beyond doubt the continuation of the Live Oak orebody into Southwestern Miami ground, having disclosed a thickness of 175 ft. of chalcocite ore. Assay returns are not made public, as it is the policy of the management to withhold this information until more holes have been drilled, so that an estimate of tonnage can be made. Two churn-drills remain in operation on the ground of the Live Oak Development Co., one of the holes being now in ore. It is reported that the engineers' estimates differ as to the tonnage of ore developed, the Live Oak company claiming 19,000,000 averaging 2.11% copper, of which 15,000,000 will average 2.25%, while another estimate placed the figure at a total of 14,000,000 tons. It must be remembered, however, that the lower estimate was made by a prospective buyer. There as yet seems to be no reason to doubt that the official estimate of the Live Oak management was based on careful sampling, assaying, and computation, although there may be a difference of opinion as to what constitutes developed ore.

At the Superior & Boston, the cutting of the station on the twelfth level in the McGaw shaft is nearly completed and the cross-cut to the Great Eastern and Old Dominion veins will soon be continued. It is quite probable that diamond drilling will not be resumed, as the results obtained were not as satisfactory as the initial drilling led the management to expect. It was thought that the homogeneous diabase formation could be easily penetrated by the diamond drill, and slow progress was made for the first few days. Then numerous slips and small faults began to be encountered, forming alternate stretches of hard and soft material so that progress became very slow, and it was almost impossible to obtain a solid core. It will probably be three or four weeks before the cross-cut can reach the vein, and the disclosures then made will be of great importance to the Superior & Boston company. At the annual meeting of the stockholders, held at Globe on December 4, the following board of directors was elected: John H. Rice, William G. Rice, Norman W. Haire, John R. Pimlott, and James W. Harrington, the only change in the board being the election of James W. Harrington to succeed George R. Hill. The articles of incorporation were so amended that the board of directors may, at its discretion, increase its membership from five to nine.

W. H. Aldridge, managing director for the Inspiration Copper Co. has spent a couple of days at the mine, and returned to the East on December 6. Regarding the reported negotiations for consolidation of Miami, Inspiration, and Live Oak, he said: "I do not know whether the controlling interests in the properties will succeed in bringing about a consolidation. If a consolidation were effected it would be of great benefit to those interested in the district, as it would involve operations on a very much larger scale than at present, while, from the standpoint of the very many stockholders in the several companies, it would result in a large gain, because of the much lower cost of producing copper and correspondingly large increase of profits. The companies mentioned have developed over 65,000,000 tons of ore of a copper content averaging 2.17%, which would place the consolidated properties among the largest of the big porphyries. The beginning of these negotiations for consolidation will not change the policy of the Inspiration company regarding the present work in the experimental mill, the development of the mine and mill plans, or the providing of a water supply from Pinal creek."

The November output of the Old Dominion was 2,060,000 lb. of fine copper. Work is progressing satisfactorily, and 'A' shaft, which is the main working shaft, is being sunk to the eighteenth level. The work of clearing the Kingdon shaft, recently burned out, is under way, and the management has called for bids for a concrete lining for this shaft, instead of timbering. If bids are satisfactory as to cost, this shaft will be concreted for 1000 feet.

The fifth unit of the Miami concentrator started on December 1, and production should soon be at the rate of about 2,500,000 lb. of refined copper per month. Installation of machinery and equipment in the sixth and last unit is being effected, and this unit should be running early in January, bringing the monthly production of refined copper up to about 3,000,000 lb., based on the present rate of production.

H. F. Wendelborn, who is leasing on the Nevada vein on United Globe ground, is shipping 20 tons per month of ore reported to average about 14% copper. The ore is shipped to the Old Dominion smelter.

It is rumored that the Guggenheim interests have acquired control of the Ray Central. The report adds that a 1500-ton mill will be built.

General Mining News

ALASKA

KETCHIKAN

(Special Correspondence.)—The Mount Andrew and It mines, Kasaan bay, have suspended mining operations for the winter. About 700 tons of ore from the It mine is ready for shipment.

The high-grade orebody at the Rush & Brown mine has been discovered on the 200-ft. level. This property is being developed by the owners under the management and supervision of U. S. Rush.

The Princeton M. & M. Co., at Dolomi, has suspended operations until early next spring, when a 20-stamp mill will be erected.

A new orebody was uncovered on the Copper Center group and another large orebody was discovered on the Gopher property, formerly known as the Hydah group. The latter body is being prospected, and shows good ore at present. M. L. Polson is superintending the work, which will only consist of assessment work for the present year.

M. D. Ickis has returned from Dall island, where he had charge of the assessment work for the Ketchikan Marble Company.

The Gervis Bros., at Hollis, are taking out high-grade gold ore and cutting a winter trail to facilitate sledding the ore to tidewater during the winter.

The Lond De Van adit at George inlet is in about 1850 ft. It is expected to cut the vein at about 2500 ft. from the portal.

Ketchikan, December 11.

THE TANANA

Cooper & Stillman, of the Rexall quartz claims on Wolf creek, have sacked 15 tons of ore assaying about $100 per ton, says a report from Fairbanks.

Ground panning as high as $2.50 per square foot has been discovered on Flint creek in the Ruby district.

The vein on the Ryan Lode group, St. Patrick creek, has been traced by drills for 1200 ft. An adit will be driven from the base of the hill where it was discovered.

ARIZONA

GILA COUNTY

(Special Correspondence.)—At the Inspiration, the experimental mill is running steadily under the supervision of J. M. Callow. At the site of the proposed dam at Wheatfields, sixteen miles from the mine, test-pits sunk in the bed of Pinal creek disclosed bedrock about 12 ft. below the surface. Excavation is being made for a large steel warehouse near the mouth of the main adit. The gravel from the gulch near the mouth of the adit is being tested as to its suitability for the making of concrete. Development steadily continues at the Live Oak. Work at No. 2 shaft is at present confined to the cutting of a station at the 900-ft. level. The Miami Copper Co., with five of the six units of the mill in operation, is mining and milling 2500 tons of ore per day. The fifth unit is reported to be giving good results. Mill recovery is reported to be about 75% and production of refined copper is estimated to be at a rate of about 2,500,000 lb. per month.

The churn-drill of the Southwestern Miami Development Co. has been moved from No. 1 hole 400 ft. east to the location for hole No. 2, and drilling will begin at once. An assessment of $1 per share, payable January 15, has been levied on the 35,000 shares of outstanding stock. The New Keystone Copper Co. is operating one churn-drill on hole No. 41. Results are not made public.

At the Superior & Boston mine, on Copper hill, the cross-cut from the McGaw shaft., on the twelfth level, is being driven north toward the Great Eastern and the Old Dominion veins.

At the Five Points mine of the Manitou Copper Co., fifteen miles west of Globe, the 100-ft. Cracker Jim shaft is being unwatered with a small gasoline hoist, and the road to the property is being repaired. A larger hoist is about to be installed, and as soon as the shaft is unwatered it will be sunk 100 ft. deeper and a cross-cut driven to the Maverick vein. The Sleeping Beauty Copper Co. is employing six men on assessment work on its group of 20 claims nine miles west of Globe in the Sleeping Beauty range. The Orphan Copper Co. is doing assessment work on its 10 claims lying southeast of the New Keystone on the edge of the schist belt near a contact of the granite-porphyry and the schist. The Barney Copper Co. has completed assessment work on its group of 26 claims adjoining the Live Oak on the west.

Globe, December 14.

Advices from Boston state that the United Globe Mines earnings for 1911 will not be far from $200,000, an equivalent of 68c. per share on the 295 shares of the Old Dominion company issued. While a 50c. dividend may be declared, there is some doubt, owing to the recent fire in the Kingdon shaft. It is asserted that the Old Dominion has had a fire in the abandoned stopes of the upper workings for over a year. Since the Kingdon blaze, a second fire was discovered in the abandoned stopes.

PIMA COUNTY

Ore assaying 7% copper recently was discovered at the Copper Queen, state reports from Tucson.

PINAL COUNTY

The Ray Con. Copper Co. in November treated about 110,000 tons of ore in its mill, an increase of 15,000 tons over the preceding month. In concentrate there was produced about 2,600,000 lb. of copper, a proportionate increase. Shipment of concentrate to the El Paso smelter of the Guggenheim interests will be stopped January 1 in favor of the A. S. & R. smelter at Ray. The new smelter, however, will not be placed in commission until April 1, and the concentrate will be allowed to accumulate until then. At the Ray mill a saving of 70% of the 1.8% ore was obtained.

CALIFORNIA

AMADOR COUNTY

Recent newspaper reports state that the newly organized Keystone Mines Co. has taken over the McDonald interest in the Keystone mine. Carlton R. Downs of Sutter Creek is president of the company.

The annual report of the Lincoln Con. M. Co. for the year ended December 15 shows a balance on hand of $6540, after disbursements of $10,610. The south drift on the 800-ft. level is now 669 ft. from the main cross-cut, and the north drift has been extended 300 ft. The south drift penetrated ore in the last 200 ft., but not of commercial grade, taken as a whole. The old 1200-ft. level was cleaned out for about 300 ft. An assessment of 10c. per share was levied.

SAN BERNARDINO COUNTY

(Special Correspondence.)—The California Big Chief M. Co., made up of Providence, Rhode Island, people, has taken a bond on the Jumbo mine, situated in Hart district, from W. M. and L. W. Foster and P. McClusky, the original locators. The property is to be reopened and further developed under direction of F. E. Browne, the company's consulting engineer. The Jumbo has produced ore to the value of about $10,000 during the past five years, consisting of free-milling gold quartz. A stamp-mill is to be built if results of development should justify it. Mr. Browne started from Salt Lake City for Hart December 17.

Hart, December 17.

SISKIYOU COUNTY

(Special Correspondence.)—The Taylor Lake quartz mine, 12 miles from Etna, has been bonded by Chico capitalists from Harris Bros. & Co. Arrangements have been made for the placing of a crew at work. The Owl placer claim, on Orleans Bar, has passed into the hands of W. L. Clark and W. B. Grant, of Los Angeles. Repairing of the flume and other work is under way, and the handling of rich gravel will soon start. The Owl is situated on the high channel, and contains proved deposits of good gravel. The Wright family has purchased the Eastlick placer claim and is arranging for active operations. The Trail Creek M. Co. has completed the erection of a small mill. During the winter development work will be pushed, but no attempt will be made at production until spring sets in. A considerable quantity of milling ore is exposed. The holdings lie near Callahan. A recent test of 100 tons of ore from the Adaline Rocks mine was so satisfactory that the management has decided to build a 40-ton cyanide plant in the spring. A small mill was completed some months ago. Stanwood Murphy is superintendent. New owners of the Barendum & Rostetter quartz property, Plowman Valley district, are arranging for an active spring season. At the McKeen a cross-cut is being driven from the new shaft to intersect the vein.

Etna, December 15.

TUOLUMNE COUNTY

(Special Correspondence.)—A hoist and other machinery will be installed at once at the Morning Glory mine, near Confidence. The shaft is 80 ft. deep, the vein 4 ft. wide, and the assays range $40 to $80 per ton. This property has been called the Jim Lyons mine, and was bonded last September to Allen C. Redding for the reported price of $75,000.

One hundred cars of ore from the Rosedale mine, on Table mountain, yielded $704. The adit is 125 ft. long and has almost traversed the old subterranean channel, but is still being driven. It is now reported that the recent visit here of Oscar Galliee, who was at one time superintendent of the Soulsby mine, was for the purpose of rehabilitating their once noted property.

Men are again working at the Imperial group, the property having been bonded to Buick and Hutchinson, who are also the operators of the Clio. The crew at the latter is being increased and a large amount of development work is planned. M. D. Kelly is superintendent. The Jumper mill will soon be started.

Preparations are under way for reopening and operating the Nonpareil mine, which is held by P. George Gow. An interest in the Robinson quartz mine, an adjoining property, has just been purchased outright by Mr. Gow. The mill at the Gross mine, near Tuttletown, was started a few days ago, but is again idle on account of the water shortage. Work in the mine is progressing as usual.

Tuolumne, December 16.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence.)—An 8-ft. streak of ore has been uncovered on the fourth level of the Smuggler mine on Brown mountain that assays 376 oz. silver and 32% lead per ton. Shipments have been started. B. C. Catren is manager. Work is again in progress on the Raymond adit on Griffith mountain. L. Hoery, owner of the Phonolite property, has resumed operations. Stoping has been started on a body of lead-zinc ore that is 18 in. wide. A company is now in process of organization. The Little Emma mine on Democrat mountain is the scene of an important discovery, a 4-in. streak of gray copper, assaying 835 oz. silver per ton, having been uncovered. E. L. Nubton is operating under lease. A body of 150-oz. silver ore 18 in. wide has been found in the Scepter mine. The discovery was made 2100 ft. from the portal of the adit. Ira Clapper is lessee.

Georgetown, December 16.

(Special Correspondence.)—A 6-in. streak of ore has been found in the Little Champion mine that mills 15 oz. gold per ton. George Hyland is owner. Work has been resumed on the Wyoming Valley adit. J. J. Hoban is manager. Work has been resumed on the Clara mine at Alice. A. P. Alberts is manager. A plant of machinery has just been installed at the Lamartine mine. Electric power will be purchased. John Lang is manager. The Metropolitan adit on Donaldson mountain has been driven 3400 ft. A vein is now being penetrated that is heavily mineralized. Driving is in progress on the Metropolitan vein. Thomas Coppard is manager. A body of ore 18 in. wide has been uncovered on the Oneida vein at Freeland that assays $45 per ton in gold, silver, and copper. John Owen is manager. A carload of ore is being shipped daily from the lease being operated on the Gem mine by Coe & Co. Net returns of $60 per ton are received.

Idaho Springs, December 16.

SAN MIGUEL COUNTY

In a recent report the Wild Boy M. & M. Co. stated that during the year the branch adit had been extended 85 ft. in 'solid formation.' The adit was cleaned out to a point 400 ft. beyond where a large cave-in occurred. A drift was driven 85 ft. on a new vein. Another claim was located, making a total of eight claims and a millsite. New rails and tools were purchased and the company was $228 in debt. In accordance with the by-laws, work was stopped. In 1912, it is hoped, a 10-stamp mill may be erected. W. M. Herrington is manager for the company, which has its principal office at Pueblo.

TELLER COUNTY

The ores formerly going to the plant of the U. S. R. & R. Co. have been diverted to the Golden Cycle (cyanide) plant for the present, and the following open rates announced, as compared to the Standard rate of the shut-down:

MAP OF COLORADO.

Per ton.	Freight and treatment.	Standard rate.
Up to $10	$4.00	$4.00
$10 " 15	5.25	4.50
15 " 20	6.00	5.00
20 " 25	6.50	5.50
25 " 30	7.00	6.00
30 " 40	7.50	6.50
40 " 60	8.50	7.00
60 " 100	8.75	8.00
100 " 150	9.75	....
150 " 200	10.75	....
200 " 250	12.75	....
Above 250	12.75	....

These rates show a considerable advance on ores carrying 1 oz. gold, the higher grades not mattering much, as they can go to the smelters and may, with the rejuvenation of the Portland mill, lead to a rate fight early in 1912.

Lessees on the Gold Dollar Con. M. Co.'s property and the company itself shipped a total of 1200 tons of ore last month.

It is rumored that the Granite Gold M. Co., of Cripple Creek, will pay a dividend of 1c. per share shortly before Christmas. The company, according to late newspaper reports, has not taken definite action, but has had a prosperous year.

IDAHO

Idaho County

L. K. Armstrong, of Spokane, acting for Eastern investors, has acquired a three-fifths interest in the Anaconda, Georgia, and New York groups of mining claims in the Ten Mile district, according to advices from Spokane, for $125,000. The three groups include 20 claims, partly developed. There is a 5-stamp mill on the Georgia group. The ore yields $14 to $16 per ton. The new owners will erect a modern ore-reduction plant.

Shoshone County

The Success M. Co. has announced a dividend of 1½c. per share, or $15,000 in all, payable the latter part of December, making a total of $75,000 for 1911. Mr. Samuels, president of the company, says the monthly dividend disbursement will be $10,000 in 1912. Prior to the financial flurry in 1907 the company paid four dividends, aggregating $60,000. Smelter returns for a car of silver-lead-copper ore, says a report from Spokane, shipped by the Caledonia company, operating at Wardner, showed 486 oz. silver, 16% copper, and nearly 50% lead. Rapid progress has been made in development work in the new main working-adit since the bad ground in the hanging wall of the Osborn fault was passed.

Robert Scheffels, president of the Jack Waite Mining Co., has announced in Spokane that a lower adit will be driven through the first orebody. The company is installing an 80-hp. gasoline engine, air-compressor, and other apparatus, after which a concentrator will be erected. The company has $25,000 worth of ore on the dump. Forty men are at work. Workmen are erecting a 150-ton concentrator and installing a 100-hp. gasoline engine at the Black Horse mine. The Bear Top M. Co. also is erecting a 60-hp. gasoline engine and additional machinery for air-compression. Two hundred and fifty tons of ore per month is now being mined by the company and the capacity will be largely increased by the improvements.

Jurors in the District Court at Wallace, after sixteen hours' deliberation, sustained the claim of the Pittsburg Lead M. Co. to apex rights and refused to grant damages to the owners of the Monarch claim. Stockholders of the Nipisic Mining Co., headed by F. E. Goodall, of Spokane, have provided a fund of $20,000 to develop the property which adjoins the Amazon-Manhattan on the east and is separated from the Hercules mine by one claim. E. P. Spalding, of Spokane, general manager for the Coeur d'Alene North Fork M. & S. Co., announced, on returning from an inspection of the property, that the Monarch mine, near Murray, contains two large ore-shoots in parallel veins on the 1400-ft. level. One occurs in the original Monarch vein and has been developed all the way from the surface.

MINNESOTA

This State received last year, as royalty on iron ore shipped from State land, $214,717, a reduction of $142,444 from the sum received the preceding year. The State owns 20 mines.

MONTANA

Lincoln County

(Special Correspondence.)—With the object of constructing a smelter at or near Libby, building a railroad, and to further develop the Snowshoe mine, the Montana Smelting Co. has been organized and has taken over the holdings here of the Pacific Coast Smelting, Refining & Mining Co. The latter company purchased the Snowshoe mine about a year ago and has been operating steadily since that time. E. H. Wilson, consulting engineer to the company, who has the work at the mine in charge, states that the proposed work involves the expenditure of about $2,000,000, and it is the company's desire to build the smelter at Libby, providing arrangements can be made with land owners so that the company can be assured of not being harrassed by damage suits after the plant is in operation. Mr. Wilson gives it as his opinion, however, that the ores in this part of the country will cause absolutely no damage to the valley, as there is no arsenic in them.

The work of sinking the shaft is still in progress at the mine and a station will soon be cut 150 ft. below the 450-ft. level. As soon as this station is cut, drifts will be run north and south and another 150 ft. of stoping ground will be opened.

Libby, December 14.

(Special Correspondence.)—Paul D. Pratt, mining engineer, returned Friday from the California-Montana Placer Mining Co.'s property on Libby creek, where he spent several days in laying out the pipe-line for the big hydraulic plant that is to be constructed. W. H. Graham, of San Francisco, who is at the head of the enterprise, expects to have the plant ready by April 1. The steam drilling-machine is now being operated, and prospecting will be carried on throughout the winter. E. M. Sanders is in charge of this work. The company has contracted for 880 acres of land on Libby creek.

In addition to the big plant which is being constructed by the California-Montana Placer Mining Co., two others will be in full operation, the Libby Placer Mining Co. and the Comet Placer Mining Co., both hydraulic properties.

Libby, December 17.

Silverbow County

(Special Correspondence.)—The Butte-Ballaklava company will reach the depth of 1600 ft. soon after the first of the year. The sinking of the shaft from the 1400 to the 1500-ft. level was completed a couple of weeks ago.

The Tuolumne surface plant is all in position and nothing remains now but the adding of a few finishing touches. As soon as everything is working smoothly the output of the mine will be increased to about 250 tons per day. At the same time sinking, which was discontinued after the shaft had reached a depth of 1800 ft., will be resumed and the shaft carried to a depth of 2000 feet.

The Anaconda mine will not be in operation until after the first of the year. When the re-timbering of the shaft was completed from the surface to the lowest level, a short time ago, it was thought that ore hoisting could be resumed after the shut-down of over two years, but other improvements and repairs were found necessary, and it will be probably the middle of January before work is started up.

The experiments now going on in the North Butte mine for the purpose of demonstrating the practicability of operating the drilling machines by electricity have reached the stage where it is stated that it is only a question of a few weeks when arrangements will be made to equip all the machines with electricity. Besides accomplishing at least twice the work in a given time the cost of operating will be considerably reduced.

Butte, December 16.

John Farson, E. A Clark, and Francis Hamilton, according to late reports, have constituted themselves a committee to receive deposits of La France Copper Co. bonds, interest on which has been defaulted since January 1, 1908. The company's funded debt amounts to $2,000,000, interest on which is guaranteed by the United Copper Co., which offered its notes in July 1908, due July 1, 1909, and later notes due January 1, 1911, for unpaid coupons of the La France company due January 1 and July 1, 1910. F. A. Heinze is quoted as being favorable to the action. The members of the committee are all of New York. The company's assets chiefly have been the Lexington mine, near Butte, and the concentrator at Basin, Jefferson county.

NEVADA

Clark County

A new leasing company is being organized to develop the Quintette property, states a recent report from Searchlight. It will be known as the Colorado & Nevada Leasing Co. H. G. House will be general manager for the company.

Esmeralda County

It is rumored that the Florence Goldfield M. Co. is to erect another mill in the near future. T. D. Lockhart, of the Florence Goldfield company, is reported to be considering the Homestake-King mill at Rhyolite.

Twelve leases have been granted by Jordan Bros. on property at Antelope Springs. Downer Bros, assayers of Goldfield, have taken a lease on adjoining property.

HUMBOLDT COUNTY

Shaft sinking was started last week at the Limerick property in Rochester canyon. The Champion group, Jackson mountains, owned by F. W. Ackerman and Ed. Christianson, will start shipping copper ore in the near future.

It is reported that in the spring a mill will be erected on the Wam Pah property, formerly known as the Indian Ike, near Black canyon. An adit has been started. The mine is owned by Wright, Sullivan & Hunter, states a recent report from Lovelock. H. H. Hunter is manager of the property.

LINCOLN COUNTY

Newspaper reports state that the cross-cut on the 300-ft. level of the Pioche Demijohn recently penetrated the manganese orebody explored on the 200-ft. level. Another manganese orebody was traversed for 15 ft. Shipment of ore is prevented only by lack of railroad connection. W. E. Bailey is superintendent of the property.

LYON COUNTY

Reports from Yerington state that the greatest deposit of native copper yet found in the district was discovered last week on the 600-ft. level of the Nevada Douglas mine. Lumps of copper 98% pure and weighing up to 500 lb. have been removed. South of this native copper a drift has penetrated sulphide ore assaying 6 to 17% copper.

NYE COUNTY

(Special Correspondence.)—Large quantities of lumber is arriving for the Associated mill, and it is expected to have the frame in place within a few weeks. Machinery, tanks, and other equipment is reported on the way. The War Eagle mill has about completed the crushing of a shipment of ore from the Jumping Jack, and is about to start on 170 tons from Union No. 9. About 1100 tons from the Poak-Steen-Cicala lease on Big Four was recently crushed. With the crushing of the Union No. 9 shipment the mill will close until several repairs can be completed. The Big Four M. Co. has closed a deal whereby it gains a controlling interest in the Gold Wedge company. The transaction places the Big Four in a commanding position in the district, as it already owns the rich Big Four and Joker properties. The Mineral Hill management reports mining good-grade ore in the east drift from the shaft. The lower adit is progressing at the rate of about 6 ft. per day. The White Caps lease sent 1000 sacks of high-grade ore to the Western Ore Purchasing plant at Millers. The shipment comprises about 40 tons, and is said to average $60 to $80 per ton. The Steffner Con. lease has its shaft down 150 ft., with sinking progressing steadily. The steam compressor and hoist will in future be electrically operated. At the 100-ft. level connections will be made with the old workings.

Manhattan, December 14.

D. D. Sullivan, of Globe, Arizona, Frank Dick and A. L. Hill, of Los Angeles, and R. E. Pruesser, of New York, are about to organize a company, says a Goldfield report, to develop the Albion Millett mine, near Millet, which they recently purchased. The company is to be known as the Albion Millett Gold Mining Company.

The Tonopah M. Co. has declared its regular quarterly dividend of 25% and an extra dividend of 15%, payable January 20. The Tonopah M. Co. in November made a profit of $172,316, from 14,799 tons of ore which assayed on the average $20.71 per ton. The Tonopah Belmont made a net profit of $156,460 from 7807 dry tons milled and 2730 tons sent to the smelter. The North Star M. Co. has levied an assessment of 2c. per share to place it on a producing basis. On the 500-ft. level of the West End Consolidated mine an improvement in the ore was noticed last week.

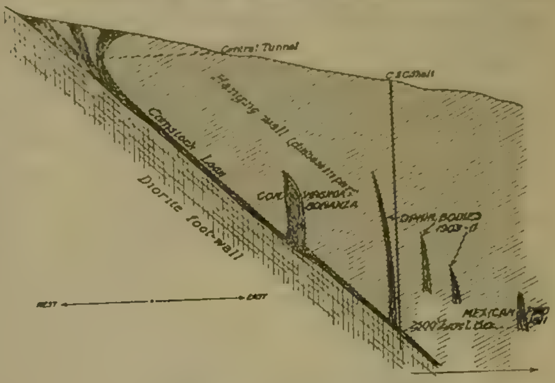
The production for the Tonopah district last week is thus summarized by the *Tonopah Miner:* The Tonopah M. Co. sent 3500 tons, the Belmont company 2450 tons, the Montana-Tonopah 1050 tons, the Tonopah Extension 980 tons, the West End 475 tons of ore and 325 tons of old tailing, making the total production for the week 8455 tons, the estimated value being $211,575.

A. S. Dingee, of Fort Worth, Texas, one of the stockholders who purchased the mine and mill of the Homestake-King company at Rhyolite, announced recently that by this action the stockholders who did not participate in the purchase are 'down and out' as far as the company is concerned. Economical operation that will pay for development will be attempted.

The Barcelona Mines Co. has been organized to develop six unpatented claims adjoining the old Barcelona mine, ten miles north of Manhattan. The company also has an option on the two unpatented claims of the Barcelona mine, owned by Eugene Locks. The company was formed through W. G. Lovie.

STOREY COUNTY

The production last week of the Comstock mines is summarized as follows by the *Virgina Chronicle:* The ore production from the Comstock mines, as reported today for the past week, shows a total of 1048 mine cars, giving a gross assay value of $24,528.86. The Mexican company output was a few cars saved here and there from development work. The production of the mines was as follows: Ophir, $18,525.78; Mexican, $3203.08; Crown Point, $2800; total, $24,528.86.



CROSS-SECTION OF COMSTOCK LODE.

The Mexican mill will be ready for a test run in the near future.

WASHOE COUNTY

Unusually rich lead sulphide ore was discovered last week in the Arkell mine, the Currie Wheeler shaft, and the McCart-Ball lease, all the property of the Nevada United company, states a recent report from Wedekind district.

WHITE PINE COUNTY

Construction work on the new Boston-Nevada mill in Spring valley will be started in the near future, and the machinery will be put in place on delivery. A few men are working in the mine, at Osceola. F. D. Goody is general manager for the company.

The water in the Giroux has been lowered to below the 1350-ft. level. The pumps on the 1200-ft. level are being tuned up for operation. Work is progressing satisfactorily on the railroad to connect the Morris No. 2 shaft with the concentrator. The hoisting plant is in place and the head-frame is partly erected.

NEW MEXICO

SOCORRO COUNTY

(Special Correspondence.)—The Ernestine M. Co.'s first clean-up for December is being smelted. Last week 600 tons of ore was milled, producing 56 sacks of concentrate. Rich ore showing flakes of gold is coming from the new orebody, which is yielding a high-grade mill-ore for its entire width of 20 ft. The new 10-stamp battery is now in commission. The assembling of the De La Vergne high-compression oil-engines is progressing rapidly, under the supervision of an expert from the factory.

A total of 53 ft. of development was done during the week by the Oaks Company. Forty tons of ore was sent to the Deadwood mill.

More machinery for the Socorro Mines' new power plant was delivered during the week. The mill treated 1050 tons of ore the past seven days.

It is reported that the Cooney mine of the Mogollon G. & C. Co., above the adit level, has been leased for a period of two years, one of the conditions being that the lessees erect a small mill for reducing the ores.

The contract for driving on the vein at the 200-ft. level of the Trilby group has been completed.

Mogollon, December 15.

SOUTH DAKOTA

Lawrence County

(Special Correspondence.)—Fred Straub has taken a contract to complete the Black Hills smelter, at Galena, by February 1, and has a crew of men at work on the finishing touches. Owing to financial difficulties work was suspended for a time, but nearly all the machinery and material excepting electric motors is either at Galena or Deadwood. The motors have been ordered from the factory, for immediate delivery. The initial order for coke has been placed, 600 tons of Connelsville being the order given.

The Custer Peak M. Co. is retimbering the shaft down to the water-level, a distance of 80 ft. Below that point, to the bottom, 300 ft., the timber is believed to be in good shape. As soon as the new timbering is completed the shaft will be unwatered and development continued on the copper vein which gave encouraging results when opened two years ago.

John Hahne has leased the property of the Minna M. Co., at Galena, and will open it to ship ore to the smelter. The ground adjoins the Golden Crest property, and has a showing of porphyry ore assaying from $8 to $72 per ton.

The adit to connect the Glory Hole workings, on the Evans Consolidated ground, has been completed, and a most encouraging feature was the finding of 20 ft. of milling ore. A sample from the floor of the adit gave returns of $12 per ton, but it is not expected that the entire body will average this amount. Plans have been completed for the repairing of the Lexington Hill mill, recently bought by the Evans company, at a cost of $2500. It is hoped to have the plant, with 20 stamps, running early in the spring.

The New Reliance company has purchased ten stamps from T. R. Griffith, at Keystone, and will install them immediately in the mill at Annie creek. The mill has been running six months.

Deadwood, December 15.

UTAH

Juab County

In a statement to stockholders the Tintic Standard M. Co. announces that since the resumption of development last July, 555 ft. of work has been done, mostly by contract. Small orebodies, assaying from 11.8 oz. silver and $1.20 gold to 51% lead, 91 oz. silver, and $5 gold per ton were found. An assessment was levied for further development.

Salt Lake County

Rumors from Salt Lake City state that Yampa Smelting company of Bingham has discontinued shipping ore. Official confirmation of the report is lacking.

Utah County

The Hiawatha M. Co., capitalized at $100,000, with 1,000,000 shares, par value 10c. each, has been organized to develop property in the Provo district, including two unpatented lode claims, the Teddy and the Iona. Jesse Knight is president of the company, which has its main office at Provo.

WASHINGTON

Spokane County

Engineers and operators from districts throughout the Northwest, including the provinces of British Columbia and Alberta, and the Alaska and Yukon territories, will meet at Spokane, February 15 to 17, to organize an international mining congress. The Spokane Mining Men's Club, the Spokane Chamber of Commerce, and the Inland Empire Federation of Commercial Clubs will be hosts. The sessions are to take place in the State armory, where there also will be exhibits of ores and machinery. The committee in charge is composed of L. K. Armstrong, J. T. Omo, W. W. Gifford, J. C. Haas, and J. W. Turner of the mining club.

CANADA

Ontario

La Rose shareholders were hoping for a partial distribution of the company's surplus of something over $1,500,000, but no action was taken at the regular quarterly meeting, when the regular dividend of 2% was declared. Possibly the La Rose management has it in mind to do something with the various Porcupine ventures in which it is interested. The Temskaming shareholders have voiced some loud protests in regard to the purchase of a control of North Dome by the Temiskaming, but have been told in reply that North Dome is sure to develop into a profit-earner for the shareholders, if the board can be allowed to carry out its plans. Temiskaming, however, has been showing a steady decline in the market, rather indicating that present stockholders are far from approving the plans of the board and prefer getting out rather than waiting for dividends to come from the Porcupine property.

Yukon

Telegraphic despatches from Dawson state that a rush is on for the head of Sixty Mile river as the result of the discovery by John Matson of unusually rich ore. Matson is said to have panned 2½ oz. of gold from a bedrock space 5 by 8 ft. The creek on which the gold was discovered is 20 miles long and has several tributaries. The district is close to the Alaskan boundary.

MEXICO

Chihuahua

Press despatches state that the mines of the Cusihuiriachic district are quite active, although only two are shipping. These, the Promontorio and the Princessa, have a combined output of about 3000 tons of ore per month, the ore assaying 700 to 800 oz. of silver per ton.

The Cusi Con. M. Co. will start development on the Consolidada No. 2 property in the near future. The Consolidada No. 1 has been unwatered. The shaft is 340 ft. deep. As soon as a hoist can be erected shipping will be started. The same company already has started work at the Elisa mine.

Sonora

The Cananea company in November produced 5,750,000 lb. of copper, against 6,100,000 lb. in October. In the production is included the concentrate handled for the Ray Con. Copper Co. A new incline tramway is being installed at the Puertocitos property. At the Veta an ore-sorting apparatus, similar to that used at the Sierra de Cobre, is being placed.

The Catalina No. 2 shaft of the Calumet & Sonora M. Co., at Cananea, has been closed down indefinitely.

The Cajon mine, forty miles west of Noria, will start its cyanide plant and mill in the near future. The property recently was taken over by Colorado investors. The Mina Mexico smelter is working full blast and the mine is active. The Oputo M. Co. soon will start development work at the Waldorf, near Oputo, Moctezuma district.

NICARAGUA

(Special Correspondence.)—The first shipment of gold bullion to the United States from the Panama Mining Co.'s property in the Piz-Piz district was made November 5.

San Pedro, November 9.

COLOMBIA

C. J. London, of Philadelphia, is on his way to the properties of the Colombia Consolidated Goldfields, Inc., on the Cauca river, Republic of Colombia. The company's engineer has cabled that work with Keystone drill on the properties bears out the opinion previously expressed of the excellent gold content of the gravels.

Book Reviews

Any of the books noticed in these columns are for sale by or can be procured from, the Mining and Scientific Press

A Manual of American Mining Law. By A. H. Ricketts. Pp 186 ; xiv. Scientific Book Publishing Co., San Francisco, 1911. For sale by the *Mining and Scientific Press*. Price $4.25, postpaid.

Convenience of use is an important factor in the worth of a book, and Mr. Ricketts has evidently kept this factor in mind in preparing a volume to add to the already considerable number of handbooks of mining law, and has well indexed his material in addition. The book is exceedingly concise in its treatment of the subject, and might indeed almost be called a dictionary of citations. An interesting feature of the volume is the preface, written by Charles G. Yale, the son of the author of the first book dealing with American mining law.

Thermodynamics of the Steam Turbine. By C. H. Peabody. Pp. 282; ill. John Wiley & Sons, New York, 1911. For sale by the *Mining and Scientific Press*. Price $3.

Steam turbines have grown immensely in importance in recent years, especially with their widening application in naval engineering, and the extent to which this is true is well illustrated in the appearance of so specialized a volume as the one under review. The author, who is professor of naval architecture and marine engineering in the Massachusetts Institute of Technology, has prepared the work for the use of his own classes, but the scope of the work is somewhat wider than might be inferred from the title, and mechanical engineers engaged in the design of related types of engines will find much of interest in so complete a presentation of the subject.

Practical Gas and Oil Engine Handbook. By L. E. Brookes. Pp. 192; ill. Frederick J. Drake & Co., Chicago, 1911. For sale by the *Mining and Scientific Press*. Price $1.

This little volume, of pocket size, has been prepared to present in a lucid and practical manner, avoiding technicalities so far as possible, information regarding the operation and care of gas, gasoline, and kerosene engines. Mr. Brookes, who is already known as the author of works on the construction of gasoline motors and the construction and operation of automobiles, is well qualified for this task, and the many engineers who, without any special training, are called upon to operate gasoline and gas engines will be especially grateful for the concluding chapter, which discusses gas-engine troubles and presents briefly the more important features of the care and operation of engines of the explosion type.

Searchlights on Some American Industries. By James Cooke Mills. Pp. 299; ill. A. C. McClurg & Co., Chicago, 1911. For sale by the *Mining and Scientific Press*. Price $1.50 net.

The rapid growth of industry during recent years brings about such rapid and sweeping changes that the members of professions often find that unrelated lines of work develop so rapidly as to prevent 'keeping up' with them. The popular magazines and some weekly journals endeavor to meet this need by the publication of semi-technical articles dealing with various industries, but which from the nature of the circumstances under which they have been prepared, not infrequently are marred by errors of fact. Mr. Mills has endeavored to present a volume which, by care in its preparation, would be free from such defects. Just what has been the guiding principle in selecting topics for discussion is not perfectly obvious, but the treatment of those chosen is good, and the book is well illustrated. It is published at an opportune time, and will be useful as a gift book for engineers.

Recent Publications

The Resources of Tennessee. Vol. 1, No 5. Pp. 40 Ill Nashville, November 1911.

Alaskan Coal Problems. By Walter L. Fisher. Bureau of Mines Bull 36 Pp. 32. Colored insert maps. Washington, D. C., 1911.

Report on the Molybdenum Ores of Canada. By T. L. Walker. Canada Department of Mines, Mines Branch. Pp. 64. Ill, index. Ottawa, 1911.

Summary of the Mines Branch for 1910. Canada Department of Mines, Mines Branch. Pp. 243. Ill., inserts, index. Ottawa, 1911.

Results of Spirit Leveling in Illinois, 1909 and 1910. By R. D. Marshall. U. S. Geological Survey, Bull. 493. Pp. 115. Index. Washington, D. C., 1911.

The Production of Coal in 1910. By E. W. Parker. Advance chapter from 'Mineral Resources of the United States, 1910.' Pp. 241. Colored insert maps. Washington, D. C., 1911.

The Production of Glass Sand, Other Sands, and Gravel in 1910. By. E. F. Burchard. Advance chapter from 'Mineral Resources of the United States, 1910.' Pp. 10. Washington, D. C., 1911.

Statistics of the Clay-Working Industries in the United States in 1910. By Jefferson Middleton. Advance chapter from 'Mineral Resources of the United States, 1910.' Pp. 66. Washington, D. C., 1911.

Surface Water Supply of the United States 1910. Part VIII. Western Gulf of Mexico. By W. B. Freeman and J. G. Mathers. Water-Supply Paper 288. Pp. 149. Ill, index. Washington, D. C., 1911.

Potash—The Search for Potash in the United State. By Hoyt S. Gale. U. S. Geological Survey, Bull. 530-A. Advance chapter from 'Contributions to Economic Geology,' 1911. Pp. 27. Ill., insert. Washington, D. C., 1911.

The Neocene Deposits of Kern River, California, and the Temblor Basin. By Frank M. Anderson. Proceedings of the California Academy of Sciences. Fourth Series. Vol III, November 9, 1911. Pp. 75. Inserts. San Francisco, 1911.

Retracement of the Boundary Line Between Idaho and Washington, from the junction of Snake and Clearwater rivers northward to the international boundary. By R. B. Marshall. U. S. Geological Survey, Bull. 466. Pp. 39. Ill, insert map. Washington, D. C., 1911.

Notes on the Later Cenozoic History of the Mohave Desert Region in Southeastern California. By Charles L. Baker. University of California Publications, Bulletin of the Department of Geology. Vol. 6, No. 15, December 2, 1911. Pp. 50. Ill., insert. Berkeley, 1911.

Physical and Chemical Properties of the Petroleums of the San Joaquin Valley of California. By I. C. Allen and W. A. Jacobs. With a Chapter on Analyses of Natural Gas from the Oil Fields of Southern California. By G. A. Burrell. Bureau of Mines Bull. 19. Pp. 60. Ill., index. Washington, D. C., 1911.

Annual Report of the Smithsonian Institution, 1910. Pp. 688. Ill., insert map. Washington, D. C., 1911. This report is in its usual form of a brief review of the work of the Institution, including the report of the Secretary and the proceedings of the Regents, supplemented by some 500 pages of technical papers of much interest, chiefly long abstracts of important papers published in the proceedings of foreign scientific societies. Many of these are of the highest importance and of great general interest. It is unfortunate that they are included in what has the appearance of a dull report on business affairs; if this portion of the volume were published separately in more attractive form its usefulness would be greatly increased. The paper by C. E. Munroe upon the testing of explosives will have the greatest technical interest to mining engineers.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

E. H. Mead has gone to New York.

M. P. Boss is at Hotel Argonaut, San Francisco.

C. W. Merrill has returned to San Francisco from New York.

J. E. Spurr has become vice-president of the Tonopah Mining Company.

William Hawxhurst was recently at Salt Lake City and has returned to California.

Bayliss Clarke, superintendent of the Lightner mine, was in San Francisco this week.

F. Lynwood Garrison has gone to Arizona and will reach San Francisco about January 1.

Alexander Leggat recently left Butte for Patterson Creek, Idaho, on professional business.

S. T. Wellman is in the hospital at Redding on account of a broken leg. He is recovering as rapidly as could be expected.

W. J. Loring, who recently went to Burma to inspect the Burma Mines, Ltd., expects to return to London early in February.

Edmund Juessen has resigned as manager for the Pittsburg-Silver Peak, and will devote his whole time hereafter to consulting work.

George H. Garrey has discontinued private practice and accepted a position as geologist for the American Smelting & Refining Company.

George D. Dimmit has left the Goldfield Consolidated Mines Co. and is at present associated with Rex W. Dunlap & Co. at Phoenix, Arizona.

C. J. London has left New York on his way to the properties of the Colombia Consolidated Goldfields, Inc., in the Republic of Colombia.

W. P. Jennings, manager for the Grand Gulch M. Co., operating in Mohave county, Arizona, has returned from the property to Salt Lake City.

G. W. Heintz, general manager for the United States Smelting, Refining & Mining Co., has returned to Utah from a trip through Arizona and California.

James A. Force has been made consulting engineer for the German Gold & Uranium Mining Co., with offices at Philadelphia and Denver, the mine being at Quartz Hill, Gilpin county, Colorado.

W. W. Wishon has resigned the management of the Austin Manhattan Con. M. Co. at Austin, Nevada, and is spending the holidays at Butte, Montana, where he was formerly for many years.

Obituary

R. W. Hines, who died of pneumonia at El Paso on December 14, was born at Toledo in 1884, and had practised as a mining engineer in the mining districts of Sonora and Chihuahua, having lately been superintendent of the West Coast Mining & Smelting Co., leaving there to engage in [illegible] in El Paso. He was widely known throughout Mexico.

John B. Fleming, who died at Reno, December 17, from the effects of a fall, was a mechanical engineer well known in mining and metallurgical circles throughout the country. For many years he was chief constructing engineer for the Joshua Hendy Iron Works of San Francisco, and built the Silver King milling plant at Park City, Utah. Later he built the Nevada Consolidated mill at McGill, and the Goldfield Consolidated mill, Goldfield, Nevada, his latest achievement being the Nevada Hills mill. He was about 45 years of age; a kindly, generous, and lovable man. His ability as a mechanical engineer had won wide recognition.

Market Reports

LOCAL METAL PRICES.

San Francisco, December 21.

Antimony	11—12½c	Quicksilver (flask)	$46.50
Electrolytic Copper	15—16½c	Tin	47—48½c
Pig Lead	4.70—5.50c	Spelter	7½—8½c

Zinc dust, 100 lb. casks, per 100 lb., small lots $5.50—6.75; large $5.50—6.50

METAL PRICES.

(By wire from New York.)

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Dec. 14	13.55	4.45	6.22	55
" 15	13.60	4.45	6.22	55¼
" 16	13.65	4.45	6.22	55¼
" 17	Sunday	No market.		
" 18	13.73	4.45	6.22	54¾
" 19	13.73	4.45	6.22	54¾
" 20	13.80	4.45	6.22	54¾

ANGLO-AMERICAN SHARES.

(Cabled from London.)

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

	Dec. 14. £ s. d.	Dec. 21. £ s. d.
Camp Bird	1 16 3	1 15 0
El Oro	1 3 9	1 2 9
Esperanza	1 7 6	1 10 0
[illegible]	1 5 0	1 5 0
[illegible] Dredging	0 5 6	0 4 9
Mexico Mines	7 11 3	7 11 3
Tomboy	1 3 9	1 3 1½

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing Prices. Dec. 21.		Closing Prices. Dec. 21.
Amalgamated Copper	$ 58	La Rose	$ 4
A. S. & R. Co.	74	Mason Valley	11⅛
Braden Copper	5¼	Miami Copper	23⅜
B. C. Copper Co.	4¼	Mines Co. of America	4
Butte Coalition	22⅛	Nevada Con.	19⅛
Chino	25¼	Nevada Utah	⅛
Davis Daly	⅝	Nipissing	7¼
Dome	1	Ohio Copper	1
Dolores	4	Ray Central	1⅛
First National	1⅛	Ray Con.	18
Foley O'Brien	⅝	South Utah	⅛
Giroux	4¼	Superior & Pittsburg	16
Goldfield Con.	4⅞	Tenn. Copper	35⅛
Greene-Cananea	8⅛	Trinity	4¼
Guanajuato Con.	⅝	Tuolumne Copper	3¼
Hollinger	12¼	United Copper	1¼
Inspiration	11⅛	Utah Copper	54¼
Kerr Lake	2⅝	Yukon Gold	3¼

COPPER SHARES—BOSTON.

(By courtesy of J. C. Wilson, Mills Building.)

	Closing prices. Dec. 21.		Closing Prices Dec. 21.
Adventure	3¾	Mohawk	$ 51
Allouez	41¾	North Butte	28¾
Calumet & Arizona	63	Old Dominion	47½
Calumet & Hecla	457	Osceola	106
Centennial	14	Parrot	14
Copper Range	53¼	Shannon	10¼
Daly West	6	Superior & Boston	3¼
Franklin	12¼	Tamarack	28¼
Granby	32¼	Trinity	5¼
Greene Cananea ctf.	8¼	Utah Con	17½
Isle Royale	24⅛	Victoria	3
La Salle	7¼	Winona	5⅛
Mass Copper	8¼	Wolverine	106¼

NEVADA STOCKS

(By courtesy of San Francisco Stock Exchange.)

San Francisco, December 21.

Atlanta	$ .15	Mayflower	$ .02
Belcher	.77	Mexican	4.25
Belmont	8.00	Midway	.29
B. & B.	.21	Montana-Tonopah	.72
Booth	.06	Nevada Hills	2.30
Chollar	.04	Ophir	1.77
Combination Fraction	.14	Pittsburg Silver Peak	1.20
Con. Virgina	1.40	Round Mountain	.55
Florence	.64	Sandstorm Kendall	.03
Goldfield Con.	4.85	Savage	.33
Gould & Curry	.06	Tonopah Extension	1.07
Jim Butler	.29	Tonopah of Nevada	7.25
Jumbo Extension	.22	Union	1.30
MacNamara	.27	West End	.77

Decisions Relating to Mining

Specially reported for the Mining and Scientific Press

Judicial Notice of Coal Veins

Judicial notice is taken of the different geological strata of coal in each county and of many other facts connected with coal mines and their operation. So judicial notice is taken of the fact that a detached stone 7½ ft. long, 3 ft. wide, and 18 in. thick, situated in the roof of an entry to a coal mine, can be carefully secured or taken down, as to hold otherwise would be ignoring the law of gravitation.

Princeton Coal Mining Co. v. Howell, (Indiana), 92 Northeastern, 122. June 1910.

Injury to Miner—Pleading

A complaint to recover damages for an injury to a miner by the falling rock from the roof of a mine entry was held sufficient where it alleged that the timbers which upheld the roof at the place where rock fell were weak, broken, and insufficient to sustain the roof, and that the owner and operator of the mine had knowledge of the defective and dangerous condition thereof, and for more than ten days prior to the day of the accident knew that the roof was liable to fall and injure the employees who were required to pass along such entry, and it was not necessary to aver that the defect complained of could be remedied, as the court takes judicial notice that a structure once made can be repaired.

Princeton Coal Mining Co. v. Howell, (Indiana), 92 Northeastern, 122. June 1910.

Statutory Duty of Mine Operator

The statute of Indiana (Burns' Ann. St. 1908, section 8580) requires the operator of a coal mine to make a dangerous place in a mine safe, and prohibits the employees from entering such a place until it is safe, but excepts such persons as are engaged in the work of making the place safe. By this statute the duty is imposed upon the mine boss or operator to see that all loose slate, coal, and rock overhead in entries where miners have to travel to and from work, shall be taken down or carefully secured, and until the place is made safe no person shall enter such unsafe place except for the purpose of making it safe. While this prohibition is general in its terms, yet the subsequent provision authorizing the mine boss to give permission for miners to return to work therein after the repairs are made, shows an intention to invest the mine boss with power in that particular, and there is no doubt of his authority and duty to order miners excluded from the unsafe place.

Princeton Coal Mining Co. v. Howell, (Indiana), 92 Northeastern, 122. June 1910.

Property Subject to Miners' Liens

The statute of Oregon provides that when two or more mines are owned by the same person or corporation and worked through a common shaft or tunnel, or at one mill, or other reduction works, then all such mines, and all roads, tramways, trails, flumes, ditches, or pipe-lines, buildings, structures, or superstructures used or owned in connection therewith, shall be taken and deemed as one mine. And in an action to enforce miners' liens the words "roads, tramways, flumes, ditches, or pipe-lines" were held to include such appurtenances though not situated upon the mine, and that the term "upon any mill-site or mill used, owned, or operated in connection with such mine," had reference to mill-sites or mills not situated on the mining property, so that a miners' lien notice need not state and it is not necessary to prove that the labor for which the lien is claimed was done on the mill or building on the mine.

Washburn v. Inter-Mountain Mining Co., (Oregon) 109 Pacific, 382.

Company Reports

THE BUNKER HILL & SULLIVAN M. & C. CO.

This company, during the year ended May 31, mined 438,290 tons of ore at a total cost of $[illegible], a lower total cost than has been attained for the past four years, notwithstanding the increased expenditure for hoisting, pumping, and higher prices of many materials and supplies. The lower grade of the ore and the continued low lead and silver prices brought the operating profit to about the same figures as for the preceding year. The profit for 1910-1911 was $1,110,315, as against $1,200,552 for 1909-1910. The highest profit was for 1906-1907, $2,627,778. While extensions to the plant and other improvements, together with cleaning up the remaining Federal M. & S. Co. litigation expense, caused heavy financial outlay, the net surplus for the year is $870,986, or $75,011 more than for the preceding year. The 438,290 tons of ore mined was valued at $3,307,393. The net smelter returns for the year amounted to $2,051,664. The concentrators treated 436,240 tons of ore, an average of about 1270 tons per 24 hours of actual operation. The tailing-mill treated, during 142.9 days of operation, 101,300 tons of tailing, at a cost of $14,009. Dividends paid during the year amounted to $1,062,750, as against $668,100 for 1909-1910. The dividend disbursements during the life of the company reach a total of $12,701,850. The development work exposed new ore in quantity exceeding the tonnage of the ore produced, and the material condition of the mines and property and the outlook for the future are reported excellent.

THE EL ORO MINING & RAILWAY CO., LTD.

This company during the year ended June 30 produced 360,294 tons of ore, which yielded bullion worth $2,389,349, or at a rate of $6.63 per ton. During the preceding year the output was 316,138 tons, which yielded bullion valued at $2,562,705, or at a rate of $8.10 per ton of ore. The recovery for the year just closed was 87%, against a recovery of 91% in 1910. The cost was reduced from $4.93 per ton, in 1910, to $3.90 per ton in 1911. For about the last three years the ore has been all-slimed and cyanided. A. F. Main, manager for the company, is making further improvements, and it was stated by R. T. Bayliss, chairman of the annual meeting, held in London, September 26, that these improvements may result in the treatment of ore yielding $4.50 per ton. Disturbances in Mexico reduced the profit from the railway from $124,254 in 1910 to $103,120 for the year just closed. The ore reserve on June 30 was estimated at 484,139 tons, averaging $9.10 per ton in gold and silver, against 441,639 tons averaging $9.50 per ton in the preceding year. This ore is in the San Rafael, San Patricio, and Descubridora veins. Work is being done also on the No. 4, or Victoria, vein in the Somera property, which it is believed will be an important source of production. There is an accumulation of tailing amounting to 450,000 tons, which on re-treatment, it is believed, will yield a net profit of $700,000, or $1.50 per ton. The Suchi Timber Co. had an output of 1,574,000 ft. per month and brought a net profit of $21,000.

The report shows a "total realized profit" of £216,430. Adding the amount brought forward from the last account, the report shows an "available profit" of £306,476. The sum of £11,532 has been set aside for the income tax on profits, and £13,059 for permanent improvement and railway construction during the year. For depreciation of equipment, £25,000 has been written off. Dividends No. 20 and 21, 1s. 6d. each, account for a distribution of £172,125, leaving a balance of £84,759. On June 30 the company had £178,000, in round numbers, in cash and short loans. Deducting unpaid dividends and other debts, there was £75,000 in cash in the treasury, against a balance of £84,759, and the company also had £21,925 worth of bullion in transit. The El Oro company's mine is 100 miles northwest of Mexico City.

Commercial Paragraphs

Constant Meese, president of Meese & Gottfried Co., has just returned to San Francisco after an extended trip along the Pacific Coast, made for the purpose of studying harbor and docking facilities. He was accompanied on the trip by W. C. Conant, manager of the San Francisco house; Mano A. Zan, northwest manager for the company; I. Boyd, manager of the Los Angeles branch; H. E. Gearon, manager of the Portland branch, and C. A. Magnuson, manager of the Seattle branch. The party spent some weeks making a careful survey of the waterfronts, all the way from Los Angeles to Vancouver, B. C., accessible to the various coast cities, the object being to prepare for the proper handling of the large increase in business which is coming to the different Coast ports on the opening of the Panama Canal. While in Seattle the party enjoyed meeting some twenty-five of its leading machinery men at the Arctic Club. The Meese & Gottfried Co. is one of the oldest and best known firms on the Coast engaged in manufacturing and dealing in transmission, elevating, conveying, and screening machinery, and with the opening of the Panama Canal it anticipates a wonderful increase in the demand for this class of machinery. The recent trip was taken with the object of making the engineers of the company thoroughly conversant with the improvements proposed for the different seaports to care for the rush of new business certain to come to the Pacific Coast.

The Broderick & Bascom Loggers & Supply Co. of Seattle was incorporated with $50,000 capital stock by Charles E. Bascom, John K. Broderick, John J. Broderick, and Joseph D. Bascom of St. Louis, and H. J. Bailey of Alton, Illinois, to conduct a special branch of the Broderick & Bascom Rope Co. of St. Louis business, and manufacture some specialties in Seattle, Washington. C. A. Stewart is president and manager of the Seattle corporation; H. J. Bailey is treasurer. L. G. Isaacson is vice-president and manager of the Aberdeen, Oregon, branch. They will handle all logger supplies and Broderick & Bascom wire rope in that section of the country.

Among recent orders for equipment received by the Dorr Cyanide Machinery Co. are eight duplex classifiers and eight thickeners for the new mill of the Tonopah-Belmont Development Co. at Tonopah, Nevada; a classifier and thickener for the Portland Gold Mining Co. of Colorado Springs, Colo.; and two classifiers and one thickener for the Katchkar Gold Mining Co., Perm Government, Russia. This will make three Dorr classifiers and four Dorr thickeners in use by this last company.

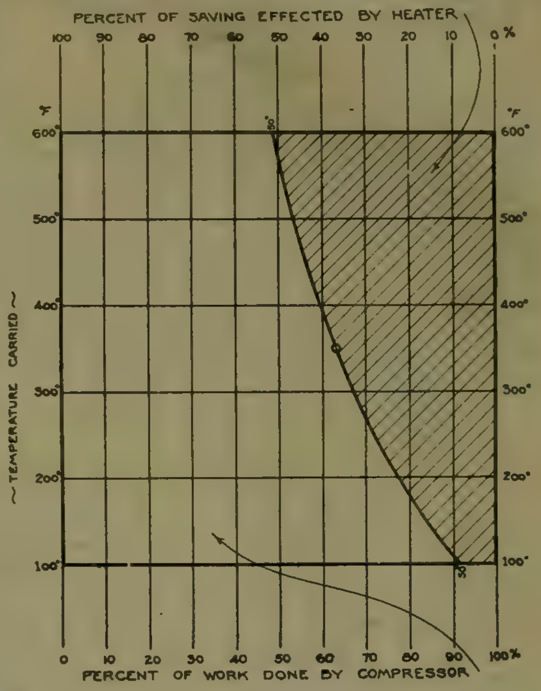
W. W. Merriam has been appointed the Mexico representative of the Oliver Continuous Filter Co. Before establishing a permanent office he will visit a number of mining camps in order to get a thorough knowledge of the Mexican situation. Engineers who are desirous of investigating the Oliver Filter can arrange for an appointment with Mr. Merriam by addressing the new offices, Rooms 704-5-6-7 Hooker & Lent building, San Francisco.

Charles E. Newmeyer, who for the past four years has been connected with the H. A. Riedel Investment Co. of Denver, Colo., has resigned to become vice-president of The W. A. Fisher Investment Co., with offices in the First National Bank building of that city. The W. A. Fisher Investment Co. is handling the financing of The Colorado-Highland Marble Co., with property in Pitkin county.

To take care of the rapidly increasing business, the Oliver Continuous Filter Co. has taken rooms 704-5-6-7 in the Hooker & Lent building. This building is in the heart of the machinery district, being at First and Market streets, directly across from the Mechanics' Fountain. The Oliver Continuous Filter Co. will be glad to welcome its many friends in the new offices.

C. E. Russell, formerly with the Traylor Engineering Co., has been appointed Assistant Sales Manager for the Hyatt Roller Bearing Co., of Harrison, New Jersey.

The Sterling Equipment Co. has recently placed on the market a portable compressed air reheater which has sufficient capacity to supply one drill, and automatically maintains the desired temperature of the air passing through it. This is accomplished by the burning of gasoline or kerosene directly in the compressed air as it is passing through the heaters. The fuel is injected into the combustion chamber in the required quantity by the current of air passing through so that the heating is automatically kept up while the tool is in operation and is discontinued when the tool is stopped. The mixture of fuel and air is ignited by an electric resistance coil or by a hot tube. It is stated that the only attention required is in the initial adjustment of the fuel valve to give the temperature desired. The heater marks a new departure and a distinct advance in the working out of one of the most important problems in connection with the employment of compressed air for general industrial purposes. The considerable increase of volume resulting from the heating or reheating of air after compression and transmission, and the slight fuel cost of such reheating are generally understood and many heaters have been devised for the purpose, but various objections have prevented their extensive adoption. Perhaps the most frequent deterrent has been in the intermittent character of air employment. Heaters which would give very good results when the current of air was flowing constantly through them, as in the driving of a pump, have not proved so satisfactory in connection with rock-drills or other intermittently operated tools. The economy resulting from the use of this reheater is shown in the accompanying efficiency chart.



—AIR ECONOMIZER CHART—
—STERLING EQUIPMENT CO.—

Catalogues Received

New York Engineering Co., 2 Rector street, New York. 'The Empire Tailing Elevator.' Illustrated. 6½ by 9¾ inches.

The Jeffrey Manufacturing Co., Columbus, Ohio. 'Jeffrey Power Transmission Machinery.' Catalogue No. 5. 142 pages. Illustrated. 6 by 9 in. This is a most complete catalogue, and besides full information about this company's product, contains technical information worth while. Typographically it is excellent, the illustrations and arrangement of tables, etc., showing much care.

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EDITORIAL

TELEGRAPH, telephone, and cable companies will be put under the jurisdiction of the Interstate Commerce Commission, if the recommendations of that body be approved by Congress. The Commission has done effective work, and has used its authority wisely; the proposal seems an excellent one.

TORONTO is elated over the plan to make that city an ocean port by extensive harbor and canal improvements. This, the second largest city in Canada, is already an important railroad centre, and the proposal is an evidence of the notable growth of industry in the northland during the past decade.

CONVOCATION week is a notable feature of each year in the educational world. Washington, D. C., has been chosen as the place of meeting, and, beginning December 27, eleven sections of the American Association for the Advancement of Science, together with twenty-eight affiliated societies, have been in session.

GREAT BRITAIN is a good customer of the United States; over a billion dollars worth of goods having passed between the territory of the two countries during the ten months ended with October. Of this, the United States exported approximately two-thirds and imported one-third, a gratifying increase over previous years.

CAMP BIRD, though about to pass from the list of producing mines, will always be remembered by mining men as one of the most famous of its day. Much apocryphal history gradually becomes current regarding the great, whether men or mines, and we are fortunate in being able to present this week the story of the property by Mr. T. A. Rickard, who lucidly and interestingly relates events of which knowledge was born of participation.

CLOSER relations between Canadians and Americans in the Northwest are likely to be the result of the efforts of the members of the Spokane Mining Men's Club, now engaged in an endeavor to organize an international congress of mining men. All such meetings are necessarily productive of good, and the engineers of the Northwest show commendable energy and initiative which, we hope, will meet with a corresponding degree of success.

CONFERENCES of leaders are vastly more productive of results than public clamor, and the recent pourparlers between Mr. W. L. Fisher, Secretary of the Interior, and the Governors of a number of Western States, should be correspondingly effective. Mr. Fisher advocates the abandonment of the apex right, the abolition of power of attorney, and maintains that the essential requisite is the development of mineral resources. It begins to appear as though effective action regarding the mineral land laws would be taken at the present session of Congress.

EVEN Homer nodded at times, and technical journals are sometimes to be found 'asleep at the switch.' *The Mining Journal*, of London, for December 2 contains the following gem: "The largest dredger of the world has now been installed on one of the pits of the Ilse Mining Company, Limited, in Germany. Its buckets have a capacity of ½ cwt. each, and thirty-two buckets are emptied each week, representing an aggregate capacity of 960 cubic metres per hour. * * * This plant is stated to represent the extreme limit of usefulness for bucket chain dredges; not even brown coal pits have, so far, ever shown any scope for a higher capacity." Our German friends have a reputation for slowness combined with effective action, and their dredging achievement should add lustre to their renown.

COPPER producers had a merry Christmas indeed, with copper at 14¼ cents. What this means to some of the large enterprises is well exhibited in the report of Mr. Pope Yeatman upon the Braden Copper Company, where the estimate is made that each cent increase in the selling price of copper corresponds to an increase of 19.6 per cent in operating profit. Only a moderate further increase is desirable; high prices in the past have always been followed by periods of depression. The official figures of copper production for 1910, recently issued by the United States Geological Survey, give leading place to Arizona, with a production of 297,250,538 pounds, closely followed by Montana with 283,078,473 pounds, and Michigan with 221,462,984 pounds, these three States having furnished 74 per cent of the total output.

IN our 'Discussion' column this week, Mr. C. R. Gent contributes some observations upon the economy of 'cheap' labor. But, with due apologies to Mr. Gent, the problem is not quite according to his view, nor can it be so summarily concluded. Immediate success will not be the reward of dismissing all dollar a day men, and putting on eight-hour shifts at $3.50 per day, for a high-priced laborer can 'soldier' as well as an unskilled laborer can, with the added disadvantage that his time is costing the company more. The management of a company in the West, where exact figures have been kept over a long term of years, asserts unhesitatingly that the effective return per dollar of wage paid has decreased since the institution of shorter hours and higher pay. Doubtless many factors are concerned in this, but at any rate it is obvious that the results are not automatically beneficial. That a highly skilled workman can produce results impossible with unskilled labor is as unquestionable as that a lathe can do work impossible of accomplishment with hand tools. Whether it is more economical to buy and operate the lathe for work which can be done by hand tools, when the wage paid to the workmen is sufficiently low to allow comparison with lathe work, is a matter of business arithmetic. Obviously an individual solution must be obtained for each individual case, and it is hoped that its discussion may establish fundamental principles which will be of service to those called upon to manage enterprises under novel conditions of work.

PURCHASE of a controlling interest in the North Dome by the management of the Temiskaming Mining Company, of Cobalt, has resulted in open rebellion on the part of the Temiskaming shareholders, who are trying to unite to oust the officers who consummated the purchase. The Temiskaming has been paying a regular dividend, but about the time the announcement was made that the treasury surplus was to be used in the purchase of North Dome shares, announcement was also made that dividends would be suspended. Now, with the completion of the payments to be made and the development and equipment of the North Dome to be provided for, the Temiskaming shareholders look upon the suspension of dividends as wholly indefinite, and possibly permanent; wherefore the protest and a demand for a change in the management. Generally speaking, Porcupine is furnishing little of interest in the share market; there have been some sharp declines, as in Rea Consolidated, which sold at one time for $6.25 per share; recently it sold for $2.12½. What has so far been done in good faith in the effort to put legitimate mining enterprises on a sane and business basis, has been so vastly overshadowed by manipulation and by what is, at least from every appearance, downright misrepresentation, that the public at large has the impression that Porcupine is one gigantic paper promotion and stock-jobbing scheme. The 'flattening out' of Porcupine and the increasing gravity of the situation in Mexico leaves the East without a field in which precious-metal mining commands public interest.

Investment and Speculation

Human judgment is fallible, and it is hopeless to expect that the general public will ever be brought to make clear distinctions in matters which involve the exercise of judgment and technical knowledge, but it would seem as though the degree of confusion existing as to the distinction between investment and speculation, especially where mining enterprises are concerned, is entirely unnecessary. Yet the theoretical distinction is a simple one; investment is the placing of capital to secure income from its employment, while speculation is the investing of capital with a risk of loss in the hope of securing large gain. Obviously the one grades into the other, and the practical distinction may be at times difficult, yet in the majority of cases the reverse is true, and it is possible to at once say whether or not the enterprise in question involves any appreciable risk. The public prefers sweeping generalizations and regards the purchase of bonds as an investment and the buying of shares as speculation; the acquisition of a corner grocery as investment and the purchase of a gold mine where a ten-stamp mill is yielding good returns, as speculation. Yet it is clear, upon sober thought, that, for example, the expected growth of population in the neighborhood may fail to materialize and the profits of the grocery business may vanish, and that this is no more improbable than that the vein may be faulted or impoverished in depth. The element of risk is involved in both cases, and the degree of risk depends on the price paid and the degree of accuracy of the information available concerning the governing conditions of profitable operation. Similarly, the municipal bonds of a Chinese city at present would have but a speculative value, while the ordinary shares of a well established industrial enterprise are of stable value. Much is added to this confusion of mind by the popular writers upon financial matters, and in one of the popular magazines which maintains an investment department for the guidance of its readers, recently to a query as to the advisability of the purchase of shares in a well known gold mining company, the pious reply was made that the purchase of mining shares is speculation and the magazine in question never advised speculation. This would be amusing were it not seriously set forth for the guidance of investors, and were it not for the possibility that investors, duly warned of the pitfalls of mining finance, may be the more easily led into the devious ways of industrial speculation. Cant has always been unpopular, and is especially so in the twentieth century. And if generalizations are required, a sweeping one can be made: the investor who places his funds into any enterprise concerning which he has neither accurate first-hand information nor the advice of someone in whom unquestioning reliance can be put, is neither investing nor speculating, but 'plunging' in the most reckless manner. Guns and 'advice to subscribers' should be handled with caution, either may be loaded.

Two Famous Mines—II

By T. A. Rickard

In 1894 Thomas F. Walsh was running a little matte smelter at Silverton, and I had the pleasure of selling him pyritic ore from the Yankee Girl, at Red Mountain, for which mine I was then manager. Walsh badly needed siliceous material containing enough gold and silver to be a profitable portion of his smelting charge, to mix with the heavily pyritic ores he was receiving from Red Mountain. He examined and sampled a number of abandoned workings in the vicinity during 1895 and 1896. Among his enterprises was a small silver-lead mine called the Hidden Treasure, in Imogene basin. One day in the spring of 1895 I walked across the range from Red Mountain to Telluride and, missing the trail going to Savage basin, I found myself in Imogene basin. Seeing smoke arising, I went toward it and found a cabin in which dwelt the miners working in the Hidden Treasure. They shared their coffee and bacon with me and told me how best to go to Telluride. I was then a brassy shot from the future Camp Bird mine. At that time it lay undiscovered. Next year, in July 1896, Walsh, during one of his periodical visits to the Hidden Treasure, happening to see some pink spar in the talus at the foot of the cliff at the head of the 'basin' or mountain amphitheatre, told Andy Richardson, a worthy prospector in his employ, that the pink spar reminded him of Cripple Creek, where he had operated the Summit and Deerhorn, two mines belonging to W. S. Stratton and leased by him to Walsh. Here we have another link between the two great bonanzas. The pink spar was not fluorite such as characterizes the Cripple Creek ore; it was either rhodonite or rhodochrosite. Walsh told Richardson to have a look at the old 'tunnel'—the Gertrude—from which the spar appeared to have come. In the September following he examined these abandoned workings himself and broke some samples, which were sent to Ouray to be assayed. They contained several ounces of gold per ton. More samples were then taken and sent to Leadville for assay. Walsh was careful to keep the discovery quiet. He set to work to acquire the ground, buying abandoned claims on tax-titles, until he had consolidated a large property. He also located a claim called the Camp Bird next to the Gertrude and gave the name of this new claim to his consolidated property. In 1900 he owned 103 mining claims and 12 millsites, covering 941 acres altogether.

At that time Theodore Gross, through Charles S. Thomas, ex-Governor of Colorado, obtained permission for me to examine the mine on behalf of the Venture Corporation. I made a preliminary inspection in May 1900, the results being sufficiently satisfactory to warrant a detailed sampling, in which I was assisted by A. C. Beatty and F. H. Minard. John Hays Hammond, being then in Denver, came to see me and expressed an interest in the mine, but, learning that an option had been secured for my clients, he did not go to see it, as I undertook to introduce him to Frederick W. Baker, of the Venture Corporation, so that they might co-operate in the formation of an English company to exploit the mine. My examination was completed in July and showed $6,118,800 in reserve, the ore averaging 5 ft. wide and $48 per ton. Up to that time the cost had been $6.50 per ton. I appraised the mine at $6,000,000. At that date the mine had yielded $2,535,512 gross and a profit of $1,650,000. In August I went home to London. Mr. Walsh agreed to give the Venture Corporation a call on the mine for three months at $6,000,000. Messrs. Baker and Hammond set to work to raise the money. In September $6,500,000 was subscribed by Wernher, Beit & Co., J. B. Robinson, C. J. Hambro & Son, and other prominent London houses. In September (1900) a company was registered at Somerset House. The closing of the transaction was deferred until Hennen Jennings, with Mr. Hammond, could pay a visit to the mine on his way to California. Meanwhile F. W. Bradley had made an inspection and sampling, confirming my results most cordially. At the end of September Messrs. Jennings (representing Wernher, Beit & Co.) and Hammond reached Ouray. Mr. Hammond was ill, and abstained from making an examination. Mr. Jennings visited some of the neighboring mines and was intimidated by the poor showing in the bottom workings of the Tomboy, for this augured badly for persistence in depth at the Camp Bird. This was before the Tomboy acquired the Argentine. Mr. Jennings endorsed the correctness of my report, but decided that the mine was not worth the price. He cabled accordingly. The checks of the subscribers were returned to them. Walsh continued to operate the mine. Shortly afterward Mr. Jennings made him an offer, of $5,000,000, half cash and half shares. This was declined. Messrs. Hammond and Baker resumed negotiations, but it was not until April 1902 that they finally closed the deal. The company registered two years earlier then acquired the mine. In the meanwhile Walsh had extracted about $1,500,000 worth of ore from which he had made about $750,000 in profit.

LOOKING TOWARD OURAY FROM ABOVE THE CAMP BIRD MILL.

By the new deal Walsh was to receive $3,500,000 in cash and $500,000 in shares, making £801,163, and he was to obtain a further $2,000,000, or £400,000, in the form of a royalty of 25% on profits from ore not then considered sufficiently proved. He received the last part of this deferred payment before his death, in March 1910, so that he obtained a total of $6,000,000 for his mine. Obviously the second deal, except as to the deferment of $2,000,000, was no better than the first, for during the interval between the two deals Walsh extracted enough ore to yield him a profit of $750,000. Mr. Hammond was appointed consulting engineer and William J. Cox came from Aspen to take charge of operations. The mine did splendidly, paying 20% per annum on the 820,000 shares (of £1 each) issued. The nominal capital of the company, called the Camp Bird Limited, was £1,100,000.

In March 1906 a snowslide overwhelmed the mill and caused a conflagration, destroying the entire plant; but this was soon remedied by the erection of a better one. In depth the lode never looked promising (for geological reasons by no means obscure), and systematic exploration proved that the orebody did not persist, but the large extent of virgin ground above Walsh's workings westward proved most productive, as anticipated. The resources of the mine, however, showed signs of exhaustion in 1908 and an effort was made to acquire another property with the surplus that had accumulated. In 1909 an option on the La Blanca mine at Pachuca was obtained for $2,500,000, but the deal fell through; shortly afterward an option on an adjoining mine, the Santa Gertrudis, was obtained by Mr. Hammond from Don Carlos de Landero, for 9,000,000 pesos. The purchase was effected for the Camp Bird company, the commission paid to Mr. Hammond, who was then consulting engineer to the company, being $600,000 or £119,178, as was duly stated in the prospectus, issued in January, 1910. The Camp Bird company paid £922,131 for the Santa Gertrudis, receiving 1,155,815 fully paid shares in the Santa Gertrudis Co., Ltd., which was registered with a capital of £1,275,000. The examination of the Mexican mine was made by R. J. Frecheville, W. J. Cox, E. E. Chase, and F. J. Pope. The ore reserve was estimated at 462,826 tons, assuring a profit of £924,755 or $4,620,000. The orebody was stated to be 2500 ft. long (of which 1500 ft. was in Santa Gertrudis territory) and had been followed to a vertical depth of 1000 ft. The average width was 15 ft. and the average assay-value $23.25 per ton. At the time of purchase the mine was 1700 ft. deep, the bottom level being extended for half the length of the orebody. The estimates and allowances for ore only partly exposed were somewhat risky and the financial requirements compelled the Camp Bird company to stretch its resources, by issuing debentures, etc., but the mine has opened up well and placed the enterprise on an excellent footing. The new mill started to work in June, 1911. During the current year the Santa Gertrudis is expected to yield a profit of $1,000,000, and next year $1,750,000. The latest estimate of the ore reserve, by Hugh Rose, the manager, is 1,150,000 tons, from which a profit of £1,650,000 or $8,250,000 is expected.

Now we return to the parent mine, the Camp Bird. While steps were being taken to perpetuate the company the old mine was nearing its end. In May 1910 the ore reserve was estimated at 83,900 tons, to yield a profit of $1,420,000. During the ensuing year a profit of $1,095,000 was made, and $435,000 more remained. Thus new ore had been uncovered to the extent of $110,000. In the first four months (May to August) of the present fiscal year the mine yielded a profit of $400,000, and $230,000 was supposed to remain. On October 31 Mr. Cox telegraphed that the reserve, owing to further finds, assured $300,000 more profit. However, the end is now in sight, and unless something wholly unforeseen happens the mine will be finally exhausted during the current fiscal year, during which it will have yielded a profit of £150,000 or $750,000. Efforts have been made to acquire productive territory in the vicinity, but without success. In 1905 a bond was taken on the ground controlled by the Imogene Basin Gold Mines Co., and eventually the Camp Bird company acquired a large holding in compensation for the money spent in development, but no ore worthy of mention has been found. At the recent annual meeting on October 31, the chairman of the company, Arthur M. Grenfell, was able to boast that the Camp Bird had yielded gold to the value of £3,750,000 or $18,750,000, and up to April 30, 1911, the dividends have aggregated £1500,000 or $7,500,000, besides the £300,000 or $1,500,000 invested in the Santa Gertrudis. Adding the output and earnings under the former owner, the Camp Bird mine has yielded $22,785,500 gross, of which $11,400,000 has been profit. Thus the proportion of gain has been 50%, after paying for equipment. This is a superb record. In comparison with the Independence, it may be said that the original owner, Thomas F. Walsh, was a real mining operator, with previous experience at Leadville and Cripple Creek. He was a much abler man, in every way, than Stratton and managed the sale of his mine with conspicuous skill. That was one reason why the finance incidental to the formation of the company was not such as to cripple the mine or handicap the management. In John W. Benson the mine had an excellent superintendent under Walsh, and in William J. Cox it had an even more experienced manager under the company. Mr. Hammond remained consulting engineer until February 1911. For several years the supervision devolved on his former assistant, A. C. Beatty, who applied exceptional skill to the technical details. Among the directors is R. J. Frechville, a veteran among British mining engineers. Thus the Camp Bird did not lack for the best that experience and knowledge could contribute. The story of the mine is a credit to all concerned, and especially to the honorable and energetic man who first uncovered its hidden wealth.

Tin Production, Federated Malay States

By D. Milton Figart

The exports of tin and tin ore were the lowest since 1900, amounting to 43,863 tons, against 48,744 tons in 1909; the 1910 exports consisting of 9900 tons of block tin and 33,963 tons of tin in the form of ore. Higher prices, however, made the total value of the 1910 production greater than that of 1909, the approximate value at Singapore being $32,447,000 in 1910, and $31,711,440 in 1909. The average price per ton on the local market was $722.90 in 1910 and $648.81 in 1909. The number of men employed in the tin mines in 1910 was 170,361, compared with 184,699 in 1909. The Warden of Mines, in his annual report says:

"At the beginning of the year the better prices realized at the end of 1909 continued, though there was little in the statistical position to justify them, the visible supply at the end of January being larger than had been the case for several years. The tin-plate trade, which is said to consume two-fifths of the world's production, continued to flourish, the returns for the first seven months being beyond all record. In June, the visible supply was low, and there is no doubt that the drop in Federated Malay States production made itself felt on the market. In September there was a reaction, the demand dropping and the visible supply increasing. In October there were urgent demand for shipments to America, and speculators who had anticipated an increase in price had their operations assisted by the limited sources of supply and the increasing demand. In November the price continued to rise despite the rumor of the closing down of a number of tin-plate mills in America. In December the market remained fairly steady and the year closed with the statistical position good.

"The tin-plate tonnage has more than doubled since 1896, and though substitutes are talked of, nothing has so far appeared in a practicable and generally useful form which is likely to oust tin plate from its uses, and also, in this connection, it should be remembered that the decrease in tin exported from the Federated Malay States in 1910, as compared with 1909, practically amounts to 5000 tons, or nearly equivalent to 5% of the output from all countries."—*Daily Consular Report.*

The total production of sulphur in Sicily during the first six months of 1911 was 182,678 tons, against 185,825 tons during the corresponding period in 1910. On June 30, 1911, the total stocks of sulphur in Sicily were 527,965 tons, against 586,878 tons at the same date in 1910. The exports of sulphur during the first half of 1911 amounted to 287,410 tons, against 240,919 during the first half of 1910, an increase of 46,491 tons. In 1909 the production in the United States amounted to 274,000 tons, of which 239,000 tons, with a value of $4,432,000 was marketed. The exports that year amounted to 37,142 tons, with a value of $736,928, as against the 30,589 tons imported.

Disinfecting Miners' Dwellings

By W. H. Ross and R. C. Benner

The mining community is at a disadvantage in proper sanitary protection against disease. Miners form an essentially transient population, not alone from the nature of their calling, but also from a certain spirit of restlessness and a desire for new and better fields. The situation of the less well established towns is almost entirely dependent upon the ore deposits. At first everything is of a temporary nature, and sanitary conditions are entirely disregarded in the location of the houses. One family moves in when another moves out, with a total disregard of the state of health of the former occupants. This leads to the spreading of disease, which might be prevented in many cases by the proper use of disinfectants.

The principal agents which are efficient in the destruction of germs of all kinds are three: chemical disinfectants, heat, and light. Although the purposes for which chemical disinfectants are used are now generally understood, there is much popular misconception as to the value and limitations of the various commercial disinfectants. Most commercial preparations contain some true disinfectant, but often in such small amount that they are of little or no value for disinfecting purposes. In many cases this is due to the fact that they are produced by persons having little knowledge of sanitation, or of the principles of disinfection. With bacteria, as well as with animals, or the higher plants, a poison, to be effective, must be administered in excess of the limit of toxicity.

Many substances will prevent the development of bacteria, and as they may be used without destroying the tissues, they are therefore useful in preventing putrefaction or suppuration in the living body. Such substances, as boracic acid, salicylic acid, and others, when used for this purpose, are called antiseptics. A much smaller number of substances are more powerful in their action and are true disinfectants, that is, substances which will destroy the bacteria which are the cause of infection. The most important of these are formaldehyde, sulphur dioxide, carbolic acid, cresol, chloride of lime, and bichloride of mercury.

When disinfection is carried out by means of a gas, the process is called fumigation. Only two effective gaseous disinfectants are known: formaldehyde, and the sulphur dioxide formed by burning sulphur. It should be borne in mind that a sufficient concentration of the fumes of any disinfectant to kill the micro-organisms in the air must make the air entirely unfit to breathe. Consequently burning a small amount of sulphur on the stove; placing saucers of chloride of lime under the bed or about the room, or hanging up sheets dipped in some non-volatile disinfectant, are of little value. In the same way, medicated lamps or burning pastils are useless as disinfectants but simply act as deodorizers.

To thoroughly disinfect a room with sulphur, 3 to 5 lb. should be burned for each 1000 cu. ft. of space. This is best done by placing the powdered sulphur in an iron pot which is, in turn, placed in a vessel of water. This not only diminishes danger from fire, but also furnishes moisture to the air, thus making the gas more effective. Sulphur dioxide not only destroys the germs of infection, but is also fatal to animal life. It quickly kills rats, mice, roaches, fleas, mosquitoes, and all kinds of vermin. It is, for this reason, particularly suited for fumigating cellars, vaults, stables, outhouses, and similar places which are infected with vermin. Formaldehyde, which is such a powerful germ killer, is not poisonous to animal life, and in the strongest concentration of the gas has no effect on roaches, bugs, etc. Places infected with such diseases as plague, yellow fever, and malaria, which are carried about by different classes of vermin, should therefore be fumigated with sulphur.

Formaldehyde is a gas which is soluble in water to the extent of 40%, forming a solution known as formalin. It also occurs in the form of a powder and is then called paraformaldehyde. Whether obtained in the form of a liquid or solid, some means must be resorted to for the liberation of the gas. A great number of devices have been placed on the market for this purpose, some of which require expensive apparatus, while others are comparatively simple. In formaldehyde candles, of which there are many different kinds, the solid formaldehyde is almost always used, and the gas is set free, in most cases, by the heat of a burning paraffin candle. Repeated experiments by bacteriologists have shown that under ordinary conditions at least 2 oz. of solid formaldehyde are required to properly fumigate a space of 1000 cu. ft. Candles selling for 35c. each usually contain 1 oz. of formaldehyde, and two are required for a room 10 by 12 ft. A second method of fumigating with formaldehyde, and which is considered by many to be the most satisfactory and efficient method of fumigation known, consists in setting free the gas from formalin, the 40% solution of formaldehyde in water, by means of potassium permanganate. When using this method 1 lb. of formalin should be taken for each 1000 cu. ft. of space. This is placed in a metal pail of about 3 gal. capacity, which in turn is placed in a pan to guard against any possibility of the material boiling over upon the floor. One-half to three-quarters of a pound of potassum permanganate, in the form of crystals, is then added. In a short time a violent action will take place and the gas will be evolved with great rapidity.

A third method which is quite often used in setting free fodmaldehyde consists in heating the solution in a shallow metal pan on a stove, or over an alcohol lamp. When this is done properly, the method is as satisfactory as any other, and when the means for heating is available, it is more economical than either of the other methods referred to. Whatever method is used in fumigating, the same care should be taken to close all doors, windows, fireplaces, keyholes, and other openings as tightly as possible by stuffing with cloth or pasting over with paper, as otherwise the fumes will escape, particularly on a windy day, before the proper concentration of gas is reached. All articles should be spread out as much as possible or hung up on clotheslines in the middle of the room; window shades should be unrolled; cupboards and drawers should be opened; and mattresses should be so placed that both sides are exposed. Formaldehyde has considerable power of penetration, so that when the fumigation is carried out in the way recommended above, it is not usually necessary to open either mattresses or upholstered furniture, but when articles of this kind are to be fumigated, special care must be taken to make the room tight. The time that a room should remain closed while being fumigated is variously recommended as from six to twenty-four hours, although it is very probable that most of the organisms on exposed surfaces are killed during the first hour, if they are destroyed at all. The longer exposures are recommended so as to permit of ample time for the gas to penetrate into the interior of bedding and other articles requiring more than surface disinfection.

The principal disadvantages in the use of formaldehyde are that the gas has little value as a disinfectant when the temperature of the room is below 60°F., and that, in common with the fumes of sulphur, it is not effective if the air is dry, nor unless a sufficient concentration be maintained for a sufficient length of time. Its advantages are that when used properly it is the most efficient germicide known for disinfecting closed rooms and apartments; it is not poisonous or dangerous to work with; and it is not injurious to delicate fabrics, paints, or metals. In this respect it is practically the only disinfecting agent which may be used in the living apartments without danger of injury to objects of art or value.

A number of powerful disinfectants are not volatile and cannot be used for fumigating purposes, but are valuable for disinfecting solid substances which have been particularly exposed to infection. The most important of these are bichloride of mercury, carbolic acid, cresol, formalin, and chloride of lime, to name but a few.

Bichloride of mercury, or corrosive sublimate, is the most powerful disinfectant known. A single application of a solution containing one part of corrosive sublimate in 500 parts of water is sufficient to destroy the most resistant organisms in a few minutes. A solution of one-half this strength is the one most commonly used. It is especially suited for washing floors and articles of furniture, such as chairs and beds. This is often done as an additional safeguard even when the articles have already been fumigated. Corrosive sublimate tablets, so largely used for general purposes, contain about 50% of ammonium chloride, which renders them more readily soluble. The principal disadvantages in the use of corrosive sublimate are that it is a dangerous poison; it acts injuriously upon materials made of metals; and its power is destroyed by albuminous matter, so that it cannot be used for the disinfection of excreta or sputum.

Carbolic acid is very generally used as an antiseptic. A 5% solution of the crystallized acid in water acts as a disinfectant and is of wide application. A solution of this strength does not destroy metals or fabrics. Whenever possible, garments or implements to be thoroughly disinfected should remain in the 5% solution for about an hour, if cold, but when heated, a much shorter time will suffice.

Cresol, sometimes called crude carbolic acid, is derived from coal tar. It contains little or no carbolic acid, but consists of a mixture of three closely related compounds, all of which are superior to carbolic acid as disinfectants. A 2% solution of cresol is regarded as being a more efficient disinfectant than a 5% solution of carbolic acid, and is considerably cheaper. Like the latter, it does not destroy metals or fabrics and is applied in the same way. Many preparations have been placed on the market containing varying amounts of cresol. Some of the most efficient of these are known in the trade as creolin, lysol, and kreso. Directions are given on the labels for their use not only in washing woodwork, floors, and utensils, but also in disinfecting garbage, sputum, and excreta. They are also used to a large extent as antiseptics on cuts and wounds. As is well known, but not always practised, the disinfection of sputum is of particular importance in the case of consumptives. For this the cresol preparations are well suited. Bacteria are not able to rise from a moist surface, and only get into the air when in a dry state, hence the advisability of the use of sputum cups containing a liquid disinfectant.

Formalin is not only valuable in fumigating, but a solution of it in water may also be used for any of the purposes for which carbolic acid or cresol is recommended. A 5% solution of formalin is generally regarded as superior to carbolic acid of the same strength as a general disinfectant, but it is not commonly used as an antiseptic.

Chloride of lime has long been used for treating foul smelling cesspools and similar places. It is a powerful deodorant, and when properly mixed with the material it is intended to disinfect, it destroys not only the odor, but also the bacteria which give rise to it. Its cheapness makes it particularly suited for this purpose. As a general disinfectant, however, chloride of lime has no advantages over carbolic acid, cresol, or formalin, and has the disadvantages that it is destructive to metals and fabrics, and that it loses its strength on being exposed to the air.

The application of heat is the most reliable as well as the most economical of all methods of disinfection. It is for this reason that refuse, garbage, and all articles of little or no value should be destroyed by burning. It is not at all necessary, however, that articles should be burned in order to insure absolute destruction of any infection which they might contain, for it fortunately happens that germs of all kinds in washable articles may be completely destroyed with certainty by simply boiling in water. The germs of most of the common diseases, as diphtheria, cholera, typhoid fever, pneumonia, and tuberculosis, are instantly killed by boiling water, but linens and all articles of clothing which are disinfected in this way should be boiled for fifteen minutes or so in order to insure that all air spaces in the materials are heated to the temperature of the water. If it is desired to take extra precautions, a small amount of formalin, or one of the cresol preparations already referred to, may be added to the boiling water. It may be mentioned in this connection that the effectiveness of the chemical disinfectants when used for the purpose to which they are suited, is greatly increased by using the solution while hot.

Some bacteria, as for example those which produce blood poisoning, and which give rise to such diseases as anthrax and lockjaw, form what is called spores, and when in this state are so much more resistant that continued boiling for two hours, or even more, is necessary to destroy them. Steam, particularly when under pressure, is much quicker in its action than boiling water, and is the most valuable disinfecting agent we possess. Various appliances for disinfecting in this way have been devised and are used in all hospitals, quarantine stations, and other places where a great deal of disinfecting has to be done.

Under a pressure of 20 lb. to the square inch, steam has a temperature of 248°F., and will then destroy all living organisms in a few minutes. A substance so treated is said to be sterilized. Disinfection implies the destruction of all disease-producing germs without necessarily destroying all of the non-pathogenic bacteria which are so beneficial and so widespread in nature. A body which is sterilized is necessarily disinfected, but disinfecting processes do not always cause sterilization.

Disinfection with steam is particularly suited, with some exceptions, for bedding, clothing, and fabrics of all kinds. Among the articles which are injured in this way may be mentioned leather and rubber goods, furs, and skins of all kinds. Fumigating with formaldehyde is the best way for treating these. The disease germs which are most likely to occur in milk, or drinking water, are all of the non-spore bearing kind, and are therefore very easily gotten rid of by simply heating to boiling. Many are even killed when maintained for a short time at a temperature considerably below the boiling point. Milk heated in this way is said to be pasteurized.

Light is the great natural disinfectant. None of the pathogenic bacteria are able to develop in sunlight, or even ordinary daylight, but thrive best in dark damp places. It is for this reason that well-lighted rooms are so frequently and wisely recommended. The time required for light to cause the death of any particular class of bacteria cannot be stated definitely, as this depends upon the intensity of the light, and the thickness of the stratum containing them. It is for this reason that the time required for sunlight to kill the germs of tuberculosis, which are more resistant to disinfectants in general than the germs of most of the other common diseases, is variously stated to be from a few minutes to several days.

THE Province of Batum, Russia, is rich in all kinds of mineral wealth, although little advantage has yet been taken of its resources. Coal of good quality is found within a short distance of the sea, and antimony and copper in the mountains. The mining industry has been developed slowly because of the lack of transportation facilities and the high prices demanded by the owners of promising locations. A company organized in 1900 and financed by American and English capitalists for the development of copper properties near Batum is perhaps the most important enterprise of its kind in the country. Over $8,000,000 is said to be invested in this company's plant, which has now reached a stage where it is able to pay working expenses and a small profit. The present output is 500 tons per day, but the company intends ultimately to increase its capacity to 1500 or 2000 tons per day. The output is all sold in Russia, where it commands a good price, as the duty on copper imported into Russia is $2.575 per 36.1 lb. The development of this plant is largely in the hands of Americans.

DURING 1910, 15,868 oz. of gold, valued at $307,929, was exported from the Federated Malay States, against 14,864.61 oz. in 1909. Exports of wolfram ore reached $26,623.

The Rogers Concrete Drop-Shaft, Iron River, Michigan

By P. B. McDonald

The Rogers concrete drop-shaft recently sunk at Iron River, Michigan, by the Foundation Company of New York presents several interesting features. It was put down through 140 ft. of shifting overburden on the edge of a swamp, and was sealed to the solid rock without having pumped any water; the water was held back by compressed air in which 50 'sand hogs' did the work of excavation. Just before reaching hard rock, several feet of brecciated rock was found which was not firm enough to seal to, and which had to be removed by expensive labor; this and the fact that it dipped at an angle of 40°, considerably complicated what would otherwise have been a relatively expeditious job. Also, the shaft got out of plumb during sinking, and it was not possible to entirely throw it back into line, so that after the air-pressure was removed one wall had to be chipped an amount varying from 18 inches down.

SURFACE EQUIPMENT, ROGERS CONCRETE DROP-SHAFT.

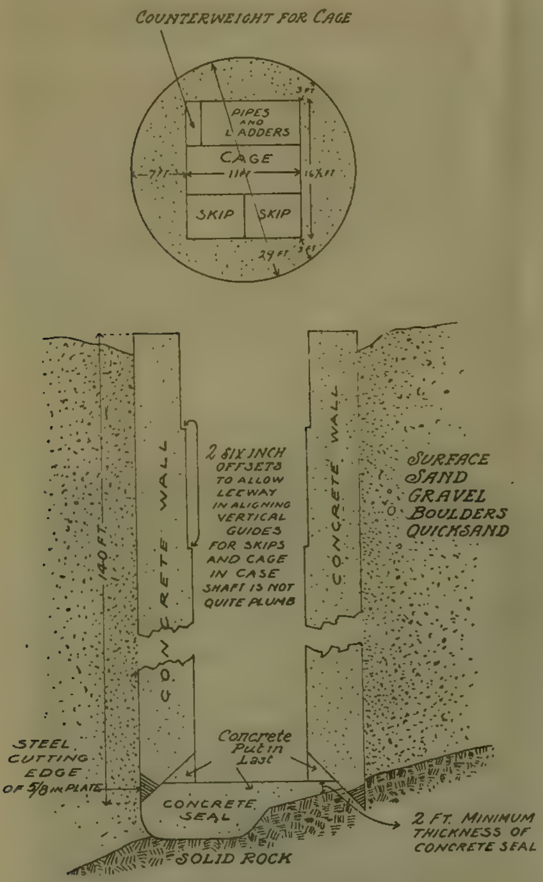
Steel dividers and guides were put in, making two skipways, a cage-way, and a compartment for pipes, ladders, and a counterweight; the steelwork was supported by brackets fastened to the concrete by bolts.

The sinking of concrete drop-shafts, using compressed air for holding back water and quicksand, was introduced by the Cleveland-Cliffs Iron Co., some four years ago, for several shafts on the Swanzy range south of Negaunee. Attention had been attracted to the process by the success attained by its use in bridge-pier and tunnel work. The method has since been utilized a number of times, both on the Michigan and Minnesota ranges, and its adoption has followed the growing tendency toward exploration of deep, drift-covered deposits by churn and diamond-drilling. Orebodies discovered under heavy overburden by drilling, demand permanent, water-tight shafts for hoisting purposes, and the recent impetus given to diamond-drilling has encouraged the practice of sinking concrete shafts.

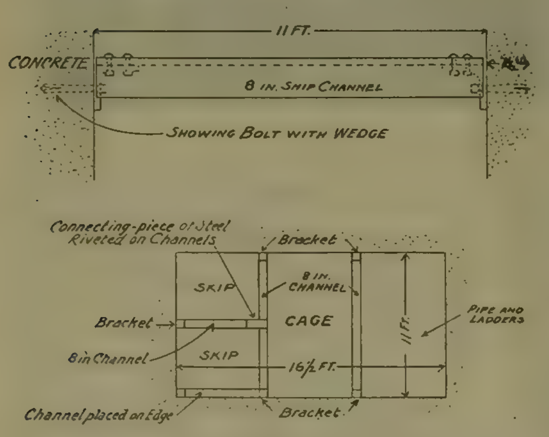
The Munro Iron Mining Co. had proved a large orebody by diamond-drilling at the Rogers mine, four miles east of Iron River, and it was desired to sink a shaft in the foot-wall through 140 ft. of glacial gravel, sand, quicksand, and boulders. None of the operating mines of the district are within three miles of the site chosen, so that the overburden gave promise of containing considerable water, especially as a swamp overlies a portion of the orebody.

A timber shaft might have been attempted, but it was known that a mine nearby had been trying to put down a timber shaft for over a year and was having a difficult time. Also, when finished, a timber shaft would let in a large quantity of water, and might give trouble in keeping plumb. Thus the Maas timber shaft on the Marquette range got out of line so badly, and let in so much water, that after several years' use it was filled with sand, and a large concrete shaft sunk around it. Teal lake, not far distant, from which the city of Negaunee obtains its water-supply, had begun to lower materially, so that it was thought the lake was draining into the Maas mine; since the concrete shaft was finished the level of the lake has risen. It is to be understood that it is the thick overburden, with its tendency to shift and conduct large quantities of water, that presents the more difficult part of sinking and maintaining shafts in the Lake Superior region; that portion of a shaft in the solid rock makes relatively easy sinking as compared to the work in wet soil where the excavation is constantly getting out of plumb, and water and quicksand come in in such quantity as at times to force the abandonment of the work. For this reason a concrete shaft is very satisfactory, if the orebody warrants the initial cost, for it is practically water-tight. The Rogers shaft cost approximately $500 per foot; a timber shaft might have been cheaper, or it might have cost more.

The Rogers shaft was started about the middle of February and was sealed to rock about the middle of July. The total time taken was five months; three months were spent on the first 125 ft., during which no compressed air was used, and two months on the last 15 ft. with compressed air at a pressure of from 38 to 45 ft. per square inch as the sinking progressed deeper. The first stage of the work, with no compressed air, went along very rapidly, and consisted simply of dredging dirt with a clam-shell and derrick from the interior of the shaft, so that the concrete casing sank by its own weight, more concrete being added at the surface in 5-ft. sections as needed. During these three months the shaft was kept full of water (to the level of ground-water, about 30 ft. from the surface) which helped wash the dirt from under the cutting edge of the casing, so that the clam-shells could work to better advantage. The bottom or 'cutting' edge of the shaft was pointed and encased in a steel plate for better forcing its way through the overburden. The weight of the heavy concrete walls was sufficient to drive the shaft down as the earth was dredged out from the interior. Vertical and horizontal reinforcements were used in the concrete, both of 1-in. steel, and placed near the outside and inside edges, about 18 in. apart.

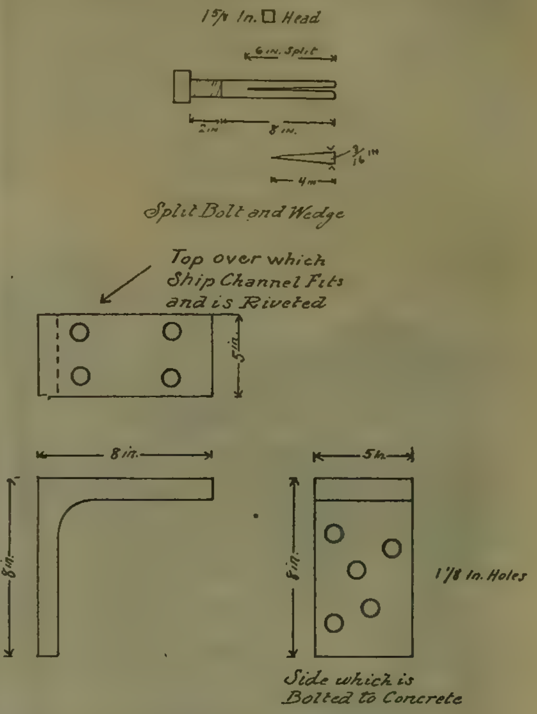

COUNTERWEIGHT FOR CAGE
PIPES AND LADDERS
CAGE
7 FT.
11 FT.
16 X 11
SKIP
SKIP
3 FT.
29 FT.
3 FT.
2 SIX INCH OFFSETS TO ALLOW LEEWAY IN ALIGNING VERTICAL GUIDES FOR SKIPS AND CAGE IN CASE SHAFT IS NOT QUITE PLUMB
CONCRETE WALL
CONCRETE WALL
140 FT.
SURFACE SAND GRAVEL BOULDERS QUICKSAND
STEEL CUTTING EDGE OF 5/8 IN PLATE
Concrete Put in Last
CONCRETE SEAL
SOLID ROCK
2 FT. MINIMUM THICKNESS OF CONCRETE SEAL

PLAN AND SECTION OF DROP-SHAFT.



CROSS-SECTION OF SHAFT. DIVIDER SHOWN ABOVE.

The second stage of the work, with compressed-air pressure, held in the shaft by a 6-ft. timber and concrete deck placed across the opening, was made necessary because boulders and hardpan were encountered, requiring men to work with pick and shovel under the cutting edge. The deck was set in notches left in the concrete, and the men and earth were 'locked' in and out through a cylindrical steel chamber placed over a hole cut in the deck. The lock was provided with two doors, one opening into the interior of the shaft where the pressure was, and the other opening into the atmosphere; both doors were, of course, never open at the same time. It was necessary for the men to spend several minutes in the steel chamber in coming out and going in, during which the air was let in or out very gradually, in order to accustom themselves to the difference in pressure, and there was always danger of the occurrence of air bubbles in the blood, causing a painful form of paralysis known as 'the bends.' Consequently there is some danger in connection with working under pressure, and men used to the work had to be brought in, about half of whom were negroes. Each man worked two 40-minute shifts per 24 hr. and received $4; the consumption of energy from 40 minutes in 40 pounds of air is about the same as from an ordinary half-day's work, and no one with a weak heart is allowed to undergo the pressure.



DETAILS OF CONSTRUCTION.

It was estimated that the pressure tending to lift up the timber and concrete deck at 45 lb. per square inch was 700 tons. If through some defect in the apparatus the air-pressure was suddenly lowered, the shaft would immediately have filled with water and sand, and the men probably drowned. For this reason the deck and air-lock were put in with considerable care, and a reliable type, the so-called 'hurricane-inlet' pattern, of air-compressor adopted.

When the rock was reached it was necessary to cut out the soft, oxidized upper layer in order to seal the shaft to hard, compact rock. When this was finally done the Foundation company's contract was finished and the air-pressure was taken off. The shaft had to be delivered by them water-tight, ready for the mining company to begin sinking with rock-drills, and unless the bottom had been properly sealed to firm foundation the shaft would not be water-tight in the bottom. No water had been pumped, so that the level of ground-water of the surrounding country was unchanged, and about 100 ft. head of water was on the shaft. In this respect the method is markedly different from ordinary sinking, in which the level of ground water is lowered by the pumping necessary to enable men to work in the shaft. With the compressed air method, instead of seeking to drain the surrounding country and lower the level of ground water, the water is held back by air of a pressure in pounds per square inch approximately of one-half the number of feet head of water outside. When the casing has been bottomed in solid ground and sinking in rock is commenced, the water can be pumped to better advantage, as it cannot come in so fast. However, the soft rock must be removed from the rock surface while the air is still on, or otherwise the miners will be drowned out by a rush of water when drilling is commenced in rock.

INTERIOR OF SHAFT FROM BELOW.

Putting in the steel dividers after the casing had been sealed to rock was a job requiring careful attention. In the first place, despite the two 6-in. offsets, one wall of the shaft had to be chipped off considerably to make it plumb for guides. It was decided to use 8-in. ship channels for dividers and to support them on steel brackets. To fasten the brackets to the walls, two holes were drilled with an air-hammer drill and the bracket bolted with two bolts, which were driven in on wedges to expand their ends; melted lead was then poured into the holes to make a firm joint.

Gold and Silver Production of Canada

By S. Dushman

The gold production of Canada is mainly derived from the Yukon and British Columbia. The exhaustion of the richer gravels of the Yukon has led to a diminished but much steadier exploitation of the placer deposits. The production from this territory in 1910 was $4,550,000. The future production will probably increase annually, owing to the mining being put on a more stable basis, due to the reduction of costs and the advent of large companies. Large companies are carrying on extensive operations for dredging and hydraulic mining for the purpose of working over the old tailings and large deposits of low-grade gravel.

The gold production of British Columbia was $5,432,000 in 1910, most of it being from auriferous copper pyrite in the Nelson and Rossland districts. It is a question whether electrolytic methods of treating these ores would not be found to be more economical than the present metallurgical methods. In the treatment of the auriferous gravels of the placer deposits it is very likely that some process of electrolytic amalgamation might also be found to yield better results than the ordinary amalgamation methods. The remarks of E. E. Carey are worth while quoting in this connection. "In the near future we may look for a greatly increased production of gold, due to the application of electrochemical methods in mining and milling operations. Were electro-amalgamation and electro-cyanidation today in general use in other mills now in operation, the gross output of gold would be increased 25%. The great increase in the future supply of gold, however, will come from vast low grade deposits which cannot now be mined.

That the gold resources of the Yukon and British Columbia have only been skimmed, as it were, is evident from the fact that the mountain ranges of this territory in which gold deposits have been found so far form the northern extremity of the western or Cordilleran belt, which, extending from South America to Alaska, is recognized as one of the greatest mining regions of the world, noted principally for its wealth in gold, silver, copper, and lead." In both Mexico and the United States this mountain range has yielded about $3,000,000 per mile of its length, and it is only reasonable to expect that Canada, which possesses over 1300 miles of this range, will yield enormous amounts of the precious metals in the future. The resources of placer gold in the Klondike alone have been estimated at $100,000,000. Up to the present probably not one-twentieth of this vast area has been prospected in detail.

About 90% of the silver produced in Canada in 1910 was derived from the rich silver deposits of Cobalt, Ontario, the rest being derived from British Columbia. Since the discovery of the Cobalt deposits, in 1904, the production of Canada has grown rapidly; in 1910 this country produced 32,000,000 oz., or 13.3% of the world's total production.

Fine silver is produced only at Trail, B. C. as a by-product in the lead-refining process. In Ontario ores from the Cobalt district are at present being treated at three metallurgical works operated by the following companies: The Canadian Copper Co., at Copper Cliff, Ont.; The Deloro Mining & Reduction Co., at Deloro, Ont.; The Coniagas Reduction Co., at Thorold, Ont. Silver bullion of fineness varying from 850 to 998.2 is produced at the works, other products being white arsenic, and in the case of the Coniagas plant, nickel and cobalt oxides. In each case residues carrying silver, arsenic, cobalt, and nickel are either shipped to the United States or held in reserve for further refining. In 1909 about 52% of the total silver production was recovered in Canada as fine metal or bullion.

The ores of the Cobalt district are extremely complex, and the problem of treating these ores economically is still awaiting a solution. Under present conditions one of the pressing needs for the further promoting of mining and metallurgical activity in northern Ontario is the devising of suitable methods for the treatment of the Cobalt silver ores. Only about 30% of the ore shipped from Cobalt in 1909 was treated in metallurgical works in Canada, most of this being high-grade silver ores, and the rest was shipped to a number of large companies operating in the United States. With respect to the content of nickel, cobalt, and arsenic in the ores, the mining companies are paid only for a small portion of the cobalt content, and nothing for the nickel and arsenic; in fact, in certain cases, the latter two are penalized.

In the solution of these problems there is undoubtedly a field for the electrochemist and electrometallurgist. Not only is there an abundance of mineral wealth in the Cobalt region itself, but even in the districts farther north, deposits of the most varied nature have been unearthed. Iron, copper, molybdenum, silver, gold, and even small diamonds have been discovered in the lone land south of Hudson's Bay. The whole of the Temiskaming region appears to be a vast mineral deposit where the richest ores and minerals of the earth have been thrown together in the past ages, in a most haphazard and extraordinary manner, so that one knows not what to expect in the future. Added to this is the fact that there are abundant waterfalls throughout the whole region. The facilities for transportation are being increased as fast as the country demands them; the government of Ontario has constructed a direct line to open up the agricultural and mining districts of the north of the province and is operating it by a commission. All these considerations serve to emphasize the fact that the hopes which are entertained for the electrochemical future of northern Ontario are not without some warrant.—*Applied Science.*

Manganese Mining in British India

By Herbert A. Carter

Manganese ore, as is fairly well known, is principally used in steel metallurgy, and the manganese market is regulated by the requirements of the iron and steel trades, which consume at least nine-tenths of the world's output of the ore. A period of great prosperity in the steel industry (1905-7) led to a much larger demand for manganese ore, just at a period when the Russian output, the most important source of supply, was reduced by the political disturbances in that country. Prices, as a result, rose quickly, which developed prospecting in India and elsewhere, and led to the discovery and working of new deposits of the ore, together with a much larger output from the mines then in existence.

Manganese mining commenced in British India in 1892, and the yearly output from the mines since that date has steadily increased, with the exception of slight fallings off in 1898, 1902, and 1904, to a maximum of 916,770 metric tons in 1907, so that it is possible India produces more manganese ore at present than Russia. The production of the United States, though large, is chiefly made up of manganiferous iron ores. Production in India up to 1900 was confined to the Vizagapatam district, in the Madras presidency, but in that year a beginning was made in the Central Provinces, however, and since 1902 the mines in the Central Provinces have provided the bulk of the Indian output. The industry opened out in the State of Ihabua, central India, in 1903, in the Sandur State, Madras, and in the Belgaum district, Bombay, in 1905, in the Pauch Wahals district, Bombay, in Mysore State, the Portuguese territory of Goa, and the Singbham district, Bengal, in 1906; in the Las Bela State, Beluchistan, in 1907, and in the Gahgpur State, Bengal, in 1908. Between the years 1905 and 1907 the manganese production of India rose from 250,000 to a maximum of 916,770 metric tons. Prices for first-grade ore rose from a minimum of 8¾d. per unit at the end of 1904, to 16 and 18d. in the early part of 1907, but in February 1908 quickly fell to 10d., and have since changed but little from 9½d. This fall in prices was due to the financial crisis of 1907, which lessened steel production in the autumn of that year; the great demand then for the ore was curtailed, and large stocks of ore, which for the time being were unsalable, helped also to depress the market. Manganese mining in India during 1908 was limited to those mines which had made contracts during the time prices were high, and although the steel trade became good again in 1909, the demand continues below the available supply.

Manganese ores are to be found in many widely separated districts of India, and almost all the deposits which are of economic importance are found in Archean rocks. Some deposits of a superficial character are found in laterite. Manganese ore was at one time made use of in the manufacture of chlorine and bleaching powder from pyrolusite. For this the ore must contain at least 70% of manganese peroxide, and small quantities of pyrolusite are also employed for various lesser chemical and manufacturing purposes. By manganese dioxide is meant the commercial powder.

The manganese ore deposits in India can be divided into three divisions in accordance with their origin. The first are those derived from a distinct series of igneous Archean rocks, rich in manganese, by processes of decomposition of a secondary nature, and like replacement, acting within the zone of weathering. This division is represented by the deposits formed in the Vizagapatam district. Second, those derived from manganese, the source of which is very probably the same series of igneous manganiferous rocks referred to, already precipitated from solution as hydrated oxide contemporaneously with the decomposition of the enclosing strata which now compose the subdivision of the Archean group known as the 'Dharwars'. After the consolidation of the series of sediments, the rocks were subjected to more or less severe metamorphism, with the result that an important change in the character of the ore-bands, as a rule, occurred, the manganese oxide combining with the intermixed or interstratified clay, or sand, commonly present, with the formation of manganiferous silicates (especially spessartite, a manganese-alumina garnet, and rhodonite). By later chemical alteration, thought to have taken place at considerable depth before the action of denudation brought the series within the zone of weathering, manganese ores (oxides) were largely reformed, but recent outcrop oxidation has also contributed in most cases to the surface enrichment of the orebodies. This division comprises all the important Indian deposits, including those of the Central Provinces which do not come under the headings of the first or third divisions. Third, those derived from manganese compounds disseminated in small proportions throughout the Dharwar series, as a rule, and concentrated by superficial replacement, and segregation of the manganese in the decomposed outcrops, and in masses of laterite, formed on the outcrops of the underlying rocks, usually Dharwars. This division includes the deposits of Sandur, Mysore, Goa, and other localities. In a limited number of instances the manganese is most likely of composite origin, being in part derived from original sedimentary deposits and partly enriched by superficial replacement by means of percolating waters carrying manganese in solution.

There is no difference in the character and mode of occurrence of the deposits divided into the three genetic divisions. The first class is of irregular shape and size, strewn in soft decomposed rock, and as a rule outcropping on level ground. The second class forms regular beds interstratified in metamorphic rocks, usually schists and quartzite with a steep dip, and very frequently forming a background for ridges which stand out above the plain; though this is not the case when the enclosed strata are mostly soft schists. The third class, as a rule, forms the crest of small hills, or is found irregularly as segregations, and concretions, in laterite and subsoil.

As to the resources of India in manganese ore, many millions of tons of oxide exist obtainable by the present open-cut methods, but a general lack of development work in depth prevents any exact estimate being made. Though enormous, the amount is not inexhaustible, and within the next decade or two those best fitted to speak on the subject consider it will be necessary to make use of much second-class ore, crushing and concentrating by mechanical means, and also to consider the adoption of underground work in the larger and more persistent types of deposits. The depths to which salable oxidized ore extends in these deposits is, however, as yet unproved, but it could be ascertained by the aid of diamond-drilling. It is, in fact, possible that a general exhaustion of the oxidized ores may ultimately force metallurgists to utilize the unoxidized silicate ores, carrying 30 to 40% manganese, but this is not a matter which need disturb the present generation.

The deposits in India are worked by open-cut methods with coolie labor, usually under a contract. The ore is pried out with crowbars, or drilled and blasted, a certain amount of deadwork being necessary in the country rock which encloses the deposit. In boulder ore, concretionary ore in clay, and subsoil the material is simply excavated or turned over, and the lumps of ore picked out by hand. The ore quarried is broken where necessary to a convenient size for handling, and separated from admixed rock, or low-grade mineral, by sorting and cleaning with small hammers. The waste goes to the dump, while the ore is carried away on the heads of women and children, and piled into rectangular heaps which are then measured, and the tonnage calculated from the cubical contents (15 to 20 cu. ft. per ton, according to the specific gravity and mechanical condition of the ore). In some of the large mines situated on hills the transport to the stacking ground is facilitated by the use of aerial rope-ways, and gravity inclines, and chutes are at times used. The total mining costs vary greatly, being as low as Rupees 1 to R1-8-0 per ton in the mines of the Central Provinces, and as high as R6 in some of the Vizagapatam mines, and in some of the small irregular deposits of Goa and Mysore. The royalty payable in British India is 2½% on the selling value of the dressed ore at the mine, and the rate per ton has varied between 1 anna and 4 annas, according to manganese prices. In native States a fixed royalty of 4 or 6 annas per ton is usually charged.

When an analytical chemist is employed at the mines, the stacks of ore are sampled and analyzed separately, in order to control the grade of the ore and to meet the requirements of the contracts on which it is sold. The manganese content must not be let fall to a point which will entitle the buyers to reject the consignment, and for the same reason the injurious impurities (silica and phosphorus) must be kept within the limit allowed. After the measurement and sampling of the stacks, the ore, commonly composed chiefly of a mixture of the manganese minerals, psilomelane and braunite or pyrolusite, is carried to the railway by bullock carts which hold half to three-quarters of a ton, or by light steam tramways in trains of 25 or 30 cars, each holding one to two tons. Carting costs 2 to 4 annas per ton per mile, while the tramway service costs about 6 pice. The ports from which the ore is exported are, in order of importance, Bombay, Vizagapatam, Marmagoa, and Calcutta. With Vizagapatam deposits the railway freight to the port costs about R1-4-0, while the Sandur and Mysore ores pay about R5-12-0, and the Central Provinces ores (via Bombay) R8, and (via Calcutta) R10. At the ports the ore is stacked for shipment; which is usually in consignments of 1000 tons and upward. The charges at the port are R1-4-0 to R1-8-0 per ton, and about the same cost is incurred at the port of destination. The freight to English ports, and ports on the Continent is usually about R12 per ton, and about R13-8-0 in the United States. Central Provinces ore, via Bombay, costs about R27 delivered c.i.f. at English and Continental ports, while Vizagapatam ore costs about R28-8-0. The average cost at which the Indian ores can be placed upon the market will bear favorable comparison with the cost of the Russian and Brazilian ores, and they compete with them. On reaching the ports of destination, the ore is unloaded into railway cars, occasionally into lighters, the weight is determined, and the ore delivered at the works.

Manganese ore is sold on contracts made between the producer and consumer, or an ore-broker who occupies the position of a middleman. The price obtainable varies widely, according to the market rate per unit of manganese. Thus a 50% ore realizes at times when the metal is at 9d. per unit, £1 17s. 6d., or R28-2-0 per ton; the same ore when manganese stood at 16d. per unit, would have realized £3 6s. 8d., or R50 per ton. The permissible amount of silica and phosphorus is arranged for in the contract, as well as the manganese basis on which the ore is to be paid for, with provision for deductions for excess amounts, and the right to refuse ore of above fixed maximum limits. The limit of free silica is generally 8 or 10%, and that of phosphorus 0.10 or 0.12%, though ores with twice this amount of phosphorus meet with a sale at lower prices. They are principally employed in smelting sulphury iron ores. A rejection limit for the manganese is named in addition, and the iron content is paid for in some instances, but not in others. Ore that contains too large a proportion, say above 15%, of fine ore is objected to by purchasers. The composition of the ore, and accordingly the price to be paid for the consignment according to the conditions of the contract, is fixed by an official sample drawn at the port of loading, or of destination, by persons who represent the buyer and seller acting jointly, or by an independent firm of samplers and assayers. In either instance a number of sealed portions of the samples are analyzed on behalf of both parties, and the mean of agreeing results is accepted. The moisture which is found is deducted from the weights, and the analysis, as a rule, reported on the dried sample. The great bulk of the manganese ore marketed is smelted in blast-furnaces for the production of ferro-manganese and spiegeleisen, which typically contain 80 and 20%, respectively, of manganese, the other constituents of importance being iron, carbon, silicon, and phosphorus.

Manganese forms several oxides, the most important of which are manganese oxide, MnO, trimanganese tetroxide, Mn_3O_4, manganese sesquioxide, Mn_2O_3, manganese dioxide, MnO_2, manganese trioxide, MnO_3, and manganese heptoxide, Mn_2O_7. It is difficult to prepare a pure hydrated manganese dioxide owing to the readiness with which it loses oxygen, leaving residues of the type $xMnO\,yMnO_2$. Manganese salts can be detected by the amethyst color they impart to a borax bead, and by the green mass formed when they are fused with a mixture of sodium carbonate and potassium nitrate. Manganese may be estimated quantitatively by precipitation as carbonate, this salt being then converted into the oxide, Mn_3O_4, by ignition, or by precipitation as hydrated dioxide by means of ammonia and bromine water, followed by ignition to Mn_3O_4. The valuation of pyrolusite is generally carried out by means of a distillation with hydrochloric acid, the liberated chlorine passing through a solution of potassium iodide, and the amount of iodide liberated being ascertained by titration with sodium thiosulphate.

Manganese steel is very strong, hard, and extremely ductile; it contains about 12% of manganese and 1.50 of carbon, although the presence of 1.50% of manganese makes steel relatively brittle, and while a further addition at first increases this brittleness, so that steel containing between 4 and 5.5% can be pulverized under the hammer, yet a further increase gives the remarkable result of good ductility, accompanied by hardness, a combination of properties which was not possessed by any other known substance when this remarkable alloy known as manganese steel was discovered. Its ductility, to which it owes its value, is profoundly affected by the rate of cooling. It is used largely for objects which need both hardness and ductility, such as rock-crushing machinery, railway crossings, mine-car wheels, and safes. No process softens manganese steel rapidly, and this very fact that it is unalterably hard has limited its use because of the great difficulty of cutting it to shape, which has in general to be done with emery wheels instead of the usual iron-cutting tools, another defect in its relatively low elastic limit.

In the manufacture of steel the manganese alloy is added at the conclusion of the process, just before the metal is cast into ingot molds. This effects the following: (1) the reduction of the small amounts of iron oxide present in the molten metal; (2) addition of the manganese needed in the finished steel (about ½% on an average); (3) formation of blow-holes minimized, reduction of the sulphur content, and production of a fluid slag.

Some of the carbon needed in the finished steel is contained in the manganese alloy added, while the balance is added as charcoal, or in some other form that is convenient. The quantity of manganese added as alloy averages about 1% of the steel. A special steel which is called manganese steel contains 13% of manganese, as a rule, and is very hard and tough. Other alloys of manganese which are made are silicon-spiegel and manganese-bronze. Manganese bronze is employed for ships' propellors, as it is very tough and strong, and is not liable to corrosion by sea-water. It is composed of copper, manganese, aluminum, and zinc.

Manganese steel is made by Hadfield's Steel Foundry Co., Ltd., Sheffield, England, the Edgar Allen American Manganese Steel Co. of Chicago, and the Taylor Iron & Steel Co., Highbridge, New Jersey. It is specially suitable for certain wearing parts of grinding and elevating, as well as crushing machinery, as its wear-resisting properties are extraordinary. Manganese in small quantities has little influence on the character of the metal. When the quantity of manganese rises to 2.5%, the strength and ductility diminish, and the hardness increases, the influence reaching a maximum with about 6% of manganese. With larger quantities strength and ductility increase. It casts well, the castings being free from blow-holes, and forges well at a moderate temperature, and manganese steels are remarkable by not being susceptible to magnetization.

An Old Treasure Town

By [illegible]

[illegible]

RUINS OF SPANISH SMELTING PLANTS

the lode vein which extends for several miles across the country, and the mine soon became a great producer, yielding almost fabulous amounts of silver; indeed, it is yet on record that during the great bonanza in the eighteenth century [illegible] one million dollars was taken out in less than eight years. Several great plants were built to treat the ore, and are the largest of their kind that I have ever seen. Two of them are still in a fair state of preservation, of one only the foundations remain, while a fourth has entirely disappeared, with the exception of a ruined stone arch thickly overgrown with cactus. I will add that the stones from the last two were carried away by the natives to build the modern town.

These reduction plants merit description, as they are excellent examples of early Spanish architecture in Mexico. They are constructed entirely of stone, and each one covers about ten acres; from without they present the appearance of a great square fort, with one or two massive gateways, and almost no windows in the outer wall. Clearly they were built for defence, as the outer walls are about three feet thick. Within the enclosure all around the wall are [illegible] of buildings, while the central part consists of a great yard or patio, where the ore was treated. There are abundant remains of mercury tanks and ditches, and old [illegible] cut from a single block of stone, while the ruins of a dozen adobe furnaces testify that smelting was also practised there. The long rows of columns and arches which give the great rooms and halls the appearance of a monastery are especially notable. These columns were placed down the centre of the big rooms and were necessary to support the roof, as the rooms were far too wide to be spanned by single beams.

[illegible]

METHOD OF TRANSPORTATION.

the old ruins at night. Some of them firmly declare they have seen the ghostly occupant peering over the wall on stormy nights, and I have no doubt they believe it. Although an unbeliever in ghosts, I tried to get a glimpse of this spook, going into the ruins at night on several occasions and waiting patiently for hours, but he failed to put in an appearance.

When the Mexican Revolution broke out in 1810, the principal owner of the mines resided in Ramos, and was killed there. As he was possessed of considerable wealth, and none of it was ever found after his death, there is a foundation for the story that a great treasure is hidden somewhere in the old ruins. Legend has it that one night shortly before he was killed, the Spaniard and his servants threw all his treasure, in silver bars, down the main shaft of the mine. When the mine was unwatered, all the treasure would be found, it was said; but alas, when the water was removed, no treasure was there. Another tale said that deep underground was a passage between two of the mines, closed with an iron door; near that door would be found the treasure. The door was actually found some years after the reopening of the mines, but no treasure. Perhaps there is still a fortune hidden away somewhere, waiting for the lucky finder, but the possible places of concealment are so numerous that even a systematic search would occupy many months.

But hidden treasure has actually been found in the old town. There was an American miner living in one of the fine old houses there, a house called the *Alto Blanc*, or 'the white house', and one day, probably by accident, he discovered a secret hiding place in the wall, from which he took thirty thousand dollars. Then there was an old Mexican who dreamed three successive nights of finding a treasure in one of the bandit caves near the town, and finally went there and dug in the floor of the cave, where he found a considerable sum of money, this story is also well authenticated. Afterward some of the Americans visited the same cave, but only succeeded in unearthing a few bones and human skulls. When the old town began to revive, after the advent of the Americans, some strange things came to light. A family, having moved into a long-disused house, were sitting at dinner one day when they were startled by a portion of the wall falling in, revealing in a niche in the thick wall, a skeleton standing upright. Who was this unexpected guest? How came he there? These are questions that will never be answered. An eye-witness of this strange occurrence informed me that the skeleton held a paper in its hand, yellow with age and with faded writing on it; but as the family were illiterate people, the skeleton and its unread missive were consigned to rest in the village cemetery. In another old house there was discovered a walled-up closet containing the remains of two skeletons, suggesting some long-forgotten crime.

COCINERA MINE PLANT.

Ramos is in the northwest corner of the State of San Luis Potosi, and about thirty miles east of the city of Zacatecas. It lies on a high plateau, and the nearest mountains are fifteen miles to the west; the country rock is andesite, and nearly all the mines are along a fissure vein which is almost vertical and traverses the country from north to south for about twenty miles; all the mines are near the southern extremity of this vein, and within an area of one square mile.

The Cocinera is the largest mine, and the depth in 1901 was 1200 ft. The Spaniards worked this mine to a depth of 900 ft., when a barren streak about 100 ft. thick was found. The vein matter is a decomposed quartz, impregnated with various copper minerals, the sulphides, chalcocite, bornite, tetrahedrite, chalcopyrite, galena, and blende predominating. The average width of the vein is 15 ft., and the ore occurs in large pockets, sometimes in great masses; the walls are well defined, but the mine is very wet and hot. It is worth noting that the galena in these mines is almost barren of silver, while the blende carries a good quantity. The sorted ore from the Cocinera averaged 5 kg. silver and 14% copper, with from 8 to 10% lead, and 5 to 10% zinc; there is no gold in the entire district. At a depth of 1100 ft. a great body of oxidized ore was found, containing the copper almost entirely as red oxide; in this orebody was found a few pounds of silver-gray mineral, which on analysis gave the formula $AgCu_4S$. Its structure was massive, and under a high-power microscope was shown to be perfectly homogeneous and not a mixture; apparently it was a new variety of stromeyerite. There was also much native silver and copper found in this oxidized vein.

North of the Cocinera is the San Vicente, about 600 ft. deep, which also showed considerable ore on unwatering. When the water was drained away, the walls in some of the levels were found incrusted with a coating of goslarite crystals ($ZnSO_4$.) Also, several old Spanish miners' candles were found in which the tallow had been almost entirely replaced by green copper carbonate, so that the candles crumbled on handling. North of the San Vicente, on the same vein, there are, in a distance of one mile, about twelve other shafts, most of which are either fallen in or full of water. Most noteworthy is the Colorado, a circular shaft of red masonry about 6 ft. in diameter, which is now completely caved in at a depth of a little less than 100 feet.

Three miles north of Ramos is a large deposit of copper carbonates and silicates on a vein parallel to the great vein; the ore averaging 2 to 3% copper and very little silver. A few miles northeast of the town is a low range of hills of red volcanic rocks, tufa or scoria, which are late intrusives. The entire district contains numerous fissures of black basalt, and is covered with a calcareous deposit called *caliche*, varying in thickness from a few inches to several feet; this deposit is apparently of earlier formation than the red dikes. About eight miles east of Ramos, a great dike of white quartz, projecting several feet, traverses the country for a long distance north to south; the quartz averages about 2 gm. silver per ton. In the Santiago mountains, 15 miles west of Ramos, are several deposits of low-grade copper carbonates and silicates averaging from 3 to 5% copper, with about 170 gm. silver. There are also in the Ramos district many tons of copper slag and tailing from the *patio* process of the old Spanish days; much of this tailing averages from 2 to 5% copper and 250 to 500 gm. silver.

Economy in Power Transmission

By C. R. Trowbridge

The line-shaft of a system of machinery has been termed the highway for power, and the comparison is apt, for in many ways it bears an analogy to the roadbed of a railway. The ballast of a railroad may be compared to the balance of the rotating members upon a line-shaft; every pulley should be in perfect balance, and, so far as possible, the pull of belts in opposite directions be equalized. Not only as regards balance, but also in connection with support and alignment, may the line-shaft be compared to the railroad line. It must be firmly supported, and thus the hangers and bearings come into play, and its alignment must be correct and self-correcting, otherwise harmful resistances will multiply rapidly, and efficiency fall off accordingly. It should never be forgotten that the final efficiency of any system, such as that of a line-shaft and distribution, consists of the continued product of the several detailed efficiencies, so that any small falling off in the various elements will produce a much greater influence upon the whole. This means that the closest vigilance is necessary upon all details—watchfulness in the shop, in the erection, and in the continual operation. It does not mean, however, that the transmission should be a continual source of anxiety and trouble to the superintendent of motive power, for if the mechanism has been properly designed and erected it will take care of all these questions automatically. If the hangers are of the real ball-and-socket construction they will place the bearings themselves in parallel with the shaft at all times; if the adjustments may be made in all directions, the shafting can be placed in perfect alignment and kept there; while if the various portions are provided with independent friction-clutch connections, every opportunity is given for control over the whole system or any of its parts. Efficiency in manufacture means efficiency in operation, but there is yet a further kind of efficiency—that completeness which is always ready for any emergency. When it is understood that every detail of a power transmission system is kept in stock, it will be realized that there is an efficiency of the highest character, an efficiency which permits a minimum of loss in time in the case of accidents, changes, or extensions.

Determination of Copper by a Modification of the Iodide Method

By E. C. Kendall

[*]The modification of the iodide method as described in this paper consists in the destruction of the nitrous acid without boiling. This is accomplished by the addition of a small amount of sodium hypochlorite. The addition of sodium hypochlorite to a nitric acid solution produces hypochlorous acid. The interaction of hypochlorous acid and nitrous acid results in the oxidation of the nitrous acid and the formation of hydrochloric acid, and the reaction between hypochlorous and hydrochloric acid results in the destruction of the hypochlorous acid and the formation of free chlorine and water. As the solution of sodium hypochlorite contains small amounts of chlorides, hydrochloric acid will always be present when the solution is acidified, thus insuring the destruction of the hypochlorous acid and the formation of free chlorine. The effect of adding sodium hypochlorite to the solution is the complete destruction of the nitrous acid and the formation of free chlorine.

To remove the free chlorine in solution some compound must be added which will take up the chlorine, but will not affect subsequent operations. Such a compound is found in phenol. Under the conditions of the determination, phenol will add chlorine directly to the benzene ring, but is not affected by iodine or any of the other compounds in the solution. Chlorophenol not being ionized removes all traces of free chlorine. This modification of the method greatly reduces the time and attention required for a determination, and, in addition, the copper solution is prepared in such a way that iodine can be liberated by copper alone.

In the determination, the copper, copper oxide, or sulphide is dissolved in nitric acid. After the addition of the sodium hypochlorite and phenol, which requires but a moment, the solution is made slightly alkaline with sodium hydroxide, and is then made acid with acetic acid, when the solution is ready for titration. Potassium iodide and starch are added, and the titration is made to the disappearance of the starch iodide color. There is never any fear of the blue color 'flashing back', and the solutions will remain colorless indefinitely after the titration. As the ionization constant for acetic acid is too low to allow nitrates to liberate iodine, the amount of nitric acid in solution is immaterial. Even 20 c.c. of concentrated nitric acid will not affect the titration. However, too great an acidity is to be avoided, as nitrophenol will be formed. The presence of nitrophenol prevents the determination of copper, but there is no danger of its formation even in the presence of a large amount of acid, if the solution is neutralized soon after the addition of the phenol. If a large amount of nitric acid is used to dissolve the copper, it should therefore be partly neutralized before addition of the phenol.

As chlorine easily oxidizes phenol to compounds which prevent the determination of copper, it is essential that all of the phenol be added quickly to the solution. Under these conditions the chlorine adds directly to the benzene ring, but if the phenol is added drop by drop the chlorine will oxidize it, producing colored compounds in solution. In order to add the phenol quickly enough to the solution it may be poured in from a beaker, or, a more convenient way, from a pipette from which the tip has been removed, so that the delivery is from an opening which is of the same bore as the rest of the tube. By forcing the phenol out of such a pipette with the breath the entire volume is added very quickly and at the same time the phenol is well mixed with the contents of the flask. After addition of the phenol the chlorine gas which is in the flask above the liquid is removed by blowing it out with the breath, and the sides of the flask are washed with a jet of water from a wash bottle. There should be no odor of chlorine just before the solution is made alkaline.

It should be remembered that the end point of the titration is not pure white. Cuprous iodide has a cream color, and when a large amount of copper is present the cuprous iodide gives a decided tint to the solution. When the end point is nearly reached, a drop of the thiosulphate is allowed to fall into the centre of the flask. If a change of color occurs the solution is given a slight rotary motion, and after the solution is again quiet, another drop of the thiosulphate is added. The 'spot test' is easily recognized and gives a very accurate end point. The speed of reaction of the copper with potassium iodide varies with the volume. In a small volume the action is rapid, and all of the iodine is liberated at once, but in a large volume an appreciable time may be required for all of the copper to react. This is especially noticeable when a small amount of copper is present. A high concentration of potassium iodide greatly assists the liberation of the iodine. Accurate results cannot be obtained unless at least 3 gm. of potassium iodide are added, irrespective of the amount of copper present, up to 500 mg. of copper.

If the copper to be determined is present as metallic copper, 200 to 300 mg. is placed in a 300-c.c. flask and dissolved in 5 to 10 c.c. of 50% nitric acid. If the copper is present as cuprous oxide, it is filtered on a Gooch crucible through asbestos. The cuprous oxide is then dissolved through the Gooch crucible with 10 to 15 c.c. of 30% nitric acid into a 300-c.c. Erlenmeyer flask. If the copper is in the form of sulphide, it is filtered on a Gooch crucible which has a layer of asbestos ⅛ in. thick. The crucible is then placed in a small beaker of 50-c.c. capacity, and 10 c.c. of 50% nitric acid is added. The beaker is placed on a hot plate, and the nitric acid allowed to boil until all the black sulphide has gone into solution. The crucible is then washed off, and the solution transferred to a 300-c.c. Erlenmeyer flask. The presence of the asbestos in the solution does not interfere with the titration of the copper. If the copper to be determined is already in solution as sulphate, chloride, or other salt, sufficient solution is taken to give 100 to 300 mg. of copper.

Having obtained the copper in solution, preferably in a 300-c.c. Erlenmeyer flask, the volume being between 50 and 60 c.c., the acidity is adjusted to equal 4 to 5 c.c. of concentrated nitric acid. A greater volume or acidity is to be avoided. The temperature should not be above 25°. Five cubic centimetres of the hypochlorite solution is now added to the copper solution, which is well mixed with a rotary motion. As soon as the color of the copper solution changes from a clear blue to a greenish tint, sufficient hypochlorite has been added. Another indication of a sufficient amount of hypochlorite is the liberation of chlorine. For weights of copper up to 200 mg., 2 to 3 c.c. of the hypochlorite is sufficient. For larger amounts of copper, more hypochlorite may be needed, but 5 c.c. will be sufficient for any amount of copper which would be determined by this method. The reactions between the hypochlorous and nitrous acid require an appreciable time, and the best results are obtained by allowing the solution to stand about 2 minutes before the addition of the phenol. This, however, is not essential. Ten cubic centimetres of the phenol solution is now added as quickly as possible, by blowing the solution from a pipette from which the tip has been removed. The chlorine gas which remains in the flask above the liquid is removed by blowing into the flask, and the sides are washed down with a jet of water. If the solution is allowed to stand at this point, nitrophenol will slowly form. Sodium hydroxide is therefore added until a very slight precipitate is obtained. The solution is now made acid with acetic acid; only a few drops should be required to dissolve the precipitate; 10 c.c. of the potassium iodide is added and the titration made with the standardized thiosulphate. If great accuracy is required, the titration is finished with a weak solution of thiosulphate.

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[*] Abstract from the *Journal* of the American Chemical Soc., December 1911.

The blister-copper production from Pennsylvania in 1910 was 740,626 lb., as compared with 994,089 lb. in 1909. The output was from the iron mines of Lebanon county. These ores carry a small amount of pyrite and chalcopyrite.

Making Laboratory Cyanide Tests

By George A. James

It has been my object to devise an apparatus for laboratory cyanide tests that will duplicate the conditions of actual practice, and that will handle quantities large enough to obtain accurate results, in checking solutions and tailing after treatment. I have used such an apparatus over a year with gratifying results.

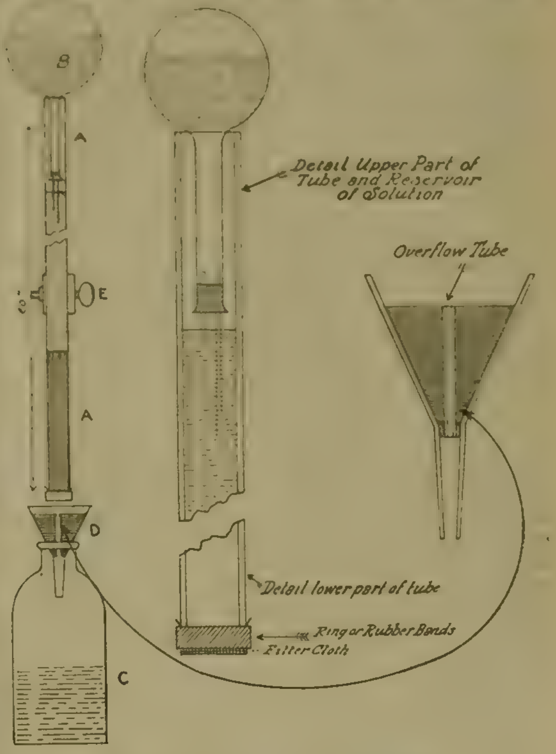
The accompanying sketch shows the apparatus now in use. A large glass tube, *A*, 60 in. long and not less than 1¼ in. internal diameter (1½ in. is preferable) at the lower end, is covered with a filter medium of cloth or canvas, which is held in place by a tight fitting ring of metal or by rubber bands. The measuring flask, *B*, should have a neck small enough to enter the glass tube and a capacity of 2000 c.c. This is fitted with a cork, through which two small tubes enter the neck of the flask. One protrudes about an inch and the other must be at least three inches longer. The purpose of this arrangement is to provide a self-regulating feed to the percolation tube, *A*, and to prevent the contamination of the solution by the laboratory gases.

As the shorter tube provides the only inlet for air, its length regulates the height of the liquid column in *A*. Its length can be regulated as desired, but the two tubes must differ in length sufficiently to assure a flow of solution. A difference of three inches is sufficient. *D* is a funnel with an overflow tube covered with a small piece of rubber tubing, which may be pressed into the neck of the funnel, thus retaining sufficient solution for tests. This always represents the last liquid received, and can be allowed to enter the solution reservoir by releasing from the neck of the funnel, or it can be withdrawn if so desired. These large tubes are very susceptible to changes of temperature and should be protected. This can be done by pasting thick paper over them, allowing enough glass exposed for observation.

Before using the tube for experiment, it should be graduated. As the tubes are not always of regular diameter, it is well to mark them permanently at the points reached by successive additions of not more than 500 c.c. of water. This provides a simple method for determining the specific gravity of ore charges, when using the tubes for experiments. In using the tubes the ore charge is introduced, preferably with a funnel, from the top. The feed regulator, *B*, is then inverted in the neck of the tube, and no further attention is required. It is well to bend the point of the discharge tube of the supply flask so that the liquid will not drop directly on top of the ore charge, but against the wall of the tube *A*.

After introducing the ore charge and solution as described, the time is noted. For this purpose an experiment card is provided for each apparatus, which it is best to hang conveniently at hand. This card should be provided with columns in which are entered all the amounts of liquid removed for tests, the total content of solution in chemicals, and the total content of the ore charge in gold and silver. I use 1 kg. of ore in most tests, and estimate the total milligrams of gold and silver contained. As soon as the solution is exhausted from the solution-reservoir, the speed of percolation can be noted. This can be taken as correct for similar depth of ore-beds, no matter what diameter the beds may have, and can be safely rendered as the speed of percolation for similar charges on a large scale. It is important to keep track of this detail during the time of the experiment. When the entire solution has passed through the ore charge, the amount recovered is measured (with allowance made for solution appropriated for tests), and the difference from the original amount charged to what is held by the ore. If wash water has been used, the amount held by the ore charge must be known, and its effect considered in increasing the quantity of solution, with its bearing on the cyanide strength in tests, also in precipitation for gold and silver extraction.

It is my custom to precipitate the gold and silver after the passage of each total quantity used, with a weighed amount of zinc dust, remove the precipitate by filtration, and reduce in the assay furnace, thus obtaining the actual metal leached, and introducing the effect of zinc found in solutions used in practice. These incomplete recoveries are compared to the original amount in the ore charge, their proportion to the remaining metal in the tube noted, and furnish an accurate comparison of the progress of the experiment. After a few tests a factor is found that will make them accurate enough to determine the progress of the work and indicate the point desired. The assays of the tailing remaining in the tube should be expected to check closely.


B
A
E
A
D
C
Detail Upper Part of Tube and Reservoir of Solution
Overflow Tube
Detail lower part of tube
Ring or Rubber Bands
Filter Cloth

LABORATORY CYANIDE APPARATUS.

Where it is desired, a portion of ore charge can be removed by a sampling device. I use for this purpose a glass tube, attached to a rubber tube sufficiently long to permit its entrance from the top of the percolation tube. This is allowed to rest on top of the ore charge. By suction it will enter into and draw up the pulp. This can be withdrawn, with its contents, by pressing the rubber tube to prevent the entrance of air. By slipping a heavy rubber band over the filter-cloth of the percolation tube, to form an air-tight connection, the end may be introduced into a suction flask and the rate of filtration accelerated by an air-pump.

The first asset a prospector should acquire before attempting to prospect a lode is some knowledge of the constitution of lodes, and particularly of the distribution of ore in a lode. If this knowledge has been obtained he will certainly prospect his particular vein by sinking a shaft and driving levels along it, thus preparing the way for systematic development. But the man who only knows the ways of certain detrital deposits will assuredly object to the expense of sinking and driving, and will perhaps argue that drilling holes from the surface through the lode will answer just as well. As hand-boring tools like auger and sand-pump would be unable to do the work in most cases, he uses the best instrument for the purpose, a diamond-drill; but as he objects to the expense of sinking and driving he will limit himself to a machine giving a small core, at most 2 in. diameter.

High-Duty Gravity Stamp-Mills

By Peter N. Nissen

*Although the gravity stamp-mill has been in use for generations, I venture to state that it is not as generally understood and consequently not as thoroughly appreciated as its merits warrant. Possibly this is due to the great simplicity and seeming crudeness of its construction and the tendency to regard anything simple as unimportant and unworthy of serious study. However, the most interesting facts are often concealed in the simplest forms, and it is safe to say that nothing is of too little importance to merit investigation. This is especially so with the gravity stamp-mill, for in spite of its simplicity and seeming crudeness it is susceptible of the most delicate adjustment, its efficiency depending in a great measure upon the skill [illegible] devoted to it. It is interesting at this stage to [illegible] as a result of reliable tests that the well designed gravity stamp has proved to be the best [illegible] for crushing within the prescribed limits, as will be shown in these notes.

It has been demonstrated in many fields that in the items of power, labor, wear and tear, the cost of running stamp-mills is lower than for any of the other known crushing machines. In addition the stamp-mill covers a wider field in its work than competitive machines, since the size of feed for stamp-mills ranges from over 3 in. to fine sand; therefore its [illegible] as a crushing machine is greater. Every practical man knows that it is almost impossible to maintain the product from ore-breakers at the required size for more than a short period. This fact adversely affects work by rolls and Chilean mills, the feed for which must remain within the size governed by the diameter of the rolls or edge runners if they are to perform efficient work. Tube-mills are limited in their feed to a size not exceeding ¼ in., while ball-mills, although not so limited in size of feed, cannot possibly compete with stamp-mills in view of the enormous wear and tear on balls and liners in crushing the ore of the Witwatersrand.

The history and development of this excellent machine has been ably recorded by many writers. It is therefore not my intention to attempt any further elucidation of the subject, so far as the development of the multiple stamp-mortar battery, having sets of five stamps, is concerned. It is generally agreed that in spite of the length of time this machine has been in use, and while many improvements have been made in an effort to get the best results, it still remains a very imperfect machine. Much thought has been given to the present design for the rectangular mortar for five stamps [illegible] conditions of service, and many types have been [illegible], all of which adhere to one general principle and differ only in detail. [illegible]

Since the function of the stamp is one of crushing the greatest quantity of ore [illegible] large pieces, in the centre of the die face, renders it impossible to expect really efficient work from the stamp. Of equal importance with a controlled feed is the positive discharge of the crushed ore when reduced to the desired size. The rectangular mortar, having a screen on one of its longer sides, does not suggest a logical method of dealing with the problem. By the order of drop necessary to force the ore from one die to another, waves of motion are set up from end to end of the mortar, and only that material adjacent to the screen can be discharged. Double-discharge mortars might have improved these conditions, were they not still more difficult to feed, owing to increased width and the necessity of having to introduce the ore higher in the box, besides other faults of design.

It is not within the limits of commercial possibility to make the multiple-stamp mortar of sufficient weight in itself to secure the necessary inertia for effective crushing. It is therefore important that it should be securely fastened to a foundation having great weight and solidity. In a mortar with the blows of the several stamps acting on different sections of the casting with great rapidity, the greater the length the more difficult it is to hold securely on the foundation. Regardless of the skill exercised in fitting the mortar to the foundation, a certain rocking tendency exists, due to its being struck at alternate ends by the falling stamps. It is difficult to keep the foundation bolts tight; in any case, they are liable to stretch and easily break, due to the strain. Certain internal stresses exist in the mortar casting, due to its design, and this eventually breaks by the repeated blows.

Coming to stamps weighing above 1250 lb. and up to 2000 lb. each, we find the same diameter shoes and dies are used in all cases, so that the mortar need be no longer. Attention has been drawn to this fact by several writers, and rightly so, for there must be a correct relation between the area of the crushing members and the weight of the stamp, on rock of a certain hardness and toughness, to get the highest efficiency from the blow. Given the same length of mortar, to increase the weight of the stamp, it becomes necessary to use longer heads and heavier tappets. It is apparent that this is not the most desirable way of obtaining the object in view, because it raises the centre of gravity and increases the distance between the face of the die and the lower guide. A more rational way of accomplishing this object would be to increase the diameter of the head. This, however, would demand a longer and heavier mortar to accommodate the larger stamps and thus exaggerate the rocking tendency, besides increasing the distance between the cam-shaft bearings, which is undesirable. It is well known that there are limitations to the diameter of cam-shafts, since the longer the shaft the greater the velocity of the cam at the point of engaging the tappet, due to the greater distance between centre of cam-shaft and centre of stem.

It has been proved that heavy stamps are better crushing machines than the lighter stamps, within certain limits; therefore, since the heavy stamp is desirable, and as ordinary five-stamp battery construction does not lend itself to use with the very heavy stamp, a new design had to be evolved. To render the use of the heavy stamp possible, different principles of design should be adopted, so as to [illegible] the desired greater crushing capacity with sound mechanical construction.

[illegible] New York, is the owner of the American rights.

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*[illegible] a communication to the [illegible] Chem. Met. & Min. Soc. S. A.

Goldfield Consolidated Report

The monthly report by J. F. Thorn, general superintendent, shows that during November the total production of the Goldfield Consolidated Mines Co. was 28,628 tons, containing $766,352, or an average of $26.77 per ton, the whole being milled with an average extraction of $25.28 per ton, or 94.4%. The total net profit was $510,468, or $17.83 per ton. During the month 3764 ft. of development work was performed. The total cost of mining, development, milling, office, and general expense was $7.49 per ton, distributed as follows:

Mining:		
Development	$1.09	
Stoping	2.47	
		$3.56
Transportation		0.10
Milling		2.01
Marketing		0.67
General expense		0.39
Bullion tax		0.26
Construction		0.50
Total cost of operation		$7.49
Miscellaneous earnings		0.04
Net cost per ton		$7.45

At the Clermont the 401-sill has been extended, and produced 36 tons of ore which averaged $58.08 per ton. The 413-sill was again extended, and produced 235 tons averaging $53.74 per ton. The 410-X, an intermediate between the third and fourth levels, and in the foot-wall of the 408-stope is being driven in $15 ore. The east end of 420-sill on the 750-level has been extended about 35 ft. and produced 183 tons, which averaged $19.43 per ton. The 555-drift in the hanging wall of 510-intermediate, between the 750 and 900-ft. levels, has produced 231 tons, which averaged $13.44 per ton. The 521-sill on the 900-ft. level was extended, and produced 183 tons, which averaged $28.11 per ton. The Grizzly Bear shaft has been sunk to a point 20 ft. below the 1300-ft. level, and a station cut, preparatory to driving the 1300-ft. level.

In the Mohawk the 3-E sill being cut out of the No. 20 and No. 21 cross-cuts near the Sheets Ish workings, was considerably extended, and produced 849 tons, of an average of $44.44 per ton. The 3-D sill, also near the Sheets Ish workings, which is being cut from No. 13 drift, was extended, and produced 424 tons, of an average of $99.63 per ton. The 354-sill produced 118 tons, of an average of $49.19 per ton. The 345-sill, just south of the 354-stope, on the 450-level, produced 212 tons, of an average of $14.26 per ton. The 495-intermediate, between the 450 and 600 levels, produced 388 tons, averaging $13.23 per ton. The 499-drift over the 413-Clermont stope produced 56 tons, of an average of $21.50 per ton. In the Red Top, No. 352, the cross-cut in hanging wall of 305-drift mentioned in the last report, produced 417 tons, of an average of $60.56 per ton. The Hazel shaft was sunk a distance of 90 ft. below the 718-level during the month. The raise from the first level of the Combination, 20 ft. northwest of the 136-stope, has disclosed $15 ore. The 402-stope, near the bottom level of the mine, has been deepened, and produced 802 tons, averaging $74.62 per ton.

Traversing Between Two Known Points

It is sometimes necessary to traverse between two known points which are plotted on a map, but which are too far apart to permit seeing from one to the other; such as two section corners or wires hung in two raises underground. In such a case it is necessary to assume a bearing for figuring latitudes and departures from one point to the other. Next it is usual to figure the course with the corrected bearing obtained from computing the bearing between the two points and comparing it with the known bearing. This second computation can be obviated by plotting the results of the first one on a small piece of tracing cloth and orienting the two known points over the same points on the map.

Much Ado About Nothing

London Correspondence.

A striking example of a political mare's nest is afforded by the case of the Anglo-Westfalian Kent Coal Syndicate. A group of parliamentarians, keen on keeping their names before the public as clever critics, have agitated against the granting of a mineral lease to the above-named company, and have raised the question in Parliament. "Is it right," they say, "to allow the confounded German to own coal land in Kent and to sink shafts and produce a high-class quality of steam coal in our own territory just under our very noses, on the English Channel and the Straits of Dover? Also, is it not a scandal that the landlord that granted the lease should be one of the Government Departments that happens to hold the land in trust for the Church of England?" and so *ad infinitum*. The facts, however, put a different complexion on the matter. The English company that has the business in hand decided to employ one of the German methods of sinking through watery strata by means of which the iron lining of the shaft is built up as the shaft is excavated; so some of the officials connected with the company are necessarily representatives of the German engineering firm. It is a wise policy to adopt some sort of protective sinking, for the overlying chalk has caused enormous difficulty to the other companies working in the Kent coalfield. For instance, at the Tilmanstone and Snowdown shafts, the sinking to the coal seams is continually being postponed by flooding, and the expensive pumping plants provided appear to be incapable of coping with the flows. Even if sound shafts are sunk, it is an open question whether the workings will not eventually be flooded from other irruptions. Therefore the anxiety will not be at an end when the Anglo-Westfalian shaft at Chislet, near Canterbury, is completed, and the policy of keeping the German experts in control afterward is a good one. But the German invasion does not warrant a public scare, or the mobilization of the British fleet.

Copper Mines in Turkey

The copper mines of Arghana are in a region which is rich in mineral deposits. They are situated to the northwest of the town of Diarbekir, on the upper reaches of the Euphrates. The ore was discovered so long ago as 1096, and, according to an authority, the cupriferous deposits extend over a surface of 12,000 metres square, and contain 30% copper, 30% sulphur, and 40% iron. It occurs in a huge lenticular mass enclosed in volcanic rock, which has thus far been worked to a depth of 30 metres, but there is evidence to show that the deposit is not exhausted. The vein has a mean thickness of 15 metres, and contains an average of 25 to 30% metal. Some of the veins contain as much as 50% pure metal.

Formerly the mines were the property of the community, but of recent years the Government has bought 40% of the deposits, which it works at an annual cost of $T15,000, and by means of a shaft 80 metres deep. This is all but complete. At one time the ore was smelted at Tokat, 380 kilometres distant; but the smelting works have fallen into disuse, and now, after being treated in the crude state on the spot, the metal is conveyed on camel-back to Alexandretta, 1400 tons being shipped annually. As is the case with so much of the mining industry in Turkey, the greatest difficulty to the economic production of ore is the lack of fuel, and in regard to the Arghana mines the charcoal used in smelting the ore has to be brought a distance of about 60 kilometres, owing to deforestation. So important is this mineral deposit that a German-American group proposed to the Government to make it a loan of £4,000,000 for the right of co-working the line.—*The Near East*.

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Enemies of Society

The Editor:

Sir—Believing that no good work should be allowed to pass without a word of encouragement or praise to the workman, it gives me great pleasure to congratulate you upon the publication in your issue of December 9 of the editorial entitled 'Enemies of Society.' You have gone to the very heart of the subject when you say that the danger to society lies in "* * * the obscuring of the bad unit in the larger aggregation of units." And surely the only remedy is to "cut out the rotten spots", whether they be found skulking in the aggregation of units composing the humblest social stratum, or whether they are exposed in the highest social or political atmosphere, as did Wharton Barker before the Senate Committee on Interstate Commerce, on November 28.

It is too early yet to view clearly the astounding McNamara case. I remember that an early investigation by Government experts resulted in the opinion that the explosion in the Times' building could not have been of dynamite, but that it probably was illuminating gas. If this is so, then a much deeper conspiracy than a dynamite plot lies behind the McNamara "confession." I am not surprised that Clarence Darrow should be found "discredited before the world." He was that before part of the world long ago, when he first took up his demagogic defense of organized labor. Great enemies of society may be brought to light before the final settling of the Otis-McNamara-Darrow dust.

DAVID R. SMITH, Jr.

Guaymas, December 13.

Pitch of Ore-Shoots

The Editor:

Sir—Since my communication of September 2, I have read W. H. Storms' communication on 'Pitch of Ore-Shoots' that appeared in your issue of that date. When groovings (also 'cross-fractures') do exist, and there is no stronger evidence to go on, I should expect the ore-shoot to angle across, rather than with, their dip. That the ore is likely to follow the general trend of the troughing, as Mr. Storms suggests, seems to me correct: space favors deposition. And, considering only the physical factors influencing ore-shoots, this assumption *might* also apply to those veins where the 'pay-ore' is in the narrower parts; the higher-grade ore following the trend of the larger portions of the vein, that is, along the edges of swells or between a series of these. The difficult point to determine, at least in a prospect, is the general trend of such possible troughing.

I submit that 'cross-fractures' and the wall-grooves of variable depth are useful indications of shoot-pitch. In the mineral deposits of the Southwest (including most of Mexico) the impression left with me is that the deposition of the present ore is about the last thing that has happened. (Many 'faults' when run to ground are found not to be post-mineral, but, on the other hand, the ore appears to have commenced forming from the locus of such 'faults'. This is illustrated in some of the mines in the Johnson district, Arizona.) And where there have been later movements these are apt to follow the same general directions as those that first formed the fissure, such movement being indicated by mineralogical and structural features of the filling and walls, and sometimes only indicated by cross-fracturing. This relation of cross-fractures, groovings, and shoot-pitch may be illustrated with a couple of scraps of corrugated roofing. These placed together might be taken to represent the vein at the moment of fracture. Then by slipping the sheets on one another it will be seen that any possible line of movement would angle across the trend of the troughs thus formed. Even if the two sheets be slipped along their corrugations, any change in the dip of the vein, or any warping, would cause similar trough-like spaces, as illustrated by turning the sheets at right angles to their first position, and giving them the same up-and-down movement. This change of vein-dip, and of width, should be noted in the plotting suggested in my letter in the issue of September 16, and in those cases where such changes occur a cross-section of the vein should be shown.

W. N. CUMMINGS.

Tucson, December 3.

Is 'Cheap' Labor Economical?

The Editor:

Sir—After reading the letters that have appeared under the above title, or caption, it seems to me that a definition of terms is wanted. What is meant by 'cheap' labor, and what is meant by 'dear' labor? So far, the question has been confined to the relative merits of African and Mexican, Chinese and Indian labor; but no attempt has been made to refer this so-called 'cheap' labor to any definite standard. However, from some of the statements made, I assume that 'dear' labor means white labor, and 'cheap' labor means native labor in countries outside the United States and, perhaps, the northern part of Europe. It is interesting, of course, to note the merits and demerits of the various races; but I fail to see how it touches the question at issue. I think what is really meant by the question (and therefore the whole gist of the matter) is this: Which is the more economical—high-priced skilled labor, or low-priced unskilled labor attempting to do the skilled laborer's work? In my opinion there is no room for question, and I have had over thirty years' experience of all kinds of labor—all, or nearly all, nationalities and races, I mean. My opinion then is: That there is no economy in cheap unskilled labor, no matter whether it is the labor of the manager or superintendent, or the labor of the foreman, the shift-boss, or the miner. Many promising prospects, many a mine in the making, has been ruined by unskilled 'cheap' labor in the 'office,' and many a mine has been forced to close down because of the effects of unskilled labor underground. I also think that the whole question is one of intelligence. The more intelligent the miner is, the more valuable he is. Mining is a trade as much as carpentering, blacksmithing, or any other form of skilled labor, and it is a trade that calls for as much skill and intelligence—if not more—as any other trade. Moreover, mining is a trade that no one man can learn thoroughly in all its phases. It takes many years to make a good all-around miner, and he should be paid well. I am quite confident that, in deep mining especially, a crew of good skilled miners can do more work, and what is more important, far better work, than twice their number of unskilled laborers, or only half efficient miners (?). 'Cheap' labor, no matter whether it is African or Mexican (peon), Chinese or Korean, American or European, is the very dearest form of labor when it is only hired because it is cheap, or because highly skilled labor is dear. It may be stated, as a general proposition, that when a mine will not pay for the skilled labor that is necessary to properly extract the ore, it is time to close it down. To sum up, it is the skill, the ability, to mine intelligently and efficiently, that commands the high price, so-called, for underground work, just as it is the skill and ability to manage mines intelligently and efficiently, that commands the high price, so-called, paid for the office work, the supervisional work.

CHARLES R. GENT.

Trimmer, California, December 18.

VERMONT made a production of 1935 lb. of blister copper in 1910. The most important deposits of the State are those near Ely. These deposits have been worked at intervals since 1821 and have made a considerable contribution to the copper output of the country.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

IN ORDER that a screw conveyor may deliver centrally to a bucket elevator, it should be equipped with both right and left hand flights placed on opposite sides of the elevator.

LEAKY VALVES may be repaired in the following simple manner. Remove the hood and sandpaper the brass valve disc bright where it sets on the seat, then go all around with a hot soldering-iron and place a coating of solder all around it; when it is put back it will be found perfectly liquid tight. This scheme is not effectual where high pressure steam is used, as it will not stand long in this case.

AN adjustable drop-light can be easily made. Cut a spring shade-roller to any convenient length for attaching, by the usual sockets at each end, to rafters or other supports over the spot where you wish an electric light to be suspended. Attach a cord to the roller and wind it so as to coil the spring when it is pulled down, just as a shade would do. Tie the other end of the cord to the insulated wire of your electric light. Of course, the latter can now be made to hang at any desired elevation.

THE difficulty of screwing flanges on pipe of large size is well known to those who have tried it, as these flanges are made so short that it is difficult to grip them in any way. An expedient which is amply satisfactory in many cases is to place bolts loosely in the bolt-holes in such a manner that a large stick of timber will be held between them, the stick acting as a lever by which the flange can be turned. The method will commend itself for its simplicity and the rapidity with which the work can be done.

TO REMOVE PAINT from an iron tank, take lime and mix with common lye into a thick paste by the addition of water, and apply over the surface of the metal with a mason's trowel to the thickness of about ⅛ in. After allowing the mixture to remain a short time, wash off with a hose, and most of the old paint will be entirely removed, the remainder being easily scraped off. If the tank has several coats of dried paint, two or three applications will be necessary before the entire surface is clean.

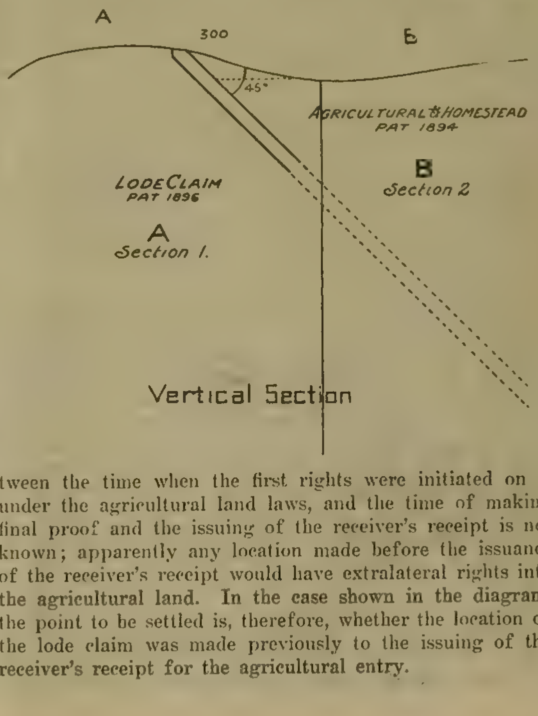
CORUBIN is a new artificial abrasive manufactured abroad, which has recently been put upon the market. The material is produced from the slag resulting from the reaction between aluminum and chromium oxides. It is practically pure alumina containing a trace of chromium oxide, which gives it a red color. On account of the high temperature at which it is manufactured it is free from combined moisture. It is produced in three grades—coarse, medium, and fine—and is sold only in the proportion of two parts coarse to one each of medium and fine.

REFINED grades of plaster are used in dental work, also as cement for plate glass during grinding, for making pottery molds, stereotype molds, and molds for rubber stamps, and as an ingredient in patent cements. A large quantity of gypsum is used in the raw state as a retarder in portland cement. Considerable quantities are ground without burning and used as land plaster or in fertilizers. Smaller quantities are used unburned in the manufacture of crayons, paper, imitation meerschaum and ivory, calcimines, water paints and tints, and dry colors, notably venetian reds. When used in excess in mixed paints, gypsum is regarded as an adulterant. The unburned and dead-burned forms of gypsum may be used to a certain extent with oil paints, because they are not very active chemically.

AN amended location notice, not a relocation, should always be placed upon the ground and recorded, when changing boundaries in any way. The difference between an amended location and a relocation should be fully understood. An amended location is made for the purpose of preserving all the desired rights and privileges obtained by the original location. A relocation is a new location of the ground of a former and abandoned or forfeited location. If the location is made by the owner of the former location, it is technically a waiver of all rights under the previous location. Still, the exact rights under a relocation by the original locator or owner are indeterminate, for both miners and courts hold that it has some relation back to the original location, the strength of the relation depending mainly upon whether any adverse claimant or intervening location has come between the two locations. By making a relocation instead of an amended location, the value of any previous work is lost for patent purposes.

PHOSPHATES containing 35% of P_2O_5 are produced in Sweden by a recently devised process. During the exploitation of the Gellivara mines, enormous quantities of ore too poor in apatite to be utilized were left. Now that the immense electric power-house supplied by the Porgus waterfalls has been constructed, it is proposed to work these heaps of débris. The poor ores are first sorted mechanically, and then treated by the process devised by W. Palmer, of the Stockholm University. The diphosphate of calcium can be obtained by subjecting the apatite to the action of hydrochloric acid produced by the electrolysis of common salt. The salt is regenerated, and can be again used. For 1 kw.-hp., 3 tons of the diphosphate of calcium can be produced annually from 11 tons of the residue containing apatite. It is estimated that Gellivara will be capable of supplying 11,000 tons of phosphate per year, for which 5000 to 6500 hp. will be necessary. There are also similar large waste heaps at Kirunawara, Svapparara, and Ekstroeberg, equally amenable to electric treatment.

AGRICULTURAL entries on public land are made subject to any accrued rights, and consequently the vein of a location older than the agricultural entry or patent, may be followed into the agricultural land. A location made subsequent to the issuance of the agricultural patent confers no right to follow its vein into the agricultural ground, but the status of a piece of agricultural land between the time when the first rights were initiated on it under the agricultural land laws, and the time of making final proof and the issuing of the receiver's receipt is not known; apparently any location made before the issuance of the receiver's receipt would have extralateral rights into the agricultural land. In the case shown in the diagram, the point to be settled is, therefore, whether the location of the lode claim was made previously to the issuing of the receiver's receipt for the agricultural entry.



Special Correspondence

KALGOORLIE, WESTERN AUSTRALIA

October Gold Production $2,493,000.—Lake View Consols and Oroya Exploration Merger.—New North Boulder to Erect Mill.—Water Shortage Serious.

The October gold yield from all mines in this State was valued at $2,493,000. The principal mines returned as under during the period:

Name.	Tonnage.	Yield.	Profit.
Associated	10,379	$75,400	$5,700
Associated Northern	1,296	15,400	.....
Burbanks Main Lode	1,762	23,000	.....
Golden Horse-Shoe	26,890	161,900	6,900
Golden Ridge	2,760	27,500	8,700
Great Boulder Perseverance	21,243	116,000	6,700
Great Boulder Proprietary	17,482	238,500	128,500
Great Fingall	6,089	68,500	18,500
Hainault	5,200	38,500	1,500
Ivanhoe	20,871	205,000	90,200
Kalgurli	10,940	110,400	45,300
Lake View Consols	8,145*	8,940	1,200
Lake View & Star	17,883	105,000	16,900
Oroya Black Range	4,710	47,100	16,600
Oroya Links	10,050	59,200	9,900
Sons of Gwalia	14,035	135,000	49,200
Sons of Gwalia South	2,273	14,500	4,100
South Kalgurli	9,590	60,100	10,500

*Old residue.

The amalgamation of the Lake View Consols and Oroya Exploration is announced, each company having equal share in a company of 900,000 shares of $2.40 each, 180,000 being held in reserve. These are rather holding companies than actually running mines, and they have interests all over Australia, and in Nicaragua and Burma. Both had large dumps of residue to treat by vacuum plants; but the latter has finished its lot and handed the plant over to the Oroya Links. The Hannans Star, here, had a vacuum plant at work on its old dumps, but it has been shut down, as the gold content was too low. Out of five vacuum plants about Kalgoorlie, with a monthly capacity of some 50,000 tons, only 10,000 tons are of fresh mill-slime, this being at the Oroya Links, the rest being on old dumps. There also are the Ridgway machines on the Great Boulder, which can deal with 20,000 tons. There is nothing like accuracy in all departments of mining, but for a company to return 834.24 tons milled for 401.81041 oz. worth £1706.77917, giving an average of £2.0506 per ton, seems a trifle over the margin.

The New North Boulder company, situated on the east side of the Associated, has decided to erect a mill to treat its oxide. The plant will consist, for a start, of a Campbell gas-engine and a 5-ft. Huntington mill. The sulphide ore, typical of our eastern belt, will be opened up in the meantime. This company crushes periodically and has just returned 400 tons of sulphide ore for $12,000; and 1000 lb. of specimens for $3700.

Mentioning specimens reminds me of a recent crushing from Mulgabbie, a few miles from Kanouna, where 5600 lb. of ore yielded $16,000. One by one the outside districts are running short of water, and appealing to the Government for help. This has been an unusually dry year, and no rain may be expected until next March or later. The Marvel Lock district, south of Southern Cross, is to be connected with the Water Scheme main by a 5-in. pipe, costing $55,000. The Ora Banda district also wants a supply, while the Mines Department is improving the supply between Yuanmi and Paynesville, the latter being the new district developed in the Murchison field. There are, among others at Paynesville, the Aster, Bovania, Carnation, Sweet William, and Thistle prospects being opened up with rather promising results. The third named is the original Payne's Find, and contains three lines of lode formation, 70 to 300 ft. apart. Assays over 18 to 30-in. width at various depths to 30 ft. show $12 to $25 per ton. Trenches aand shallow shafts have been sunk on the others named, with such favorable showings that they are under option to an Adelaide concern, which had interests at Tanami, in the extreme north of this State, and also at Bullfinch.

The Miners' Phthisis Commission has finished taking evidence and will consider its report for Parliament. An Italian contractor at the Great Fingall mine, in the Murchison district, stated that of 250 men working for him, 100 had died, and the inference was by fibrosis. Later witnesses included insurance company managers, secretaries of friendly societies, and the like. They gave their views on compulsory insurance of miners and the like. Many believe if the State took on this business, it would be guesswork as to which workers suffered from pulmonary complaints. The past financial year of the municipality of Kalgoorlie showed its revenue to be $137,500 from 8700 people, including profits from lighting, markets, and other sources. The bank overdraft is $31,200. The electric light receipts were $100,000, of which $21,500 was profit.

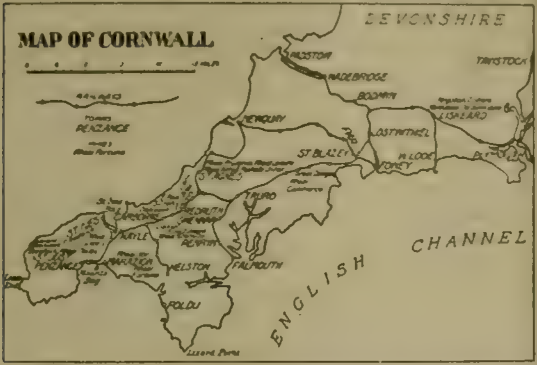
LONDON

Warm Contest for Control of East Rand Proprietary Expected.—Anglo-French Exploration Co. Objects to Amalgamation with Farrar Interests. — Cornwall Notes.

The case of the East Rand Proprietary mines continues to absorb the attention of English investors. I have kept your readers pretty well posted in the developments, so I need not recapitulate here. The exposure of the failure to make good the promises of output and profit has led not only to the resignation of the manager, Sydney Penlerick, but to a notification of the intended resignation on the part of Sir George Farrar and the rest of his supporters on the board. The two nominees of the Wernher-Beit-Eckstein group (or the Central Mining & Investment Corporation, as it should now be called) also have intimated that they will resign in order to prepare the decks for a battle royal. The resignations will be tendered at the annual general meeting to be held at Johannesburg at the end of February. The two sides, Farrar and Central Mining, are now actively conducting their canvass among English and Continental shareholders, and naturally the decision will be settled by proxies and not by personal attendance at the meeting at Johannesburg. The Central group members are recommending E. A. Wallers and F. Raleigh, two of their best financial men, as directors, and H. Ross Skinner as manager and also as managing director. The general opinion here is that the Farrar group will have to retire into the background, for though it is easy to accept their assurance that they did everything for the best according to their lights, yet it is obvious that they made a bungle of it. On the other hand, there is opposition shown in some quarters to the absorption of the company into the Central control, for it looks too much like the thin end of the wedge of monopoly. Personally, I do not see that this argument is effective in this case, for the Central group can point to great successes in administration and technical organizations, and on this 'platform' at the present juncture they are bound to win. There probably will be no further news with regard to the East Rand Proprietary until the meeting two months and a half hence.

In the meantime the Farrars are being worried by opposition in a different quarter, and there seems to be a likelihood of a split between them and the Anglo-French Exploration group. The trouble has arisen through a proposition made to amalgamate the Rezende and Penhalonga companies, operating in the Umtali district of Rhodesia. Neither company has been a marked success, but the Penhalonga has been in the control of the Anglo-French-Farrar group for thirteen years, while the management of the Rezende was transferred to them only a year or two ago. Since then the two companies have been directed and managed by the same boards and the same staff at the mines. Seeing that they own two parallel sets of deposits not far from each other, an amalgamation seemed reasonable, especially in view of the fact that the engineer, C. R. Pinder, and a firm of first-class accountants had agreed upon terms which were fair to the shareholders in the respective companies and suitable to the management. However, the directors representing the Anglo-French group dissented and resigned. It is difficult to fathom the motives for this quarrel, either the Farrar management is at fault in this case, as in the East Rand Proprietary, or the Anglo-French people have taken advantage of the temporary discredit of the Farrar management to make an attempt to capture the control.

The news from Cornwall this week contains the usual mixture of encouraging and depressing items. The most pleasing features are the estimated increased profits, both at Dolcoath and South Crofty for the year just ending, and the publication of the first results at the dredging work on the tin gravel of Goss Moor. These gravels are being worked by F. M. Lush, on behalf of a company of which J. H. Collins and C. G. Lush are directors. The system is one adopted in Australia, where the gravel banks are loosened by hydraulicking and the gold recovered on a floating barge. The first campaign has given a cost of 1s. per cu. yd.; but in view of the usual difficulties in connection with a new plant and in teaching the workmen, it may be taken that this figure will be substantially reduced before long. The average recoverable content is $1\frac{1}{2}$ lb. black tin per cu. yd., which with concentrate selling at £110, the present current price, would make the value of the recovery worth 1s. 6d. per cu. yd. As a matter of fact, the concentrate is of a higher grade than even the best products of the lode mines, for the percentage of the metal varies, never less than 73%, while the absence of other minerals is also in its favor. I am quite hopeful that the first six months' run will yield a substantial profit. Another interesting venture is that of the Cornish Tailings Co., which is re-working the old dumps at Carn Brea & Tincroft. The material is reground in tube-mills and treated on tables and buddles. Though the extraction is still very incomplete, the recovery is sufficient to yield a net profit of £1000 per month, not at all a bad performance in Cornwall.



The depressing news from Cornwall comes from St. Ives and Dowgas. In these columns three months ago, I mentioned that the St. Ives Consolidated would be requiring still more capital, following the usual course of the Schiff-Dietzsch group. Old properties and dumps are bought up right and left, and magnificent machinery erected for the treatment of the expected ore. Now a further installation of stamps and tube-mills are to be erected, and £120,000 of debentures are to be offered for subscription. The rich ore about which so much was heard has apparently vanished; for, instead, large blocks of low-grade ore are now the strong point. But 23-lb. ore will not pay under anything but the most skilled and economical management, and this is not to be found at St. Ives Consolidated. The Falmouth Consolidated, belonging to the same group, does not fulfil the wonderful promises of a year and two years ago, when sufficient ore to feed 1000 stamps was airily discussed. Though the plant has been running for more than a year, the product is a paltry few tons per month. As regards the Dowgas, the news is that the surface plant is to be sold by order of the receiver in bankruptcy, for the benefit of the debenture holders. Quite $100,000 was spent on surface equipment and the plant had a capacity of 100 tons per day. But, unfortunately, underground work was neglected, and no more money could be obtained to continue it. I believe there is plenty of tin there, and a competent mining man would make a good bargain by bidding for the plant and re-starting the property.

NEW YORK

Copper Merger Impossible. Favorable December Producers' Report Expected. Production Notes. Live Oak and Inspiration Consolidation.—Scramble for Butte Coalition. Other Developments.

The copper situation has continued to furnish the chief topic of discussion in mining circles during the week. The outstanding feature in the metal market is the apparent attempt to make the most of every bull argument, all of which is accompanied by an evident feeling of uneasiness and a decided lack of confidence in the stability of the market. Interviews with some large brass manufacturers confirm the statement that stock piles are very low and that many of them are anxious about supplies during the next few months. Copper-selling agencies have adopted a somewhat high and mighty tone, with some sales made at $14\frac{1}{8}$; this is a part of a campaign waged to stampede the reluctant domestic consumers and induce them to stock up with normal supplies. While combinations in restraint of trade are being counted as outlaws and several are on trial for corporate existence, it is out of the question for any organization to acquire control of the copper metal market. A copper merger is an impossibility at present, and in the present state of the public mind would hardly meet with anything but a hostile greeting; nevertheless, it is to be deplored that foreign interests should reap the major part of the benefits arising from cheap copper. The German manufacturer has found many uses for copper bought at 12c., that are and will be impossible to our home consumer with copper bought at 14c. and upward. A feature that confronts the copper producer is that cheap copper makes for many uses of the metal and a record consumption, while every half cent added to the price makes tremendous gross profits on the country's total output but at the same time works proportionately for a decrease in consumption. A very favorable report is looked for covering December output and consumption, and, unless something untoward develops, the copper market may be expected to be in full swing by the middle of January.

There are many indications of increased activity that are due to the prospect of higher metal prices. Anaconda, for one, is expected to increase production some 6,000,000 lb. per month. There are numerous smaller properties that are in the same position as is Anaconda. They have had a breathing spell in which to work out cheaper cost-sheets and to complete new development work, and they now are prepared to show, not such large increase, to be sure, as is mentioned for Anaconda, but in proportion, and in the aggregate to make a very important increase in the red metal output. While specific details are not available, there is some talk of a corner in copper engineered by a London syndicate, and if there is any foundation for the rumor, it may only tend to increase the stubbornness of the domestic user of copper, who is firm in his belief that no organization can absolutely control the copper market. Just one report by the Producers' Association showing that refinery output is once more running beyond the combined demand of consumers at home and abroad, and all the life with which the present situation is charged will disappear. The critical period of the market will be the first quarter of the coming year. What is being done now is simply by way of an attempt to discount the future.

The merger, which was to include the Miami, the Live Oak, and the Inspiration, and which was alternately reported as consummated and then said to have been declared impossible, finally resulted in the consolidation of the Live Oak and the Inspiration. The first step has been taken by the incorporation in Maine of the Inspiration Consolidated Copper Co., with an authorized capital of $30.000,000, in 1,500,000 shares, par value $20. It is not expected that all of this stock issue so authorized will be taken up in making the necessary exchanges for the present outstanding stock of the two companies; there will be a substantial treasury reserve held for future needs of the new company. The terms which are to be offered to the present stockholders have not as yet been announced. The immediate erection of a large reduction plant is planned.

The leading issue in the copper share list traded in New York during the week has been Butte Coalition. The announcement of the early dissolution of the company, involving, as it does, the distribution of a half million shares of Anaconda, 3000 shares of International Smelting & Refining, and an additional block of Anaconda, representing the interest which the Butte Coalition had in the Alice Gold & Silver, amounting to some 20,000 shares of Anaconda, has created something of a scramble in the stock market. The International stock, which cost the Butte Coalition some $100 per share, has been sold to the Amalgamated around the present market price of $130; there is in the Coalition treasury some $3,500,000 cash; with the sale of the smelting stock, there will be something over $4,000,000 to be paid as a final dividend. The present market price of Anaconda is about $38, which would give the Butte Coalition holding a value of $19,000,000; with the $4,000,000 cash added, making a total of $23,000,000, equivalent to $23 per share upon the 1,000,000 shares of Butte Coalition. The market has established a parity in the two issues and, on the strength of the market activity created, is bidding full price for Butte Coalition on the basis outlined. The distribution of the Parrot's assets is also announced, though in the latter case dissolution will not immediately follow, as there is some litigation pending which prevents the giving up of the company's charter at present. The market feature of the situation is the large addition to the amount of Anaconda stock in the hands of the public and available for trading purposes. It is rather anticipated that there will be something doing in Anaconda, hence the scramble for Butte Coalition shares in order to get the exchange privileges.

The International S. & R. Co. is to build a lead refinery which, it is expected, will be situated in or near Chicago. The question of situation is dependent principally on freight rates.

A protective committee has been formed to receive deposits of the bonds of the La France Copper Co., a subsidiary of the United Copper Co. The La France company has defaulted in its interests since January 1908; the interest payments were guaranteed by the United Copper Co., which likewise has failed to pay, though it has given notes in lieu of payment; the notes, however, were not paid when due, and the present step is the first in some form of reorganization, to be worked out later. The La France company owns the Lexington mine, in Walkerville, at Butte, and the concentrating plant at Basin. The defaulted bond issue is for $2,000,000.

The Ahmeek, which was the principal contestant against the proposed Calumet & Hecla merger, is justifying the claims made for it in resisting the planned consolidation. The property is now turning out the cheapest copper which comes from the Lake country and producing at the rate of about 15,000,000 lb. per year. Present plans include development underground and enlargement of equipment sufficient to bring production up to 25,000,000 lb. per year within a year or fourteen months. The dividend rate of $2 per share quarterly has been increased to $3 per share quarterly.

Estimates are being made of the probable output of the Cobalt district for 1911. It is generally conceded that Cobalt is carrying the peak of its load, and that this year will be a record-breaker for the future as well as for the past eight years of its life as a mining camp. When the final clean-up is made for the year, Cobalt production will probably reach 32,000,000 oz. of silver as against nearly 30,000,000 oz. for 1910. Cobalt is producing nearly 14% of the world's output of silver, and as a poor man's country stands alone among the mining districts of the world. No other field has ever produced so much in net profit. Cobalt dividends now total nearly $30,000,000.

The fact that some of the large producers are apparently nearing the end of their productive careers, on anything like the present scale of magnitude, is responsible for the decline in market interest which is now almost negligible.

BUTTE, MONTANA

Rosy Future in Zinc Production Predicted for Butte Process.—Basin Reduction Works' Future Arouses Conjecture.—General Notes.

Many mining men believe that the Butte district is destined in the not far distant future to become important in zinc as well as copper production. Experts who have visited this city and made an investigation of the Butte & Superior mine and discovered that over 1,000,000 tons of ore was developed, and who then inspected the zinc property of W. A. Clark, have had no hesitation in declaring that the zinc industry would make Butte as famous as had its copper. During the month drawing to a close, with a shipment of about 500 tons per day, the Butte & Superior company estimates that it will net $47,000, and the claim is put forward that with similar shipments greater profits will be made when the company is operating its own concentrator, now under construction. The Butte & Superior is having an experimental plant erected for the purpose of giving the Peterson electric process a practical test. Should the process turn out to be what is claimed for it, the mines of the Butte district will be in a position to make a higher profit than at present. Mr. Peterson says that at present the cost of treatment to Butte operators is about $40 per ton, which he says is far out of proportion when it is considered that copper ores can be smelted at a much lower cost.

The assignment of the claim of the State Savings bank of this city to its interest in the Basin Reduction Works to George E. Shaw and F. E. Potts of New York, as trustees, has been filed for record with the clerk of the court, still leaves the curious in as much doubt as ever as to who put up the $158,920 to redeem the property. Nearly four years ago the Basin Reduction company, through W. A. Kidney as president and Henry Brunssen, treasurer, secured $145,000 from the bank and gave in return a promissory note. At that time F. Augustus Heinze was the prime head of the Butte Reduction Co. and was also one of the chief directors of the State Savings bank. No part of the note was ever paid, and nearly one year ago, H. Mason Rabourg, of New York, who was vice-president of the Davis-Daly company and supposed to be closely connected with Heinze, came to this city and took charge of the bank. He endeavored to collect on the note, but failed in the attempt, and then started proceedings which resulted in the property being sold at sheriff's sale on January 14 of this year. The bank bid the property in for the amount of the note with interest, and a few weeks ago it was announced that the property had been redeemed. It is believed that Shaw and Potts, who are named as trustees in the assignment, are acting for the bank, and that an arrangement has been made whereby W. A. Clark will take over the property. Mr. Clark's zinc property has been closed down for over three months, as there is not a mill in operation which is available for handling zinc ore. He had the Butte Reduction Works' concentrator fitted up with the latest machinery, and its destruction by fire was a heavy loss. If it should turn out, as is generally supposed, that Mr. Clark is going to take over the Basin works, he cannot get possesssion until July 1, as the Butte & Superior company has a lease on the concentrator which does not expire until the last day of June. There is an impression in some circles that the negotiations for a merger of interests between Mr. Clark and the Butte & Superior company are still pending.

It now looks as if the case of the Anaconda Copper M.

Co. against the Butte-Ballaklava company on a charge of extracting ore from ground alleged to belong to the former company will be called for hearing at the February term of court, but whether it will be tried here or in some other part of the State is in doubt. The ground has been laid out and excavation work is now going on for the construction of the Butte Central concentrator, upon which the real work of erection will start early in the coming year.

GOLDFIELD, NEVADA

Rumor Goldfield Con. Report Will Show Ore Reserves Opened Equal to Production of Year. Florence Goldfield Plans. General Notes.

Much interest attaches, here as elsewhere, to the forthcoming annual report of the Goldfield Con. M. Co., which will be submitted to the board of directors at the meeting in January. Although no definite intimation has been given of the contents of the report, it is said that it will contain a new estimate of the tonnage and value of the company's ore reserves; a feature of the mines that has been discussed pro and con for some time past, but upon which there has been no reliable information accorded the public. It is also stated, but not upon official authority, that the report will show ore reserves opened during the past year's operations equal to the yield in that period. This represents a sum of about $10,750,000 gross. Some ore of excellent grade has been coming from the old Jumbo workings, which have been cleaned out, and of which the shaft has been prepared for further sinking. The company's plant for the treatment of concentrate-residue, with a capacity of 75 tons per day, is nearing completion. Estimates have placed its cost at about $70,000 and it is expected to effect a saving of $80,000 per year.

Development has been resumed on the Florence Goldfield, and probably will be carried on along the lines planned before the destruction of the 40-stamp mill on December 2. The head-frame, equipped with automatic skips that were described recently in the *Mining and Scientific Press*, was built against the main mill structure, dumping the ore directly into the stamp-bins. This, together with the main mill structure and the store-house, was totally destroyed by the fire. The mill proper, according to officials of the company, cost $432,000. The hoist and compressor were not damaged, but it was necessary to cut both hoisting cables during the fire. A. D. Parker and Thomas G. Lockhart, respectively president and vice-president of the Florence company, are now in Goldfield and are engaged in going over the wreck and appraising the loss, in company with adjusters representing the Underwriters' Association of San Francisco, in which city the insurance was placed by Mr. Parker. They have not yet announced the amount of insurance carried, nor have they been able to determine whether any of the machinery has escaped total destruction. A formal meeting of the directors will be held shortly, when the future policy of the company will be decided upon and made public. Mr. Lockhart has been at Rhyolite, where he examined the 30-stamp mill of the Homestake-King M. Co., which was recently sold at auction to satisfy a judgment, and he was met there by representatives of the Homestake-King company. This has led to a report, which has not been officially confirmed, that the Florence company is negotiating for the purchase of this mill, which is said to be a modern well equipped plant in excellent condition. Two days after the fire a young electrician, F. L. Eubank, who had been in the company's employ for over two years, while climbing the perpendicular ladder in the main shaft, fell 40 ft. to the bulkhead at the eighth or 530-ft. level, and died several days later. Only five sets of timbers in the shaft were burned and these have been replaced, the old head-frame from the Hall Florence lease shaft has been installed over the main shaft, and the hoist, pumps, and compressor are again in operation, having taken out about 60 ft. of water that ran into the shaft during the fire. The shaft is now down 930 ft. and will be continued to a depth of 1060 ft. to provide a sump below the 1000-ft. level, where the main lateral work will be carried on. It is said that some rich ore has been exposed in old workings nearly under the site of the mill.

Work is now in progress that has for its object the further exploration of the Combination Fraction. This work is being done by the Consolidated company, being paid for by the Fraction company, and consists of driving to the south from the old Mohawk workings on the 450-ft. level to open up the northern part of the Fraction at that depth. Two years ago the Combination management drove a cross-cut on its 600-ft. level to the west and across the Combination claim of the Consolidated, in quest of the southern continuation of the main Combination vein, but no pay ore was found on this level. The belief is now expressed that the vein, in which the Hampton stope was opened farther to the northwest, has been thrown to the east by fault displacement and into the Combination Fraction territory.

On the C. O. D. Consolidated property the company is driving on the 600-ft. level, and lessees have exposed seams of exceedingly rich ore at two points, on the Gold Bar and Victor claims and near the 200 and 350-ft. levels. The rich seam varies from four to eight inches in width, and has yielded some sensational assays. Grab samples taken from several sacks of the rich ore, prepared for shipment from the Gold Bar workings, assayed a little under $3000 per ton, and a shipment will be made shortly that is expected to mill $600 per ton. Two other leases are working on the 600-ft. level from the Sills shaft and two on the C. O. D. claim, near the boundary of the Atlanta, making six leases in operation on this property.

SALT LAKE CITY, UTAH

High Metal Prices Boom Copper Production.—Utah Consolidated Increases Shipments.—Yampa Closes Down.—Other Districts Active.

The strength of the metal markets is having an immediate effect on the production of Utah mines, which are increasing their tonnage, especially in copper. At the Utah Copper the work of remodeling the Arthur plant is being pushed, and two more sections will soon be ready for operation, making a total of eight out of thirteen to be working on ore. The six sections which have been finished treat 5400 tons per day, so the eight sections will increase the capacity to 6000 tons. When the entire plant is remodeled, it will be able to treat upward of 9000 tons of ore per day. Any great increase in the output of the mine will require the purchase of additional equipment for the Bingham & Garfield railroad, which is now working to the limit of its present equipment. It is expected this provision will be made.

In contrast to the general increase in tonnage, the Yampa has closed down, pending different smelter arrangements. The Yampa has always played close to the ragged edge on profits, and about a year ago it closed down its smelter and began shipping to the A. S. & R. Co. plant at Garfield. The new manager, Mr. Moodie, was reported to be making money through economical mining and showing a margin of profit. Mr. Moodie left recently for British Columbia to take charge of a mine there for the same interests, and now the Yampa has been closed down. It is given out that the reason for the shut-down is that the smelter limited the Yampa to 300 tons per day, and that a larger tonnage was necessary to make a profit.

In Beaver county, the South Utah Mines & Smelters (formerly Newhouse) is steadily climbing the ladder. During November it shipped to the concentrator the largest amount in its history, 25,205 tons of ore, which yielded 2255 tons of concentrate averaging 8.28% copper, an extraction of 61%. The November production was 361,681 lb. of copper, 2742 oz. of silver, and 140 oz. of gold, compared with 299,807 lb. of copper, 1903 oz. silver, and 114 oz. of gold for November 1910. For October and November the production was 688,259 lb. of copper, 5461 oz. of silver, and 274 oz. of gold, as compared with 492,449 lb. of copper, 3300 oz. of silver, and 219 oz. of gold for the corresponding months of last year.

General Mining News

ALASKA

Prince William Sound

M. M. Reese, president and general manager for the Mayfield M. Co., is planning to construct a 5-stamp mill on the property, and to have the plant ready for operation in July.

ARIZONA

Gila County

The Inspiration Con. Copper Co., capitalized at $30,000,000 in 1,500,000 shares, has been incorporated at Augusta, Maine. The new company represents the consolidation of the Inspiration M. Co. and the Live Oak Copper M. & S. Co., and has combined reserves of 45,000,000 tons of 2% ore. The first plans included the Miami Copper Co., but after consideration of the ore reserve and other matters pertaining to the merger, the price of the Miami property was considered prohibitive and the company was not included. The principal figures in the consolidation were W. B. Thompson, president of the Inspiration company, and John D. Ryan, who recently purchased the control of the Live Oak.

Graham County

The report of the Shannon Copper Co. for the year ended August 31 shows a production of 263,975 tons of ore, against 311,456 tons the preceding year. During the period covered by the report 7645 ft. of development work was done, against 7373 ft. in 1909-1910. The new development opened up bodies of smelting and concentrating ore in the lower levels, but the extent of the reserves cannot be accurately estimated, states the report of the general manager, owing to the heavy nature of the ground. The yield per ton was 56.9 lb. of copper, against 53.56 lb. the preceding year. The company has been experimenting with its low-grade ore, of which it has between 1,000,000 and 1,500,000 tons, and which assays 2 to 2½% copper. It is believed the ore can be treated at a profit.

The cost of the copper was a trifle under 10c. per lb. at Clifton, and 11.57c. per lb. at New York. The income account of the Shannon-Arizona railroad shows receipts amounting to $96,081. The expenses amounted to $50,225, the operating profit being $45,856. The interest on bonds amounted to $36,000, leaving a balance of $9856 for the year, as compared with $4718 for the preceding year.

Mohave County

(Special Correspondence.)—The Grand Gulch M. Co., operating a copper mine in the northern part of this county, mined 625 tons of copper ore during the year, 325 tons of which was marketed. This is a carbonate ore, and that which was shipped sampled 31% copper. The ore was hauled 70 miles to the railroad at Moapa, Nevada. A branch of the San Pedro railroad is being built from Moapa to St. Thomas, a distance of 25 miles, and this branch is expected to have train service by next March. In anticipation of this the Grand Gulch M. Co. is hauling ore to St. Thomas to be shipped from there later. About 200 tons of ore of above named grade is now stacked there. The mine has been developed and is being operated through a 550-ft. shaft. W. P. Jennings, the company's manager, states that development and production are to be on a larger scale after the railroad is finished to St. Thomas, as this will reduce the distance of wagon haulage to 45 miles.

Salt Lake City, December 24.

Pinal County

The clean-up at the Ray Con. Copper Co.'s mill for November shows a yield of 68½% on ore assaying 1.75% copper, stated D. C. Jackling, general manager for the company, recently. The production, 2,650,000 lb. of copper, based on smelting at Hayden, would have cost 9c. per lb. No. 2 hoist and plant will be started in the near future. The fifth section of the mill is running smoothly.

CALIFORNIA

Calaveras County

The California Supreme Court last Wednesday handed down a decision awarding the Lightner M. Co. $27,000 damages against the Utica M. Co. for the theft of ore below the Lightner workings. The first suit was filed in 1902, and the jury in the Superior Court awarded the plaintiff company $54,000, which the higher tribunal found excessive, as it represented the gross value of the gold in the ore. The verdict of this week subtracts the cost of production. The Lightner mine was sold by Alice L. Eastland to the Lightner M. Co. in 1906 for $100,000. Trespass by the Utica was discovered in 1899, and after an investigation as to the amount of ore taken by the Utica miners, suit was brought in 1902. C. D. Lane of the Utica company and associates fought the suit bitterly. The ore taken amounted to about 12,000 tons. The Supreme Court overruled several exceptions to the lower court's findings, stating that as the Utica had "employed fraudulent means to conceal the extraction of the Lightner ore" the suit was not nullified through the statute of limitations, and that the evidence in the case was sufficient to dispose of the plea that no specific date when the ore was taken was named.

Fresno County

The production of the Coalinga oilfields for November amounted to 1,508,589 bbl. of oil, according to recent estimates. This was less than the October production by 46,985 bbl., but the average daily production was greater than that of October. The decrease in the month's production was due to the 30-day month.

Inyo County

A meeting of miners and prospectors has been called for January 24 at Bishop to organize the 'Prospectors Alliance of America'. The organization will protest against a proposed ruling to require all prospectors for minerals to take out a Government license.

The Skidoo Mines Co. in November treated 1192 tons of the company's ore and 144 tons of lessees' ore, although seven days' time was lost through the breaking of a camshaft. The bullion produced was valued at $9545, while the total receipts amounted to $15,909. Development expense was $938, and operation cost $7600, leaving a net profit for the month of $7372.

Kern County

A report from Randsburg states that the Four Ace M. Co. is shipping 15 tons of ore per day from the Santa Ana mine. The ore assays, on the average, $20 per ton, according to the report. Frank Wilson, of Butte, Montana, is having assessment work done on his claims near Randsburg.

Plumas County

The New York mine, near Greeneville, will be extensively developed in the near future. The property, which is a quartz mine, has been bonded to E. O. Lindblom, of San Francisco.

Press rumors affirm that a mill will be built in the Onion Valley district, at the Comstock group of claims. A report from Quincy quotes H. Kling, superintendent of the property, as saying that the company has developed a large body of ore assaying $5 to $20 per ton.

Sierra County

Press reports state that coarse gold has been found in gravel in a raise in the Haskell Peak mine. The adit is being driven to bedrock.

The Tightner Mines Co. has been incorporated to operate the well known Tightner mine at Alleghany. Abe Hall, of Grass Valley, will be in charge of the property, L. N. Wagner will be assistant superintendent at the mine, and C. C. Derby, of Nevada City, is to be consulting engineer for the company. The capitalization is $100,000, divided into 100 shares of $1000 par value. Among the incorporators are A. D. Foote, of the North Star Mines in Grass Valley; A. B. Foote, assistant manager of that property; C. E. Clinch, of Grass Valley; Edward C. Uren, George Scarfe, E. J. Rector, and C. C. Derby, of Nevada City;

J. M. O'Brien, of San Francisco, Abe Hall, Robert Bedford, and Carl P. Jones, of Grass Valley, and W. H. Martin, of Nevada City.

COLORADO

Clear Creek County

(Special Correspondence.)—The production from the upper Clear Creek district for 1911, according to figures at hand, amounts to $51,890. Moscript & Co., leasing at the Capital mine, are stoping on a 6-in. streak of yellow copper that mills $55 per ton in gold and silver. The shoot is showing for 100 ft. Work has been resumed on the Allen property on Griffith mountain. H. Mueller is owner. John Bowen, Sr., has taken a lease on a block of ground on the Gambetta mine. Stoping is under way on an 8-in. streak of 52% zinc ore. The new plant of machinery at the Bellevue Hudson mine on Columbia mountain is in position. G. W. Boyce is manager of the property. A streak of ore 4 in. wide has been found at the 360 ft. level of the American Sisters mine. The ore assays as high as 3000 oz. silver and 2.40 oz. gold per ton. J. J. White is manager. Work is in progress on the Buffalo property on Alpine mountain. The lower adit is in 550 ft. William Hunt is owner. Clair & Co., leasing on the fourth level of the Smuggler mine, are stoping on a 6-in. vein of galena ore that mills 378 oz. silver and 36% lead per ton. The Homestake adit on Lincoln mountain has been driven 600 ft. A new vein is being penetrated. A. L. Stephens is manager for the company.

Georgetown, December 23.

ELKTON MINE, CRIPPLE CREEK.

Teller County (Cripple Creek)

In a report for the first half of December it was stated that the flow from the Roosevelt drainage adit was 8750 gal. of water per minute. During the period the main bore was driven 127 feet.

The Modoc G. M. Co., owning the Modoc mine on Battle mountain, paid a dividend of 1c. per share December 20. The property was the scene of one of the richest discoveries of sylvanite ore made in Cripple Creek district during the past year.

H. P. Reiton, of Cripple Creek, has taken a lease on the Amanda and on the north half of the Bogart properties. The Home claim, Ironclad hill, has been leased to Oscar Fogleman.

The Elkton Con. M. & M. Co., with its concluding ½c. monthly dividend for December, has paid a total of $225,000 in dividends in 1911.

The Granite G. M. Co. on December 20 paid a dividend of 2c. per share, making a disbursement of $20,000. The properties of the company are operated by lessees. It is said that the December production of the Granite company's mines will be about 2000 tons of ore.

The W. P. H. shaft of the United G. M. Co. is to be sunk an additional 100 ft. It now is 650 ft. deep. It is under lease to Fogleman & Roach.

The 101 Mining Co. has installed a friction hoist at the Requa Savage shaft. Development is now limited to the upper workings, but sinking will be commenced in a few weeks. Sub-leases may be granted for blocks of ore near the surface. Charles Crowder is manager for the company.

The production of the Jerry Johnson mine, Ironclad hill, for December, will be about 45 cars of ore, according to the estimate of Frank Caley, lessee.

The Gold King company, which owns the first mine discovered in the Cripple Creek district, according to report, has paid a dividend of 3c. per share, making a distribution of $20,000. The company is a close corporation. The property is operated by Owen Roberts, a lessee, who took hold of it after it had been declared 'worked out'.

IDAHO

Shoshone County

Silver lead ore recently was found at the Edna May mine, in the Coeur d'Alene, within half a mile of the C. M. & S. P. railroad. The orebody is developed by a 40-ft. adit and a 100 ft. adit.

Plans have been made for a gravity railroad to take ore from the portal of the new adit of the Stewart mine to the railroad. The 'empties' will be brought back by motor. A 'switch-back' was considered, but discarded for the new plan. The adit is in about 200 feet.

MONTANA

Silverbow County

The directors of the Parrot Silver & Copper Co. have voted to distribute to shareholders *pro rata* the 90,000 shares of Anaconda Copper M. Co.'s stock which was accepted as payment in the sale of the entire property of the Parrot company to the Anaconda company. The Anaconda shares have been practically the sole asset of the Parrot company. After the sale, which was before June 1911, W. F. Walt and Lewis Foss of Boston, controlling 1210 shares, brought suit in the Federal court to have the sale set aside. The directors believe that the minority stockholders should no longer wait for a settlement of the litigation. There are 230,000 Parrot shares, so the holder of ten shares of Parrot will receive slightly less than four shares of Anaconda, with a small amount of cash. The Amalgamated was the principal owner of Parrot at the time of the sale.

The Tuolumne new surface plant is to be ready for operation about the first week in January. The steel headframe and hoist are now in position. It is said the company will increase its output to possibly 250 tons per day.

The new Raven compressor recently purchased in Salt Lake is in position, and the tests made show that it is in good working order. In the next few days work will be started to unwater the lower levels of the mine, but inasmuch as the water is over 300 ft. deep, some time will be required to remove all of it. It is proposed to put a force of men at work developing the lower levels as soon as the water has been pumped out.

Mining men, including officials of the Anaconda company, do not fear trouble next spring with the Miners' Union when the contract relating to the wage scale expires. This contract, entered into nearly five years ago through the efforts of John D. Ryan, provides that when copper was 18c. or over, the miners should receive $4 per day, and that when it dropped below that figure, they were to receive $3.50 per day. For quite a long time copper was above 18c., but it was not until it dropped below 17c. that the Amalgamated dropped the rate of wages to $3.50, according to agreement. The Miners' Union is a very conservative organization, while the Anaconda company, on the other hand, has always shown its preference for union labor. The statement sent out from this city that there was a possibility of the company declaring in favor of non-union labor has not a shadow of truth in it, according to people who should be in a position to know. The Anaconda company is to start about the first of the year to sink the shaft of the St. Lawrence mine from the 2300-ft. level to a depth of 2600 feet.

NEVADA

Esmeralda County

Better progress than was expected has been made in enlarging and timbering the St. Ives shaft of the Goldfield Merger Mines Co., controlled by the Goldfield Deep Mines

Co., of which J. Ross Clark, brother of William A. Clark, of Montana, is president. The plans of this company include sinking a shaft 2000 ft. deep. It has been enlarged to three compartments, each 5 by 4½ ft. in the clear, to a depth of 470 ft. and the timbers framed to fit those of the fourth compartment. The timbering is nearly finished, and sinking will be in progress by the first of the year. The new hoisting plant, compressor, and steel head-frame, to be installed early in the coming year, will be among the largest and most modern in the entire country, and sinking will progress with all possible expedition.

In the Diamondfield part of the district the Goldfield-Belmont company has exposed a good orebody in the new winze, sunk 50 ft. below the 300-ft. level, and will resume stoping at this point and shipping the product. The winze is 750 ft. distant from the main shaft. A supplementary electric hoist is in use at the winze, which will continue to further depth. It is probable that the raise from the 300-ft. level, being driven to connect with a winze from the 150, will be continued to connect with the surface in order to supply a working shaft at this point. There is no water in the mine at present depth. The Vernal, adjoining the Belmont on the north, and developing a continuation of the Belmont vein, has some excellent ore on the 50-ft. level, assays running from $40 to $190 per ton, and is driving from an old lease shaft near the Belmont boundary to connect with the future main shaft, about 75 ft. deep, near the centre of the Vernal claim. Lessees who recently began work on the Diamondfield Black Butte, from the main company shaft, are driving northeast from a new station on the 250-ft. level and are believed to have penetrated the casing of the famous Quartzite vein, from which a production of nearly $500,000 worth of rich shipping ore was made in the early years of the camp's life. The vein dips away from the shaft and this level is 100 ft. vertically, and a considerably greater distance on the incline of the vein, below the sill-floors of the deepest of the old stopes. Other lessees working on the west side of the butte have exposed seams of rich ore, carrying gold and silver, on the 100-ft. level, and are unwatering the shaft in order to drive for the vein 100 ft. deeper. Work will be started soon on a new lease on the east end of the Daisy, which has the southern extension of the Belomnt vein and where small quantities of rich ore have been mined recently by lessees.

Humboldt County

(Special Correspondence.)—The Indian National company is driving a cross-cut on the Silver Slipper lode, and expects soon to intersect a rich shoot exposed in the upper adit. Good ore is reported in the lower workings. The Great Equator company has uncovered a promising lode, and is driving in hopes of reaching the rich Charlestown vein. This property lies north of the National Mines and Indian National group. Developments at the National Mines estate are understood to be attended with the usual good results. This company has disbursed dividends amounting to $225,000 in 1911, or a total of $570,000 since organization. The ore content is principally gold. Mrs. Emma Stith has discovered a promising prospect north of National. The vein is said to be strong. Officials of the Sheba mine recently arrived from Houghton, Michigan, to examine the company's holdings, and it is rumored that development will be conducted on a larger scale. Adamson & Turner are working steadily on the Recall property, four miles from Winnemucca, on the north side of Winnemucca mountain. A small percentage of the ore is stated to be high grade. Munna, Polin, and associates have resumed activities at their claims, a few miles above Paradise. The recently burned cyanide plant has been replaced by a new one. Lessees on the Signal Peak group, Seven Troughs district, are shipping ore from near the surface. A 1500-ft. adit is being driven to cut the vein at depth. The ore is said to assay $50 to $75 per ton. The quartz is sent to the Darby custom mill. The interests controlling the Darby mill have taken a bond and lease on the Mazuma Hills group. The incline shaft is down 400 ft., and cross-cutting to the vein is under way. Stahl Bros. have bonded several properties in the north end of the Seven Troughs field. They recently opened a vein of rich quartz on the Golden Horseshoe claim. Sinking is under way.

Winnemucca, December 22.

Ore reported to be exceptionally rich in free gold was found recently in a vein 1 ft. wide on the Seven Troughs Coalition M. Co.'s property. The new vein parallels that now being developed in the Friedman winze.

In a preliminary annual report to stockholders, L. A. Friedman, general manager for the Seven Troughs M. Co., states that during the year the Florence M. & L. Co. produced from the Seven Troughs property 887 tons of ore, principally from stopes adjacent to the sixth level. To prospect the property at depth, the Quinton M. Co., acting in conjunction with the Florence company, straightened and retimbered the Fairview shaft and did other development work. Several improvements were made in the surface equipment. A recent run at the Darby mill on 60 tons of ore from the sixth level and 72 tons of low-grade ore was made, but the returns have not been published. High-grade silver ore was mined on the 200-ft. level of the Florence workings early in the year, but at present the land about the Florence shaft practically has been abandoned.

Good ore has been found in the adit of the National Mines Co. at the south end of Radiator hill, according to a recent report from Winnemucca. George Stowe is superintendent of the property.

Lincoln County

Newspaper reports from Pioche state that the Prince Con. M. Co. has started grading for a railroad to its property. While the road, which will cost between $100,000 and $140,000, and which is to be completed by May 1, 1912, ostensibly is an undertaking of the mining company, it eventually will become the property of the Los Angeles & Salt Lake railroad.

H. C. Parker and Patrick Friel have taken a lease on the Bamberger property, adjacent to the Day mine at Jack Rabbit, and a siding will be built where the ore can be loaded for shipment to Pioche on the Pioche Pacific railroad.

Nye County

(Special Correspondence.)—The Jim Butler company is planning development of the Fraction vein, following the agreement with the Tonopah M. Co. over apex rights. Work ceased on a portion of the vein about four years ago, as it was then apparent that litigation would probably develop. The orebody has proved one of the best in Jim Butler ground, and its further development will be watched with interest. The main shaft of the Belmont is 70 ft. below the 12th level, with the winze 110 ft. farther down, on the dip of the vein. All the ore is stated to be high smelting grade. As depth is gained, the ore appears to be assuming a smelting character. The new mill is making rapid progress. Most of the milling equipment has been installed in the new MacNamara mill, and the electrical machinery is expected within a few days. If present favorable conditions continue, the plant will be in operation early in the year. The mill has 10 stamps. According to advices from Pioneer, the Tobin brothers of Denver have recovered control of the Pioneer Consolidated group and are arranging for vigorous work. The property is credited with a production of $600,000 in two years. The reopening of the group means a brisk season for the Pioneer district. Manhattan advices report good progress on the mill of the Associated company, and it will be in operation about March 1. Placer mining on the west side of the district is active, and much bullion is being sent out. The Big Four is reported to have opened rich ore on the 400-ft. level. A cross-cut has been started to determine the width of the vein.

Tonopah, December 22.

White Pine County

The Nevada Con. Copper Co.'s report for the 13 months ended October 31 gives the net earnings of the company for that period as $2,298,759. The dividends paid amounted to $2,997,505. The total receipts, $6,276,477, less the dividend disbursements and $981,255 for 'ore extinguishment' left a balance on hand of $2,594,717 in undivided profits at the close of the period named.

A meeting of the Boston Ely company will be held in the near future to consider increasing the capitalization to raise money for development, or the assessment of 50c. per share on the stock.

Unconfirmed rumors are to the effect that the Giroux company's ore is to be treated at the Nevada Consolidated concentrator at McGill. It is reported that a contract has been signed in New York for the concentration of the Giroux sulphide ore at the McGill plant, and also for the smelting of concentrate and for the treatment of a large amount of direct smelting ore which soon will be shipped from the Alpha. The report has been received with enthusiasm in the district as indicating that the Giroux would reach a producing basis at least by next April.

NEW MEXICO

GRANT COUNTY

The first shipment of the Chino Copper Co.'s mill is producing about 40 lb. of copper per ton of ore treated, according to an interview with D. C. Jackling, general manager for the company, at Salt Lake. The second section was to have been in operation before New Year's, and the third section will be ready early in January. The structural steel for the fourth and fifth sections, recently decided on, is being raised. Mr. Jackling has recently inspected the plant personally.

CHINO CONCENTRATOR.

UTAH

"To protect the interests of stockholders of Nevada-Utah M. & S. Corporation", F. D. Pavey and associates have organized a stockholders' protective committee. The committee invites deposits of stock. The Security Transfer & Registrar Co., 66 Broadway, New York, will issue transferable certificates of deposit for the stock, which must be deposited on or before January 5. The company owns property in Beaver and Salt Lake counties, Utah, and Lincoln county, Nevada.

BEAVER COUNTY

Moscow, of Beaver county, has come to the front with its second dividend in three months, of $8000. The property is shipping regularly about $6000 worth of ore per month.

The fight for the control of the old Horn Silver, at Frisco, Beaver county, has resulted in a victory for the 'insurgents.' The new board consists of E. B. Critchlow, M. C. Morris, H. S. Young, Alexander B. Simonds, Jacob Neadle, Edward E. Olcott, William R. Britton, and Charles Brennermann. The mine, which is one of the pioneers among Utah producers, is now shipping about 1000 tons of ore per month, much of it under leases. In 1910 its receipts were $147,152 and the net profit was $47,357. It has paid a total of $5,642,000 in dividends.

JUAB COUNTY

The Tintic Leasing Co. is shipping about 10 cars of ore per month from the Galena King mine, Stockton district, where it started operation last February. Development is active at the Miller lease, where shipping grade ore is being mined.

The Iron Blossom Con. M. Co.'s report for the year ended December 1 contains a hope that 'some one' will undertake the construction of a mill for the district, as many mines have ore which under present smelting charges it is not profitable to ship. Receipts for the year, according to press accounts, amounted to $269,175, and disbursements to $298,017, of which $200,000 was for dividends. Since the report a $50,000 disbursement was made in the Christmas dividend.

The electric hoist of the Selma property, in the North Tintic district, is working smoothly, and the shaft is being sunk at a rate of about 6 ft. per day.

A contract has been let for the construction of a 2600-ft. tramway at the Eva property in the Nebo district.

Ore shipments from the Tintic district last week totaled 130 cars.

Ore assaying about 30 oz. silver and $4 gold per ton was discovered last week in the No. 3 workings of the Iron Blossom mine. Further development of the orebody is said to have shown improvement in grade. The discovery was made in a raise about 40 ft. above the 600-ft. level.

About 100 tons of ore was shipped last week from the Beck Tunnel property. It is reported that the recent assessment of Black Jack stock will give a working capital of about $5000 after all debts are paid, and that development may be resumed. Sinking of the main shaft at the Eagle & Blue Bell mine will be started by January 10.

Dragon Consolidated, of Tintic, long known as a shipper of iron flux for the smelters, will soon enter the lists as a producer of silver-lead ores. The Knight interests, which control the Dragon and the Iron Blossom, have followed the Iron Blossom orebodies into Dragon ground. Shipments will be made through the Iron Blossom workings.

SALT LAKE COUNTY

The United States S., R. & M. Co. has declared its regular quarterly dividend of 1.75% on preferred and 1% on common stock, payable January 15. The company is purely a securities-holding corporation, controlling the United States M. Co., the United States Smelting Co., and the Mammoth Copper M. Company.

Newspaper reports regarding the Michigan Utah Consolidated, the new holding company of the Utah Mines Coalition Co., City Rocks, Grizzly, and Copper Prince, are to the effect that of the capital stock, one-half, or 500,000 shares, will be retained in the treasury. Of this amount, 250,000 shares will be reserved for conversion of a bond issue of about $625,000.

Efforts to get the old camp of Stockton to 'come back' are meeting with partial success. The Bullion Coalition, which is a consolidation of the old Honerine, Honorine Extension, Honerine Tunnel M. Co., Bullion, and Honorine Western, is paying expenses while searching for additional orebodies. The company is working under the lease system, and is shipping over $12,000 worth of low-grade silver-lead ore per month.

The Utah Copper Co. in November produced 9,117,961 lb. of copper, against 8,660,729 lb. in October. During the first quarter of 1911 the company produced 25,851,455 lb., during the second quarter 24,469,812 lb., and during the third quarter of the year 21,296,709 lb. of copper.

SUMMIT COUNTY

The directors of the Daly West company have declared the usual dividend of 30c. per share, also an extra of 15c., both being payable on January 10, to stockholders of record on December 30. This calls for the disbursement of $81,000.

UTAH COUNTY

The Knight Investment Co., of Provo, which controls many Utah mines, has branched into Colorado. By a deal effect at Salt Lake City, it has acquired 510,000 out of the 1,000,000 shares in the Rico-Wellington company at Rico, Colorado, and has assumed the management.

TOOELE COUNTY

The Cliff M. Co. has declared a dividend of 10c. per share, payable January 2 to stockholders of record December 20. This company owns property in the Ophir district and employs about 75 men. The orebody has been developed for 1500 ft. The main office of the company is at Duluth, Minn., but the manager, Grant Snyder, resides in Salt Lake City.

WASHINGTON

FERRY COUNTY

(Special Correspondence.)—The Republic Mines Corporation has increased its ore shipments during the last three weeks to two carloads per day, and the smelter returns received show an average of $7.65 net per car. The appearance of the mines indicate a further increase in the near future. In the Lone Pine an immense body of high-grade ore is being opened up on the 400-ft. level. The main inclined shaft on the Surprise mine has been deepened 100 ft. since sinking was resumed. From the cross-cut in the 400-ft. level drifts have been driven each way on the vein. From a point 30 ft. south from the cross-cut a rich body of ore was found, the assays running as high as $342 per ton. The stope on the 600-ft. level is up about 115 ft. The ore-content is changeable, the assays ranging $4 to $398 per ton.

At the Black Tail mine the work at present is confined to sinking the shaft, which has gained 40 ft. in depth. The San Poil Consolidated holds leases and bonds for five years, dating from February 2, 1911, on the San Poil, North San Poil, Snowstorm Fraction, Baby Fraction, and Trade Dollar claims, and has taken up the bond on the North San Poil for a consideration of $33,000, saving $15,500 in the transaction.

The Meteor M. Co. promises to put on a large force of men at the Meteor mine, at Covada, after January 1.

Republic, December 22.

STEVENS COUNTY

(Special Correspondence.)—Work has been resumed by the Valley Dew M. Co., in the Orient district. The Orient Gold Mines, Ltd., has sunk a shaft at the White Elephant mine nearly 100 ft. in ore which assays as high as $50 per ton. The shaft will be continued to 125 ft., at which depth a level will be opened. The shaft recently has been equipped with new hoisting machinery. About 300 ft. up the hill from the shaft, on a separate vein, a body of rich gold-bearing ore has been developed to a width of 6 ft. and is widening with depth.

The Ben Venue mine, near Meyers Falls, has been developed to a depth of 145 ft. and has produced six carloads of ore, none of which assayed less than $40 per ton. A recent shipment of 20 tons assayed $60.45 per ton. From the profits derived from the entire yield a surplus is left for the purchase of machinery.

The old Dead Medicine mine, on Clugston creek, in the Colville district, has been reopened by the Clugston M. Co. In the last year and a half an adit has been driven about 700 ft. which has run into a full face of ore that assays $12 to $70 per ton. The discovery was made at a depth of about 450 ft., 200 ft. below the old workings.

The south drift in the United Copper mine, at Chewelah, has penetrated 220 ft. in shipping ore, having a width of about three feet at the face which averages nearly $100 per ton.

Orient, December 23.

CANADA

BRITISH COLUMBIA

S. G. Blaylock, superintendent for the Canadian Con. M. & S. Co., is quoted as saying that the smelter at Trail is running at full capacity in its lead department, which can treat 250 tons per day. The copper department has a capacity of 1500 tons of ore per day, but never has been operated to a greater capacity than 900 tons, at which rate it is running at present. While the smelter has been run at an increased cost during the past few months, owing to the necessity of importing coke from Pennsylvania, the next annual report will show a gain both in profit and in volume of business, according to R. H. Stewart, general manager for the company. Mr. Stewart predicts an increased production by the Slocan district.

Late reports from Boston state that the Granby company in the near future will have four of its eight furnaces at the Grand Forks smelter in operation. The final payment for the Hidden Creek property, amounting to $200,000, was due December 15, but was made some time ago at a good discount. There remained to be paid $25,000 to Mr. Rogers, engineer for the company, who owned an interest in the property. He relinquished his interest for 1500 shares of Granby and $50,000 cash. Mr. Hodgens, holder of the majority interest in the Hidden Creek company, was paid $400,000.

ONTARIO

The report of the Coniagas Mines, Ltd., for the year ended October 31 shows a production of 3,789,274 oz. of silver, against 1,929,531 oz. for the preceding year, which exceeded the production of the year before. It is reported that the development of new orebodies has almost equalled during the year the value of the silver produced. During the year 52,230 tons of ore averaging 36.3 oz. silver per ton was milled. A total of 1418 tons of concentrate, containing 1,643,616 oz. of silver, was shipped during the year, together with 619 tons of ore. With the exception of one car of low-grade ore, all ore was shipped to the Coniagas Reduction Co. at Thorold.

The drill-hole on the Pearl Lake property has reached a depth of 1300 ft. and has penetrated ore assaying as high as $21.60 per ton.

MEXICO

GUANAJUATO

The work of cross-cutting from the deep Nueva Luz shaft for the mother lode of the Guanajuato district will be resumed in December, it is now announced. It was expected to cut the lode as long ago as last February, but the Proprietary Mines Co., which is financing the Nueva Luz, gave its attention to the completion of the reduction plant at the Tajo de Dolores, another Guanajuato holding, and the Nueva Luz work was delayed. Lately shaft-timbering has been in progress, and air lines have been put in to facilitate the work of cross-cutting.

SINALOA

Orders have been placed for a new power-plant at the famous Guadalupe de los Reyes mines in the Cosalá district of Sinaloa, and it is expected to make a big reduction in operating costs. For a number of years the company has been paying out an enormous sum annually for wood for the present steam plant. Formerly Guadalupe de los Reyes paid dividends of ₱1,000,000 yearly, but of late years the net earnings have been small. In the new plant, which will be ready by May of next year, charcoal gas-producers will generate current for the mines and reduction plant.

PHILIPPINE ISLANDS

For conducting mining operations in Mindoro and Bulacan and at Monte de Oro in Rizal, says the *Daily Consular Report,* articles of incorporation have been filed by the Rizal iron mining company, capitalized at ₱1,000,000. It will have its headquarters in Manila. The company will undertake the mining of iron, besides gold mining at Monte de Oro.

ARGENTINE REPUBLIC

A report from R. M. Bartleman, consul-general at Buenos Aires, says that the Argentine president has recommended to Congress the appropriation of ₱2,000,000 ($850,000) for the exploitation of petroleum in Comodoro Rivadavia. The recommendation says that three test wells there yielded not less than 10 tons each per day, and ₱10 per ton is thought a low price, as a ton of petroleum is equal to two tons of coal, of which the market price is ₱20 per ton. The Ministry of Agriculture supplied for the locomotives of the railway to Lake Buenos Aires 2000 tons of petroleum to take the place of 4000 tons of coal which had cost ₱40 per ton.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS

RIGHT OF LIFE TENANT TO SELL MINERAL

The owner of a life estate in land has no power to sell any mineral rights therein, as such a power would give to the life tenant the right to destroy the life estate of the remainder man.

Rittenhouse v. Porter, (Kentucky) 128 Southwestern, 288. May 1910.

CONVEYANCE OF MINING LAND IN TRUST

The fact that a grantor conveyed certain mining land in trust for certain beneficiaries, intending by such conveyance to part with all his interest in the land for the exploitation of the mine, the interest of such beneficiaries in the land did not terminate from the fact that the mining enterprise was a failure, but the beneficiaries held an interest in the land for whatever value it in fact possessed.

Glynn v. Maxfield, (New Hampshire), 76 Atlantic, 196. May 1910.

RESERVATION IN GRANT OF COAL—LIABILITY FOR BREACH

A reservation in a grant of the coal under certain described premises by which the grantor reserved and excepted one-quarter of an acre on which his barn was situated was sufficiently certain, and the grantee was bound to leave the one-quarter acre of coal so excepted for support, and the grantor was entitled to recover the value of the coal taken from such quarter acre; he was entitled to damages in double the value of the coal in the vein immediately before the taking under a statute of Iowa providing any mine operator or one who takes coal without permission from adjoining land shall be liable in double damages therefor and for all expenses caused thereby.

Stewart v. Colfax Consolidated Coal Co. (Iowa) 126 Northwestern, 449. May 1910.

LIABILITY FOR INJURY FROM BLASTING—INDEPENDENT CONTRACTOR

A railroad company was held liable for an injury caused by negligently conducting blasting operations near the residence of the complainant. The fact that the work was done for the railroad company by an independent contractor was not sufficient to exempt the railroad company from liability where it appeared that the company by its own servants had first attempted to perform the work, and knowing its performance in the manner attempted would injure complainant, the fact that it procured an independent contractor to conduct the work in the same negligent manner was sufficient to make the railroad company liable.

Hunter *v.* Southern Railway Co., (North Carolina) 68 Southeastern, 237. May 1910.

INJUNCTION TO COMPEL CITY TO EXTINGUISH A BURNING MINE

A court properly refused to issue a mandatory injunction to compel a city to extinguish fires in an anthracite coal mine, as there is no method in common and ordinary use which can be used to extinguish such a fire. Whether such a fire can be extinguished at all or not is a question of mining engineering, and a question of which a municipality as such would have no knowledge, and in the absence of proper apparatus it would require an outlay of a vast sum before any intelligent effort could be made to extinguish such a fire, and without any assurance that such an effort would be successful. It is a matter of common knowledge that mine fires in the anthracite coal regions present baffling questions of mining engineering, most difficult to deal with and at times impossible to grapple with successfully. The principle under which municipalities may be compelled to abate nuisances upon a public highway or arising out of their own neglect of duty, does not apply in such cases.

Cameron *v.* City of Carbondale, (Pennsylvania) 76 Atlantic, 198. May 1910.

Company Reports

TOMBOY GOLD MINES CO., LTD.

The report of this company for the year ended June 30, 1911, shows a net profit of £63,861. Two dividends of 2s. each were paid, on December 15, 1910, and June 30, 1911, resulting in the disbursement of £60,000. After deducting the income tax, commission to the general manager, John Herron, and depreciation, there is a balance of £121,179, as against a balance of £57,318 carried forward the preceding year.

The ore treated during the year amounted to 116,222 tons. The bullion production was valued at $781,324. The cost of production was $509,057, leaving a net profit of $272,267. The net profit of $309,375 is reached by adding to the foregoing the $37,108 received from other sources. The ore reserve was estimated as 427,000 tons, as against a reserve of 441,600 tons in the previous report.

To prove the mine in depth, the shaft was sunk to the 2100 ft. level. For at least 100 ft. at that level, states the report, the vein has maintained its average width and grade. No important changes have been made in the plant and equipment, excepting certain alterations incident to the gradual increasing of the concentrating plant's capacity. The report states that the title to the Revenue Tunnel property, purchased in July for $400,000, has been found good, and the last payment was made November 1. Treatment of ore from the new property will be commenced late in December. There have been some changes in the reduction plant, and one of the improvements made by the Tomboy company on the new property was the construction of a tramway from the adit to the mill.

STRATTON'S INDEPENDENCE, LTD.

During the year ended June 30 this company's mill treated 109,800 tons of ore, as against 68,711 tons during the preceding year, as the mill has been doubled in capacity, in accordance with the consulting engineer's report for 1910, and can handle 10,000 tons of ore per month. The mill's net profit for the year, £12,615, shows an increase of £7155 over that for the preceding twelve months. The production of concentrate and bullion amounted to £45,788, and the expenses to £33,173.

The mine account shows 2752 tons of ore sold for the company and 15,633 tons for lessees, for £8636 and £94,364, respectively. The cost of freight and treatment for the company's ore amounted to £2824 and £21,927 for the lessee's ore, leaving for the two accounts net proceeds of £5812 and £72,436. Of the latter sum the company retains 39.77%, or £28,813, as royalty and charges on profits.

The mine and mill profits, as stated, together with rents, interest, and commission, and after deducting all expenses including taxes and the maintenance of the London office, gives the total net profit for the company as £21,006.

One 10% dividend was paid, on November 29, 1910, resulting in the disbursement of £12,500. The directors recommended in the annual report the payment on November 16 of an interim dividend of 10% from the balance left, £9437.

The main levels of the mine are now reopened, and the 'caved area' has been repaired for active mining. The most valuable ore found below the third level in the Washington vein was discovered on the ninth level, where the vein is a foot wide and assays on the average 3 oz. per ton.

The mine output has exceeded the forecast of the consulting engineers and managers, Philip Argall & Sons, and gratification is felt from the fact that the estimated working profit of $10,000 per month has been realized from the time active milling was commenced in April 1909. Milling cost and production estimates also have been fulfilled. In the year just closed, for the first time, the mine produced low-grade ore which was treated in the company's mill. During the latter part of the year all refuse from the ore-house was treated in the mill.

Personal

[illegible] are invited to send news of their engagements [illegible]

[illegible] is at San Francisco.

[illegible] San Francisco.

[illegible] of [illegible] is at the St. Francis.

[illegible] is at the St. Francis.

J. T. [illegible] is stopping at the St. Francis hotel.

[illegible] is at Los Angeles from [illegible].

[illegible] has left [illegible] for a visit East.

[illegible] of [illegible] is at San Francisco.

[illegible] W. [illegible] has returned to San Francisco.

[illegible] has been at San Francisco.

[illegible] has gone to New Brunswick, Canada.

T. [illegible] of Chicago, has been in New York City.

M. A. [illegible] has returned to California from Mexico.

T. H. [illegible] has returned to New York from the West.

W. H. [illegible] has left London, and is now in Switzerland.

L. O. Howard has left Cleveland, Ohio, for Green River, Utah.

[illegible] has returned to La Paz, Lower California.

W. A. [illegible] is making an examination at the Las Indias.

W. L. [illegible] was at Moscow, Russia, early in November.

[illegible] of [illegible], Mexico, has gone to [illegible], Michigan.

E. E. [illegible] was at New York recently and has returned to Cobalt.

[illegible] was at San Francisco and has proceeded to the Orient.

[illegible] H. [illegible] has just returned from a professional visit to [illegible].

W. [illegible] was in Mason Valley recently and has returned to Salt Lake City.

[illegible] L. [illegible] was at San Francisco a few days; he has returned to [illegible].

[illegible] is manager for the [illegible] Argentine Mining Co., [illegible].

[illegible] has taken charge of the [illegible] mine, [illegible], Canada.

William A. [illegible] Jr., was recently at Salt Lake City and has returned to Los Angeles.

[illegible] is in [illegible], New Mexico, making a geological survey of the mines there.

[illegible] has been [illegible] assistant superintendent [illegible] of the [illegible].

[illegible] is manager for the [illegible] Mining & Smelting Co., [illegible], Nova Scotia, [illegible].

[illegible] of [illegible], sailed from New York, December [illegible], on a [illegible] weeks' examination trip to the West Indies.

[illegible] manager and [illegible] superintendent, have [illegible] of the [illegible] mine, [illegible] and [illegible] has taken charge.

[illegible] has [illegible], having resigned as manager for the [illegible]. [illegible] is now acting as manager for the company.

[illegible] is [illegible] engineer for the [illegible]. He is now in [illegible], but will [illegible] going to Witwatersrand [illegible].

[illegible] has [illegible], the [illegible] of the new mill for the [illegible] Mining Co. at [illegible], Durango. [illegible] is [illegible] mining properties near Santiago Papasquiaro, Durango.

Market Reports

LOCAL METAL PRICES

San Francisco, December 28.

Antimony	[illegible]	Quicksilver, flask	$44.50
Electrolytic Copper	[illegible]	Tin	47—[illegible]c
Pig Lead	[illegible]	Spelter	[illegible]c

Zinc dust, 100 lb. casks, per 100 lb., small lots $6.50—6.75, large $[illegible]—6.50

METAL PRICES

(By wire from New York.)

Average daily prices in cents per pound

Date	Electrolytic copper.	Lead.	Spelter.	Silver, per oz.
Dec. 21	[illegible]	4.45	6.25	[illegible]
" 22	[illegible]	4.45	6.25	[illegible]
" 23	[illegible]	4.45	6.25	[illegible]
" 24	Sunday.	No market.		
" 25	Holiday.	No market.		
" 26	[illegible]	4.47	6.25	[illegible]
" 27	[illegible]	4.47	6.25	[illegible]

ANGLO-AMERICAN SHARES.

(Cabled from London.)

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

	Dec. 21. £ s. d.	Dec. 28. £ s. d.
Camp Bird	1 10 6	1 10 6
El Oro	1 2 9	1 3 3
Esperanza	1 10 0	1 11 10½
Dolores	1 5 0	1 5 0
Oroville Dredging	0 4	0 4 9
Mexico Mines	7 11 3	7 15 0
Tomboy	1 8 1½	1 8 9

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from C. S. Burton & Co., New York.)

	Closing Prices. Dec. 27.		Closing Prices. Dec. 27.
Amalgamated Copper	$ 6[illegible]	La Rose	$ 4
A. S. & R. Co.	[illegible]	Mason Valley	[illegible]
Braden Copper	[illegible]	Miami Copper	[illegible]
B. C. Copper Co.	[illegible]	Mines Co. of America	4
Butte Coalition	[illegible]	Nevada Con.	[illegible]
Chino	[illegible]	Nevada-Utah	[illegible]
Davis-Daly	[illegible]	Nipissing	7
Dobie	[illegible]	Ohio Copper	[illegible]
Dolores	[illegible]	Ray Central	[illegible]
First National	[illegible]	Ray Con.	[illegible]
[illegible]	[illegible]	South Utah	[illegible]
Giroux	[illegible]	Superior & Pittsburg	[illegible]
Goldfield Con.	[illegible]	Tenn. Copper	[illegible]
Greene-Cananea	[illegible]	Trinity	[illegible]
Guanajuato Con.	[illegible]	Tuolumne Copper	[illegible]
Hollinger	[illegible]	United Copper	[illegible]
Inspiration	[illegible]	Utah Copper	[illegible]
Kerr Lake	[illegible]	Yukon Gold	[illegible]

COPPER SHARES—BOSTON.

(By courtesy of J. C. Wilson, Mills Building.)

	Closing prices. Dec. 28.		Closing Prices. Dec. 28.
Adventure	[illegible]	Mohawk	$[illegible]
Allouez	[illegible]	North Butte	[illegible]
Calumet & Arizona	[illegible]	Old Dominion	[illegible]
Calumet & Hecla	[illegible]	Osceola	[illegible]
Centennial	[illegible]	Quincy	[illegible]
Copper Range	[illegible]	Shannon	[illegible]
Daly West	[illegible]	Superior & Boston	[illegible]
Franklin	[illegible]	Tamarack	[illegible]
Granby	[illegible]	Trinity	[illegible]
Greene-Cananea ctfs.	[illegible]	Utah Con.	[illegible]
Isle Royale	[illegible]	Victoria	[illegible]
La Salle	[illegible]	Winona	[illegible]
Mass Copper	[illegible]	Wolverine	[illegible]

NEVADA STOCKS.

By courtesy of San Francisco Stock Exchange.

San Francisco, December 28.

[illegible]	$ [illegible]	Mayflower	$ [illegible]
[illegible]	[illegible]	Mexican	[illegible]
Belmont	[illegible]	Midway	[illegible]
[illegible]	[illegible]	Montana-Tonopah	[illegible]
Booth	[illegible]	Nevada Hills	[illegible]
[illegible]	[illegible]	Ophir	[illegible]
Combination Fraction	[illegible]	Pittsburg Silver Peak	[illegible]
Con. Virginia	[illegible]	Round Mountain	[illegible]
Florence	[illegible]	Savage	[illegible]
Goldfield Con.	[illegible]	Tonopah Extension	[illegible]
[illegible]	[illegible]	Tonopah of Nevada	[illegible]
Jim Butler	[illegible]	Union	[illegible]
Jumbo Extension	[illegible]	[illegible]	[illegible]
MacNamara	[illegible]	West End	[illegible]